SUPPLEMENT TO

Beneath Apple ProDOS

For ProDOS Versions 1.0.1 and 1.0.2

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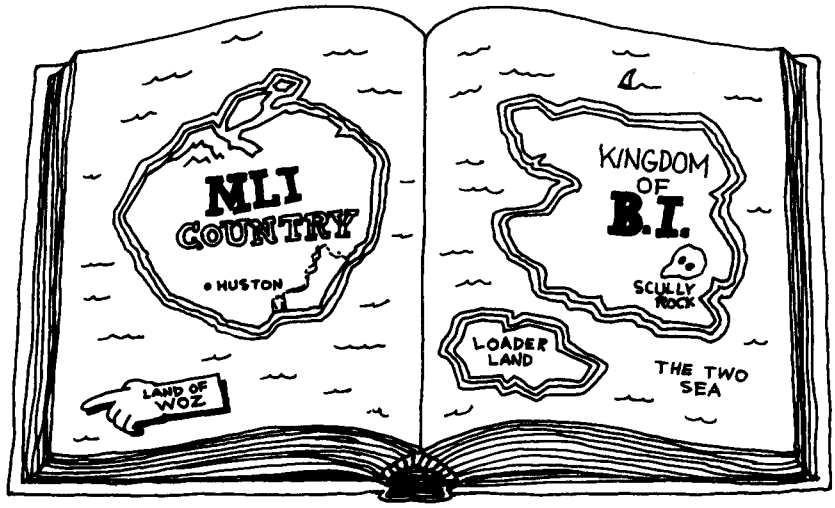

A ProDOS ATLAS

INTRODUCTION

This supplement documents the actual structure and logic of the ProDOS system at nearly a byte by byte level. It is intended to aid experienced programmers in designing customized interfaces to ProDOS, and to provide implicit documentation of ProDOS's functions. Less advanced assembly language programmers may find this supplement useful in learning about how an operating system works. Providing this information does not constitute an endorsement by the authors of indiscriminant modification of the ProDOS components. Whenever possible, standardized interfaces to ProDOS should be used to avoid the uncontrolled modifications which were made to DOS 3.3.

External system programs and utilities such as the FILER and CONVERT are not covered here.

The information provided here is for two releases of the ProDOS operating system--Version 1.Ø.1 and Version 1.Ø.2. Because these versions are so similar, we have included both in the same supplement. Version 1.Ø.1 is first presented in its complete form. Then Version 1.Ø.2 is presented by pointing out and documenting those areas that are different from Version 1.Ø.1.

As new releases of ProDOS become available, additional supplements to Beneath Apple ProDOS will be prepared. To order supplements for other versions of ProDOS, fill out the order form on page 125 of this supplement. Ordering instructions can be found on page 124. When ordering a new supplement, be sure to specify the version of ProDOS you want the new supplement for.

UNDERSTANDING THE LISTINGS

The listings which follow describe the major ProDOS components in great detail. Each module is presented separately and consists of a section defining external addresses referenced by the program (such as zero page usage, I/O select addresses, and global page fields) followed by a section describing the instructions and data in the module. Divisions between major sections and subroutines are indicated with a row of asterisks (*) and additional comments.

Each detail line gives the address of the instruction or data field being described, followed by comments. Within the comments, the following notation is used to indicate references by instructions:

(address)	A store or load reference to a memory or I/O location.
>>address	A branch or jump to an address.
<address>	A call to a subroutine at the indicated address.
-->address	A pointer to an address.

Page titles give the address of the next instruction or data area in the module to be described. These may be used to quickly locate a particular area within the component.

```
Disk Controller Boot ROM -- Apple II/II+/IIe    NEXT OBJECT ADDR: C600
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

C600    MODULE STARTING ADDRESS

          ****************************************
          *                                      *
          *  BOOT ROM - APPLE DISK CONTROLLER    *
          *       THIS CODE RESIDES FROM $C600   *
          *       TO $C6FF, IT LOADS TRACK 0     *
          *       SECTOR 0 INTO RAM AT $800 AND  *
          *       JUMPS TO IT                    *
          *                                      *
          *  VERSION 1.0.1 -- 1 JAN 84           *
          *                                      *
          ****************************************

          ******** ZERO PAGE ADDRESSES ************

0026    SECTOR BUFFER POINTER
002B    SLOT NUMBER * 16 FOR INDEX
003C    WORKBYTE
003D    SECTOR WANTED
0040    TRACK FOUND
0041    TRACK WANTED

          ******** EXTERNAL ADDRESSES *************

0100    SYSTEM STACK
02D6    TRANSLATE TABLE - $80
0300    AUXILIARY BUFFER
0356    TRANSLATE TABLE
0800    SECTORS TO LOAD
0801    ENTRY POINT
C080    PHASE0 OFF
C081    PHASE0 ON
C089    MOTOR ON
C08A    DRIVE SELECT
C08C    READ DATA REGISTER
C08E    SET READ MODE
FCA8    MONITOR WAIT ROUTINE
FF58    RTS

C600 *********** BUILD READ TRANSLATE TABLE **************************

  C600  SIGNATURE
  C602  INITIALIZE TABLE VALUE INDICATOR
  C606  STORE BIT PATTERN
  C609  SHIFT PATTERN LEFT ONE BIT
  C60A  ARE THERE ANY TWO ADJACENT BITS ON?
  C60C  NO, TRY ANOTHER PATTERN  >>C61E
  C60E  YES, TURN OFF RIGHTMOST OF EACH GROUP OF ZEROES
  C610  FLIP BITS, PAIR OF ZERO BITS NOW SINGLE ONE BIT
  C612  HIGH BIT ALWAYS ON/TURN OFF BIT WE MISSED BEFORE
```

```
Disk Controller Boot ROM -- Apple II/II+/IIe    NEXT OBJECT ADDR: C614
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

  C614  --- >>C61E
  C616  SHIFT PATTERN RIGHT, MUST HAVE ONLY ONE BIT ON
  C617  IF MORE THAN ONE BIT ON, TRY ANOTHER PATTERN   >>C614
  C619  FOUND ONE, GET TABLE VALUE
  C61A  AND STORE IT IN TABLE  (0356)
  C61D  INCREMENT TABLE VALUE INDICATOR
  C61E  GET NEXT BIT PATTERN, DONE YET
  C61F  NO, GO CHECK IT OUT  >>C606

C621 *********** DETERMINE SLOT, TURN DRIVE ON **********************

  C621  CALL A KNOWN RTS  <FF58>
  C624  GET STACK POINTER
  C625  GET HIGH BYTE OF WHERE WE ARE  (0100)
  C628  TIMES 16 TO GET SLOT
  C62C  SAVE SLOT
  C62E  PUT IN X REG FOR INDEX
  C62F  INSURE READ MODE  (C08E)
  C635  SELECT DRIVE 1  (C08A)
  C638  TURN THE MOTOR ON  (C089)

C63B *********** RECALIBRATE DISK ARM *********************************

  C63B  PREPAIR TO STEP THE ARM 80 PHASES
  C63D  TURN A PHASE OFF  (C080)
  C640  PUT COUNTER IN ACCUMULATOR
  C641  CREATE A PHASE NUMBER (0-3)
  C643  DOUBLE IT FOR PROPER INDEX
  C644  COMBINE WITH SLOT FOR FINAL INDEX
  C646  PUT INDEX IN X REGISTER
  C647  TURN A PHASE ON  (C081)
  C64A  DELAY ABOUT 20 MICROSECONDS
  C64F  DECREMENT COUNTER
  C650  LOOP UNTIL ALL 80 ARE DONE  >>C63D

C652 *********** INITIALIZATION *************************************

  C652  ---
  C654  SECTOR TO FIND -> $00
  C656  TRACK TO FIND -> $00
  C65A  MAIN BUFFER POINTER ($26) -> $0800
  C65C  CLEAR THE CARRY
  C65D  PUSH STATUS ON STACK

C65E *********** SEARCH FOR A VALID HEADER ***************************

  C65E  CHECK DATA REGISTER  (C08C)
  C661  LOOP UNTIL DATA IS VALID  >>C65E
  C663  IS IT A $D5?
  C665  NO, TRY AGAIN  >>C65E
  C667  YES, CHECK REGISTER AGAIN  (C08C)
```

```
Disk Controller Boot ROM -- Apple II/II+/IIe    NEXT OBJECT ADDR: C66A
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

  C66A  LOOP UNTIL VALID  >>C667
  C66C  IS IT AN $AA
  C66E  NO, SEE IF ITS A $D5  >>C663
  C670  YES, DELAY FOR REGISTER TO CLEAR
  C671  CHECK REGISTER  (C08C)
  C674  LOOP UNTIL VALID   >>C671
  C676  IS IT A $96
  C678  YES, WE FOUND AN ADDRESS HEADER  >>C683
  C67A  NO, HAVE WE FOUND ONE PREVIOUSLY?
  C67B  IF NOT, START OVER  >>C65C
  C67D  WAS IT AN $AD?
  C67F  YES, WE FOUND A DATA HEADER  >>C6A6
  C681  NO, START OVER  >>C65C

C683 *********** DECODE ADDRESS FIELD *********************************

  C683  INITIALIZE COUNTER
  C685  SAVE VALUE DECODED, WILL BE TRACK ON LAST PASS
  C687  READ DATA REGISTER  (C08C)
  C68A  LOOP UNTIL DATA VALID  >>C687
  C68C  SHIFT BITS INTO POSITION X1X1X1X1
  C68D  SAVE FOR LATER
  C68F  READ REGISTER FOR NEXT BYTE  (C08C)
  C692  LOOP UNTIL VALID  >>C68F
  C694  COMBINE WITH PREVIOUS 1X1X1X1X AND X1X1X1X1
  C696  DECREMENT COUNTER, DONE YET?
  C697  NO, DO ANOTHER  >>C685
  C699  KEEP THE STACK CLEAN
  C69A  IS THIS SECTOR WE WANT?
  C69C  NO, START OVER  >>C65C
  C69E  GET TRACK FOUND
  C6A0  IS IT TRACK WE WANT?
  C6A2  NO, START OVER  >>C65C
  C6A4  YES, INDICATE ADDRESS FOUND, GO LOOK FOR DATA FIELD  >>C65D

C6A6 *********** READ DATA FIELD ************************************

  C6A6  INITIALIZE OFFSET (AUXILIARY BUFFER)
  C6A8  ---
  C6AA  READ DATA REGISTER  (C08C)
  C6AD  LOOP UNTIL VALID  >>C6AA
  C6AF  EXCLUSIVE-OR WITH TRANSLATE TABLE  (02D6)
  C6B4  DECREMENT OFFSET
  C6B5  STORE BYTE IN AUXILIARY BUFFER  (0300)
  C6B8  LOOP UNTIL BUFFER FULL  >>C6A8
  C6BA  INITIALIZE OFFSET (MAIN BUFFER)
  C6BC  READ DATA REGISTER  (C08C)
  C6BF  LOOP UNTIL VALID  >>C6BC
  C6C1  EXCLUSIVE-OR WITH TRANSLATE TABLE  (02D6)
  C6C6  STORE BYTE IN MAIN BUFFER
  C6C8  INCREMENT OFFSET
```

```
Disk Controller Boot ROM -- Apple II/II+/IIe    NEXT OBJECT ADDR: C6C9
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

  C6C9  LOOP UNTIL BUFFER FULL  >>C6BA
  C6CB  READ DATA REGISTER  (C08C)
  C6CE  LOOP UNTIL VALID  >>C6CB
  C6D0  IS CHECKSUM OKAY?  (02D6)
  C6D3  NO, START OVER  >>C65C

C6D5 *********** MERGE MAIN AND AUXILIARY BUFFERS**********************

  C6D5  INITIALIZE OFFSET (MAIN BUFFER)
  C6D7  INITIALIZE OFFSET (AUXILIARY BUFFER)
  C6D9  DECREMENT OFFSET (AUX BUFFER)
  C6DA  IF LESS THAN ZERO RESET IT  >>C6D7
  C6DC  GET BYTE FROM MAIN BUFFER
  C6E1  ROLL IN TWO BITS FROM AUXILIARY BUFFER
  C6E6  SAVE COMPLETED DATA BYTE
  C6E8  INCREMENT OFFSET (MAIN BUFFER)
  C6E9  LOOP UNTIL WHOLE BUFFER IS DONE  >>C6D9

C6EB *********** DETERMINE IF THERE IS MORE TO DO**********************

  C6EB  INCREMENT MAIN BUFFER POINTER
  C6ED  INCREMENT SECTOR NUMBER
  C6F1  IS THERE ANOTHER SECTOR TO LOAD?  (0800)
  C6F6  YES, GO DO IT  >>C6D3
  C6F8  NO, ENTER CODE WE JUST LOADED  >>0801

C6FB *********** UNUSED ************************************************

  C6FB  ---
```

```
Disk Controller Boot ROM -- Apple IIc          NEXT OBJECT ADDR: C600
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

C600    MODULE STARTING ADDRESS

          ****************************************
          *                                      *
          *  BOOT ROM - APPLE //c CONTROLLER ROM *
          *       THIS CODE RESIDES FROM $C600   *
          *       TO $C73F, IT LOADS TRACK 0     *
          *       SECTOR 0 INTO RAM AT $800 AND  *
          *       JUMPS TO IT.  IT CAN BOOT FROM *
          *       DRIVE 2 AND HAS SOME MINIMAL   *
          *       ERROR CHECKING                 *
          *                                      *
          *  VERSION 1.0.1 -- 1 JAN 84           *
          *                                      *
          ****************************************

          ******** ZERO PAGE ADDRESSES ************

0003    RETRY COUNT (HIGH BYTE)
0026    SECTOR BUFFER POINTER
002B    SLOT NUMBER * 16 FOR INDEX
003C    WORKBYTE
003D    SECTOR WANTED
0040    TRACK FOUND
0041    TRACK WANTED
004F    DRIVE TO BOOT FROM

          ******** EXTERNAL ADDRESSES *************

02D6    TRANSLATE TABLE - $80
0300    AUXILIARY BUFFER
0356    TRANSLATE TABLE
07DB    SCREEN LOCATION
0800    SECTORS TO LOAD
0801    ENTRY POINT
C080    PHASE0 OFF
C081    PHASE0 ON
C088    MOTOR OFF
C089    MOTOR ON
C08C    READ DATA REGISTER
C08E    SET READ MODE
C0EA    DRIVE SELECT
FCA8    MONITOR WAIT ROUTINE

C600 *********** INITIALIZATION ***************************************

  C600  SIGNATURE
  C602  SET DRIVE -> 1
  C604  INITIALIZE RETRY COUNT (HIGH BYTE)
```

```
Disk Controller Boot ROM -- Apple IIc          NEXT OBJECT ADDR: C606
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

C608 *********** SELECT DRIVE AND TURN IT ON ************************

  C608  ---
  C60B  INITIALIZE SLOT (6)
  C60D  INITIALIZE DEVICE (1 OR 2)
  C60F  SAVE DRIVE NUMBER ON STACK
  C610  INSURE READ MODE  (C08E)
  C616  GET DRIVE NUMBER BACK
  C617  SELECT APPROPRIATE DRIVE  (C0EA)
  C61A  TURN MOTOR ON  (C089)

C61D *********** RECALIBRATE DISK ARM *********************************

  C61D  PREPAIR TO STEP THE ARM 80 PHASES
  C61F  TURN A PHASE OFF  (C080)
  C622  PUT COUNTER IN A REGISTER
  C623  CREATE A PHASE NUMBER (0-3)
  C625  DOUBLE IT FOR PROPER INDEX
  C626  COMBINE WITH SLOT FOR FINAL INDEX
  C628  PUT INDEX IN X REGISTER
  C629  TURN A PHASE ON  (C081)
  C62C  DELAY ABOUT 20 MICROSECONDS
  C631  DECREMENT COUNTER
  C632  LOOP UNTIL ALL 80 ARE DONE  >>C61F

C634 *********** INITIALIZATION ***************************************

  C634  ---
  C636  SECTOR TO FIND -> $00
  C638  TRACK TO FIND -> $00
  C63A  BUILD THE TRANSLATE TABLE  <C709>

C63D *********** COUNT RETRIES AND INDICATE ERROR IF BOOT FAILS*******

  C63D  INITIALIZE RETRY COUNT
  C63F  CLEAR THE CARRY
  C640  PUSH STATUS ON STACK
  C641  KEEP STACK CLEAN
  C642  GET SLOT
  C644  DECREMEMT RETRY COUNT, TRY AGAIN?
  C646  YES, GO DO IT  >>C656
  C648  NO, TURN DRIVE OFF  (C088)
  C64B  GET A CHARACTER FROM ERROR MESSAGE  (C6CF)
  C64E  HANG WHEN DONE PRINTING  >>C64E
  C650  PUT A CHARACTER ON THE SCREEN  (077B)
  C653  INCREMENT OFFSET INTO MESSAGE
  C654  GO BACK FOR MORE  >>C64B
  C656  ---
  C657  DECREMENT RETRY COUNT (LOW BYTE)
  C658  IF NOT ZERO, TRY AGAIN  >>C65E
```

er Boot ROM -- Apple IIc

RIPTION/CONTENTS

GO DECREMENT RETRY COUNT (HIGH B
FILLER TO POSITION CODE BELOW >>C

**** SEARCH FOR A VALID HEADER ****

Disk Control

ADDR DESC

K DATA REGISTER (C08C)
UNTIL DATA IS VALID >>C65E
A $D5?
RY AGAIN >>C657
C65A IF S CHECK REGISTER AGAIN (C08C)
C65C SPAC UNTIL VALID >>C667
T AN $AA
C65E ******* SEE IF ITS A $D5 >>C663
DELAY FOR REGISTER TO CLEAR
C65E CHEC REGISTER (C08C)
C661 LOOP UNTIL VALID >>C671
C663 IS IT A $96
C665 NO, WE FOUND AN ADDRESS HEADER >>C683
C667 YES, HAVE WE FOUND ONE PREVIOUSLY?
C66A LOOP NOT, START OVER >>C63F
C66C IS IT AN $AD?
C66E NO, WE FOUND A DATA HEADER >>C6A6
C670 YES, START OVER >>C63F
C671 CHEC
C674 LOOP **** DECODE ADDRESS FIELD *********
C676 IS I
C678 YES, IALIZE COUNTER
C67A NO, VALUE DECODED, WILL BE TRACK ON LA
C67B IF N DATA REGISTER (C08C)
C67D WAS UNTIL DATA VALID >>C687
C67F YES, BITS INTO POSITION X1X1X1X1
C681 NO, FOR LATER
REGISTER FOR NEXT BYTE (C08C)
C683 ******* UNTIL VALID >>C68F
INE WITH PREVIOUS 1X1X1X1X AND X1X1
C683 INI EMENT COUNTER, DONE YET?
C685 SAV DO ANOTHER >>C685
C687 REA THE STACK CLEAN
C68A LOO IS SECTOR WE WANT?
C68C SHI START OVER >>C63F
C68D SAV TRACK FOUND
C68F REA TRACK WE WANT?
C692 LOO START OVER >>C63F
C694 COM INDICATE ADDRESS FOUND, GO LOOK FO
C696 DEC
C697 NO, **** READ DATA FIELD **********
C699 KEE
C69A IS
C69C NO,
C69E GET
C6A0 IS
C6A2 NO,
C6A4 YES

C6A6 ******

C6A8 ---
C6AA READ DATA REGISTER (C08C)
C6AD LOOP UNTIL VALID >>C6AA
C6AF EXCLUSIVE-OR WITH TRANSLATE TABLE (02D6)
C6B4 DECREMENT OFFSET
C6B5 STORE BYTE IN AUXILIARY BUFFER (0300)
C6B8 LOOP UNTIL BUFFER FULL >>C6A8
C6BA INITIALIZE OFFSET (MAIN BUFFER)
C6BC READ DATA REGISTER (C08C)
C6BF LOOP UNTIL VALID >>C6BC
C6C1 EXCLUSIVE-OR WITH TRANSLATE TABLE (02D6)
C6C6 STORE BYTE IN MAIN BUFFER
C6C8 INCREMENT OFFSET
C6C9 LOOP UNTIL BUFFER FULL >>C6BA
C6CB READ DATA REGISTER (C08C)
C6CE LOOP UNTIL VALID >>C6CB
C6D0 IS CHECKSUM OKAY? (02D6)
C6D3 NO, START OVER >>C6A2

C6D5 ********** MERGE MAIN AND AUXILIARY BUFFERS**********

C6D5 INITIALIZE OFFSET (MAIN BUFFER)
C6D7 INITIALIZE OFFSET (AUXILIARY BUFFER)
C6D9 DECREMENT OFFSET (AUX BUFFER)
C6DA IF LESS THAN ZERO RESET IT >>C6D7
C6DC GET BYTE FROM MAIN BUFFER
C6E1 ROLL IN TWO BITS FROM AUXILIARY BUFFER
C6E6 SAVE COMPLETED DATA BYTE
C6E8 INCREMENT OFFSET (MAIN BUFFER)
C6E9 LOOP UNTIL WHOLE BUFFER IS DONE >>C6D9

C6EB ********** DETERMINE IF THERE IS MORE TO DO**********

C6EB INCREMENT MAIN BUFFER POINTER
C6ED INCREMENT SECTOR NUMBER
C6F1 IS THERE ANOTHER SECTOR TO LOAD? (0800)
C6F6 YES, GO DO IT >>C6D3
C6F8 NO, ENTER CODE WE JUST LOADED >>0801
C6FB JUMP TO DRIVE 2 ENTRY POINT >>C60B

C6FE ********** UNUSED **********

C6FE ---

C700 MAKE SLOT 7 LOOK EMPTY
C701 SELECT DEVICE 2
C703 SELECT DRIVE 2
C705 SELECT SLOT 6
C707 GO DO IT >>C6FB

I OBJECT ADDR: C65A

>>C641

Disk Controller Boot ROM -- Apple IIc NEXT OBJECT ADDR: C6A6

ADDR DESCRIPTION/CONTENTS

C6A6 INITIALIZE OFFSET (AUXILIARY BUFFER)

```
Disk Controller Boot ROM -- Apple IIc           NEXT OBJECT ADDR: C707
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------


C709 *********** BUILD READ TRANSLATE TABLE ***************************

  C709  INITIALIZE BIT PATTERN
  C70B  INITIALIZE TABLE VALUE INDICATOR
  C70D  STORE BIT PATTERN
  C710  SHIFT PATTERN LEFT ONE BIT
  C711  ARE THERE ANY TWO ADJACENT BITS ON?
  C713  NO, TRY ANOTHER PATTERN  >>C725
  C715  YES, TURN OFF RIGHTMOST OF EACH GROUP OF ZEROES
  C717  FLIP BITS, PAIR OF ZERO BITS NOW SINGLE BIT, ETC
  C719  HIGH BIT ALWAYS ON/TURN OFF BIT WE MISSED BEFORE
  C71B  --- >>C725
  C71D  SHIFT PATTERN RIGHT, MUST HAVE ONLY ONE BIT ON
  C71E  IF MORE THAN ONE BIT ON, TRY ANOTHER PATTERN  >>C71B
  C720  FOUND ONE, GET TABLE VALUE
  C721  AND STORE IT IN TABLE  (0356)
  C724  INCREMENT TABLE VALUE INDICATOR
  C725  GET NEXT BIT PATTERN, DONE YET?
  C726  NO, GO CHECK IT OUT  >>C70D
  C728  MAIN BUFFER POINTER ($26) -> $0800
  C72C  INITIALIZE RETRY COUNT (LOW BYTE)
  C72E  RETURN TO CALLER

C72F *********** ASCII ERROR MESSAGE *********************************

C72F
  C72F  "Check        Disk Drive."
  C740  TERMINATE STRING
```

```
ProDOS Loader -- V1.0.1 -- 1 JAN 84              NEXT OBJECT ADDR: 0800
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

0800    MODULE STARTING ADDRESS
          ****************************************
          *                                      *
          *  PRODOS LOADER - LOADED FROM SECTORS  *
          *  0 AND 2 OF TRACK 0 (BLOCK 0). LOADER *
          *  LOADS "PRODOS" FILE INTO MEMORY AT   *
          *  AT $2000 AND BRANCHES TO IT.         *
          *  (PRODOS RELOCATOR IS AT $2000)       *
          *                                       *
          *  VERSION 1.0.1 -- 1 JAN 84            *
          *                                       *
          ****************************************

          *** EXTERNAL ADDRESSES ***

0027    ROM BOOT SUBRTN BUFFER PAGE ADDR
002B    ROM BOOT SUBRTN SLOT * 16
003D    ROM BOOT SUBRTN SECTOR TO READ
0040    ROM BOOT SUBRTN CURRENT TRACK
0041    ROM BOOT SUBRTN TRACK TO READ
          -- BLOCK READ PARAMETER LIST --
0042    COMMAND NUMBER (1 = READ)
0043    SLOT * 16
0044    I/O BUFFER ADDRESS ($44/$45)
0045
0046    BLOCK TO READ ($46/$47)
0047
          -------------------------------
0048    POINTER TO BLOCK READ ROUTINE
0049
004A    VOL DIR ENTRY POINTER/FIRST INDEX PAGE
004B
004C    ADDR OF SECOND PAGE OF INDEX BLOCK
004D
004E    INDEX INTO INDEX BLOCK PAGES
0050    TRACK SEEK PHASE-ON INDEX
0051    TRACK PHASE WANTED
0052    BLOCK READER RETRY COUNT
0053    CURRENT TRACK PHASE/PHASE-OFF INDEX
0054
0060    BUFFER POINTER
0061
05AE    SCREEN CENTER LINE
2000    LOAD POINT FOR RELOCATOR
C080    DISK ARM PHASE0
C088    TURN DISK DRIVE OFF
C089    TURN DISK DRIVE ON
FC58    HOME CURSOR/CLEAR SCREEN
```

```
ProDOS Loader -- V1.0.1 -- 1 JAN 84              NEXT OBJECT ADDR: 0800
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

          ***********

0800    LOAD UP TO SE***************
0801 ****************CTOR 3
          ON ENTRY:*** MAIN ENTRY ************************************
                    X = SLOT*16
                    A = SECTOR NUMBER
  0801   ENTRY POINT
  0802  ALWAYS TAKEN
  0804  (NEVER EXECUT>>0807
  0807  SAVE SØ      ED) >>A132
  0809  READING SECTO
  080B   REMEMBER TH 3 NEXT?
  080D  MAKE $CS FRO S...
  0815  AND SAVE AT  SLOT
  0819  $48/49 --> $ 49
  081C   CHECK $CSFF SEE IN ROM BOOT
  081D  BOOT ROM FOR
  081F  NO, HARD DIS DISK II?
  0821  GOT BOTH SEC BOOT THEN >>085B
  0823  NO, STOP AT  ORS OF LOADER? >>0831
  0825  STORE ON PAR ECTOR 3
  0828  SKIP SECTOR  (Ø800)
  082A  DUMMY UP $CS (GET SEC 2)
  0830   AND CALL RO C AS RETURN ADDRESS
          ********** SECTOR READ SUBRTN
          (ENTIRE LO** LOAD PRODOS ***************
                    ADER IN MEMORY NOW)
  0831  CURRENT TRAC
  0833  $48/49 --> $ IS ZERO
  0837  COPY A PORTI S00
  0839  TO MY BLOCK  N OF DISKETTE BOOT ROM
  083D  FROM $9F2 TO EADER SUBROUTINE (0994)
  0843  MODIFY SOME  $A/E
  0846  TO SUIT MY E BRANCHES IN THE COPIED CODE (091D)
  084C  AND COPY SEC RROR HANDLING TASTES (0924)
  084F  TO $A7F TO $ OR READ SUBROUTINE EXIT CODE (092B)
  0855  $48/49 --> D A85 (0A7F)
  0859  AT $0986     ISKETTE BLOCK READER SUBRTN
  085B  ---
  085D  HARD DISK OR
  085F  NO, ERROR >>  DISKETTE?
  0861  STORE LSB OF 0890
  0863  STORE ZEROS  BLOCK READER
  086E  COMMAND = 1  N SEVERAL THINGS
  0871  BLOCK NUMBER (READ BLOCK)
  0875  $60/61 --> $  2 (VOL DIRECTORY)
  0877  $4A/4B --> $ 00 (BUFFER)
                    00 (FIRST ENTRY)
```

```
ProDOS Loader -- V1.0.1 -- 1 JAN 84              NEXT OBJECT ADDR: 0879
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  0879  READ VOLUME DIRECTORY BLOCKS <0912>
  087C  ERROR? >>08E6
  087E  BUMP TO NEXT BLOCK (2 PAGES)
  0882  NEXT BLOCK NUMBER
  0886  NOW AT BLOCK 6?
  0888  NO, GO READ NEXT ONE >>0879
  088A  YES, CHECK LINK FOR VALIDITY (0C00)
  088D  IT SHOULD BE ZERO FOR VOL DIR (0C01)
  0890  NASTY VOL DIR? >>08FF
  0892  NO, INDEX PAST LINK AND VOL HDR
  0894  AND BEGIN >>0898
  0896  IF ALREADY PROCESSING, USE ENTRY LSB
  0898  ---
  0899  ADD ENTRY LENGTH TO FIND NEXT ENTRY (0C23)
  089D  STILL IN SAME PAGE? >>08AC
  089F  NO, BUMP ENTRY MSB
  08A3  IS IT ODD? (SECOND PAGE OF A BLOCK?)
  08A4  YES... >>08AC
  08A6  NO, JUST FINISHED LAST BLOCK?
  08A8  YES, ERROR -- FILE NOT FOUND >>08FF
  08AA  ELSE, START JUST PAST LINKS
  08AC  UPDATE LSB OF ENTRY POINTER
  08AE  GET NAME LENGTH (0902)
  08B1  TURN OFF FLAGS
  08B4  COMPARE NAME WITH "PRODOS"
  08B9  NOT A MATCH? >>0896
  08BE  IF NAME MATCHES, IS IT A SAPLING FILE?
  08C2  IF NOT, I CAN'T HANDLE IT >>08FF
  08C6  GET FILE TYPE
  08C8  SHOULD BE A PRODOS SYS FILE
  08CA  IF NOT, I GIVE UP >>08FF
  08CD  ALL IS WELL, COPY KEY BLOCK NUMBER
  08CF  TO $46/47
  08D6  $4A/4B AND $60/61 --> $1E00
  08D8  (BUFFER TO HOLD KEY BLOCK)
  08E1  $4C/4D --> $1F00 (SECOND PAGE)
  08E3  READ A BLOCK <0912>
  08E6  ERROR? >>08FF
  08EA  BUMP TO NEXT BLOCK BUFFER
  08EE  $4E = OFFSET INTO INDEX BLOCK
  08F0  GET NEXT BLOCK NUMBER FROM INDEX BLOCK
  08F8  BLOCK NUMBER = 0? (END OF FILE)
  08FA  NOT YET, READ A BLOCK >>08E3
  08FC  ELSE, JUMP TO RELOCATOR AT $2000 >>2000

  08FF  ERROR JUMP >>093F
```

```
ProDOS Load
-------
ADDR    DES
-------

          er -- V1.0.1 -- 1 JAN 84              NEXT OBJECT ADDR: 08FF
0902 ******-------------------------------------------------------------
          CRIPTION/CONTENTS
  0902  ER
  0903  ER
-------------------------------------------------------------------------

0912 ******** KERNEL NAME ****************************************

  0912  COP GTH OF KERNEL'S NAME
  0914  (B ODOS               ' "PRODOS" (KERNEL NAME)
  091A  THE

******** COPY BLOCK READ BUFFER PTR ****************************

091D ******
          Y $60/61 --> $44/45
          OCK READ BUFFER POINTER)
          N GO TO BLOCK I/O ROUTINE >>0048

  091D    **** ROM SECTOR READ OFFSETS ******************************
          OFFSETS INTO ROM SECTOR READ SUBROUTINE
          TO BRANCH DISPLACEMENTS WHICH NEED TO
          BE CHANGED FOR LOADER'S PURPOSES
  0924

092B ******

****** NEW BRANCH OFFSETS FOR ABOVE ****

  092B  GET
  092D  TAX
  092E  RET**** SECTOR READ EXIT CODE ******************************
  092F  RES COPIED INTO DISKETTE SECTOR READ CODE

0932 ******  S0
          D EXIT NORMALLY
  0932    URN
          TART BLOCK READ OPERATION >>09BC

093F ******

**** 932-93E NOT USED ************************************

  093F  HOM
  0944  COP
  0947  TO
  094D  TRY**** ERROR HANDLER ****************************************

  0950  ***E CURSOR/CLEAR SCREEN <FC58>
          Y "UNABLE TO LOAD PRODOS" MESSAGE (0950)
096D ******SCREEN (05AE)
          N GO TO SLEEP FOREVER >>094D

  096D  GET
  096F  CON*           UNABLE TO LOAD PRODOS ***'
  0972  ADD
  0975  SEC**** MOVE ARM TO NEXT PHASE ******************************
  097A

          CURRENT PHASE
          VERT TO NEXT ARM PHASE
           S0
          ECT NEXT ARM PHASE THIS DRIVE (C080)
```

```
ProDOS Loader -- V1.0.1 -- 1 JAN 84              NEXT OBJECT ADDR: 097C
-----------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

  097C   DELAY LONG ENOUGH F
  0983   WHEN FINISHED, RETUR
  0985   RETURN

0986 ********** DISKETTE BL OR ARM TO MOVE
         $44/$45 --> BUFFE N WITH SØ
         $46/$47 = BLOCK N

  0986   GET BLOCK NO. LSB  CK READ ROUTINE ***************************
  0988   ISOLATE SECTOR REMA
  098C   SKEW SECTOR BY 2
  0992   AND STORE SECTOR WA
  0994   GET MSB
  0996   AND HIGH BIT OF TRA DER
  0999   MERGE WITH LOW PART
  099C   STORE TRACK WANTED  TED
  099F   TRACK*2 IS PHASE WA
  09A3   SET PAGE ADDRESS OF CK
  09A7   TURN DRIVE MOTOR ON OF TRACK
  09AA   READ SECTOR <09BC>
  09AD   NEXT PAGE           ED
  09B1   SKEW TO NEXT SECTOR FFER
  09B5   READ SECOND SECTOR  (C089)
  09B8   THEN TURN MOTOR OFF
  09BB   RETURN

         ******* DISKETTE  F BLOCK <09BC>
                          AND EXIT (C088)

  09BC   GET CURRENT TRACK
  09BF   CONVERT TO PHASE
  09C5   GET CURRENT PHASE  ECTOR READ ROUTINE ****
  09C7   STORE FOR PHASE OFF
  09CA   SUBTRACT PHASE WANT
  09CC   DIRECTION -- ON COF
  09D0   NO, ADJUST PHASE UP
  09D4   OR DOWN AND...
  09D6   ---                 O TO DETERMINE...
  09D7   SEEK ARM ONE PHASE RECT TRACK NOW? >>09E2
  09DD   IN PROPER DIRECTION
  09E0   UNTIL WE ARE THERE
  09E2   ---
  09E4   RETRY COUNT OF 127    <096D>
  09E7   ---                   <096F>
  09E9   LOWER RETRY COUNT   >>09C5
  09EB   RETRIES EXHAUSTED?
  09EF    RETRIES FOR A $D5


                           >>09BB
                           HEADER
```

```
ProDOS Loader -- V1.0.1 -- 1 JAN 84              NEXT OBJECT ADDR: 09F0
-----------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

         ******* DEVICE DEPENDENT SECTOR READ ****
           COPIED FROM ROM ON DISKETTE CARD
           SEE $CX5E IN BOOT ROM

  09F2    START OF SECTOR READ ROUTINE
  0A7F    BASE ADDR FOR MODIFICATIONS

09F2 ********** A86-BFF NOT USED ***************************************

09F2 ********** VOLUME DIRECTORY BUFFER ********************************

  0C00    START OF VOLUME DIRECTORY BUFFER
  0C01
  0C23    OFFSET TO ENTRY LENGTH FIELD
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2000
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

2000    MODULE STARTING ADDRESS


        ********************************
        *                              *
        *  PRODOS RELOCATOR            *
        *       LOADED AS THE FIRST    *
        *       PORTION OF THE PRODOS  *
        *       IMAGE AT $2000.        *
        *                              *
        *  VERSION 1.0.1 -- 1 JAN 84   *
        *                              *
        ********************************

          ******** ZERO PAGE ADDRESSES ************

000A    AUTOSTART ROM CHECKSUM POINTER
000B
000C    CONFIGURATION BYTE (MACHID TO BE)
0010    GENERAL PURPOSE POINTER
0011
0012    DISK TYPE (0=DISK II, 4=PROFILE)
0013     AND INPUT RELOC RANGE POINTER
0014    VOL DIR ENTRY POINTER FOR RELOCATOR
0015     AND OUTPUT RANGE PTR
0016    LENGTH OF RELOCATION RANGE
0017
0018    INPUT RELOCATION RANGE POINTER
0019
001A    END OF INPUT RANGE
001B
003C    GENERAL PURPOSE POINTER
003D
003E    GENERAL PURPOSE POINTER
003F
0040    RAMDRIVE OUTPUT POINTER
0041
0042    VARIOUS USES: PARM TO AUXMOVE,
0043     UNIT/SLOT PASSED TO RELOCATOR
0046    BLOCK NUMBER TO RAMDRIVE
0047


          ******** EXTERNAL ADDRESSES *************

0080    MACHID BUILD SUBRTN FOR 128K

0280    GENERAL PURPOSE BUFFER
0281    BUFFER+1
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2000
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

          ******** SCREEN LINE ADDRESSES **********

04B6    SCREEN BUFFER LINE
05A9    SCREEN BUFFER LINE
05AE    SCREEN BUFFER LINE
06B3    SCREEN BUFFER LINE
07A8    SCREEN BUFFER LINE
07AD    SCREEN BUFFER LINE
07D0    SCREEN BUFFER LINE

          ******** INTERP LOADER ADDRESSES ********

0800    ENTRY OF INTERP LOADER
08E2    'UNABLE TO FIND SYSTEM FILE'
090A    'INTERP FILE TOO LARGE'
092A    'UNABLE TO LOAD ...'
093B    INTERP FILE NAME ITSELF
093C    +1
094F    LENGTH OF MESSAGE
0950    MLI: OPEN LIST
0956    MLI: GET EOF
0958    EOF MARK
0959    EOF MARK+1
095A    EOF MARK+2 (MSB)
095B    MLI: READ LIST
095F    READ BUFFER ADDR
0960    +1
0963    MLI: CLOSE LIST
0965    '.SYSTEM'

0C00    VOLUME DIRECTORY BUFFER
0C23    ENTRY LENGTH
          -- RAMDRIVE VOLUME DIRECTORY
0E04    VOLUME HDR, VOLUME NAME
0E22    VOLUME HDR, ACCESS-TOTAL BLOCKS

          ******** SYSTEM GLOBAL PAGE *************

BF00    ENTRY POINT FOR MLI
BF03    QUIT VECTOR
BF06    DATE/TIME
BF10    DEVICE HANDLER TABLES
BF30    LAST DEVICE USED
BF31    NUMBER OF ACTIVE DISK DEVICES
BF32    ACTIVE DISKS SEARCH LIST
BF98    MACHINE TYPE FLAGS
BF99    SLOT WHICH CONTAIN CARDS WITH ROM
BFFF    TOP OF 48K RAM
```

```
ProDOS Relocator -- V1.0.1
------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------

        ********  I/O PORTS

C000    80 STORE OFF
C001    80 STORE ON
C002    READ MAIN RAM
C003    READ AUX RAM
C004    WRITE MAIN RAM
C005    WRITE AUX RAM
C008    MAIN STACK/
C009    ALTERNATE ST
C00C    80 COLUMN DI
C018    READ 80STORE
C030    SPEAKER
C082    MOTHERBOARD
C083    READ/WRITE
C08B    READ/WRITE
C311    MOVE TO/FROM
C314    XFTER TO AU
CFFF    RESET I/O C

        ********

D000    KERNEL STAR
FF00    START OF DE

        ********

FB1E    PADDLE READ
FB2F    MONITOR INI
FBB3    ROM VERSION
FBC0    SECONDARY V
FC58    CLEAR SCREE
FE84    SET NORMAL
FE89    IN#0
FE93    PR#0


2000 ************ PR

  2000  STORE SLOT
  2005  PRINT "APPLE
  200E  MOVE 3PAGE/
  2011  NO ERROR? >
  2013  ERROR >>212
  2016  ---
  201A  THERE MUST
  2021  IF NOT, ERR
  2029  MAKE DOUBLY
  202B  SELECT MOTH
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 20CB
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  20CB  128K?
  20CF  NO... >>20D4
  20D1  YES, ESTABLISH RAM DRIVE IN UPPER 64K <28FF>

        ******** GET VOL LABEL ******************

  20D4  MLI: ONLINE DEVICE CALL <BF00>
  20DA  ERROR? >>212A
  20DF  VALID VOLUME NAME?
  20E1  IF NOT, ERROR >>212A
  20E4  ELSE, BUMP LENGTH BY ONE
  20E9  AND PREFIX NAME BY A "/"
  20EE  MLI: SET PREFIX <BF00>
  20F4  ERROR? >>212A

        ******** READ VOLUME DIRECTORY **********

  20F6  ---
  20F8  $14/15 --> $C00
  20FE  ---
  2103  BLOCK = 2 (VOLUME DIRECTORY) (216F)
  2109  MLI: READ BLOCK <BF00>
  210F  ERROR? >>212A
  2113  GET NEXT BLOCK NUMBER
  2119  IF ZERO, END OF VOLUME DIRECTORY >>2127
  2121  ADD TWO PAGES (ONE BLOCK) TO POINTER
  2123  AND STOP AT $1400 IN ANY CASE
  2125  ELSE, READ NEXT BLOCK AS WELL >>20FE
  2127  WHEN DONE, JUMP TO INTERP LOADER >>0800

212A ********** ERROR HANDLER ***************************************

  212A  ENABLE MOTHERBOARD ROMS (C082)
  212D  CLEAR SCREEN <FC58>
  2132  PRINT "RELOCATION/CONFIG ERROR" (213E)
  213B  THEN SLEEP FOREVER >>213B

213E ********** DATA ************************************************

  213E  ---
  213E  '**           RELOCATION / CONFIGURATION ERROR **'

  2164  MLI: ONLINE PARMS
  2165          SLOT*16 AND DRIVE
  2166          READ THEM TO $281

  2168  MLI: SET PREFIX PARMS
  2169          PREFIX IS AT $280
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2169
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  216B  MLI: READ BLOCK PARMS
  216C          DEVICE
  216D          BUFFER
  216F          BLOCK NUMBER

  2171  ADDRESSES OF RELOCATION TABLES

217D ********** RELOCATION TABLES ***********************************
          +0:     00 - ZERO BLOCK OF MEMORY
                  01 - COPY BLOCK
                  02 - RELOCATE MSB ADDRESSES
                  03 - RELOCATE 2 BYTE ADDRS
                  04 - RELOCATE INSTRUCTIONS
          +1/2:   ADDR OF OUTPUT BLOCK
          +3/4:   LENGTH OF BLOCK IN BYTES
          +5/6:   ADDR OF INPUT BLOCK (IF ANY)
          +7:     NUM RANGES TO CORRECT FOR (-1)
          +8:             START PAGES
          +8+COUNT:       END PAGE ADDRESSES
          +8+COUNT+COUNT:ADDITIVE CORRECTION FACTOR

          ******** COMMON MOVES TABLE *************

  217D  COPY (INTERPRETOR LOADER)
  217E          TO =$800
  2180          LEN=$16C
  2182          FRM=$2234
  2184  COPY (3 PAGE IMAGE)
  2185          TO =$3F0
  2187          LEN=$10
  2189          FRM=$23A0
  218B  COPY (CHECKSUM)
  218C          TO =$0A
  218E          LEN=$02
  2190          FRM=$14
  2192  COPY (RAM DRIVE BANK SWITCHER)
  2193          TO =$80
  2195          LEN=$47
  2197          FRM=$2401
  2199  END OF TABLE

        ******** QUIT CODE MOVE TABLE ***********

  219A  COPY (QUIT CODE)
  219B          TO =$D100
  219D          LEN=$300
  219F          FRM=$5900
  21A1  END OF TABLE
```

```
ProDOS Relocator -- V1.0.1               1 JAN 84          NEXT OBJECT ADDR: 21A1
------------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENT
------------------------------------------------------------------------------

         ******** 48K PROD                 S RELOC TABLE *********

21A2  COPY (SYSTEM GLOBAL                  PAGE IMAGE)
21A3          TO =$BF00
21A5          LEN=$100
21A7          FRM=$4F00
21A9  ZERO (PRODOS KERNEL                  DATA AREA)
21AA          ADR=$B100
21AC          LEN=$700
21AE  COPY (PRODOS KERNEL
21AF          TO =$9000
21B1          LEN=$2100
21B3          FRM=$2D00
21B5  RELOCATE INSTRUCTIO
21B6          TO =$9000
21B8          LEN=$1ECE
21BA          FRM=$9000
21BC          FOR ADDRS=$                  XX-$F7XX
21BF          ADJUST BY=$                  C0
21C0  RELOCATE ADDRESSES
21C1          TO =$AF65
21C3          LEN=$28
21C5          FRM=$AF65                    XX-$F0XX
21C7          FOR ADDRS=$F8XX-$FEXX        C0
21CA          ADJUST BY=$C0                (S)
21CB  COPY (DEVICE DRIVERNS
21CC          TO =$B800
21CE          LEN=$700                     NS
21D0          FRM=$5200
21D2  RELOCATE INSTRUCTIC F8XX-$FEXX
21D3          TO =$B800     C0
21D5          LEN=$195
21D7          FRM=$B800
21D9          FOR ADDRS=$OS CLOCK TABLE *********
21DC          ADJUST BY=$
21DD  RELOCATE INSTRUCTIC
21DE          TO =$BB85
21E0          LEN=$339
21E2          FRM=$BB85
21E4          FOR ADDRS=$NS
21E7          ADJUST BY=$
21E8  END OF TABLE

         ******** 48K PROI

21E9  COPY (CLOCK DRIVER)
21EA          TO =$B142
21EC          LEN=$7D
21EE          FRM=$5000
21F0  RELOCATE INSTRUCTIC
```

```
ProDOS Relocator --  DRIVERS)
                   =$F800
ADDR     DESCRIPTION=$700
                   =$5200

21F1          TO
21F3          LEN 64K PRODOS CLOCK TABLE *********
21F5          FRM
21F7          FOR  CODE)
21FA              =$F142
21FC          ADJ =$7D
21FE  END OF TABL =$5000
                  STRUCTIONS
         ********  =$F142
                   =$69
21FF  COPY (INTER  =$F142
2200          TO    DDRS=$C1XX-$C1XX
2202          LEN   ST BY=$S0
2204          FRM
2206  COPY (SYSTE
2207          TO
2209          LEN
220B          FRM
220D  ZERO (PRODC
220E          ADR
2210          LEN
2212  COPY (PRODC
2213          TO
2215          LEN
2217          FRM
2219  COPY (DEVIC
221A          TO
221C          LEN
221E          FRM
2220  END OF TAB

         ********

2221  COPY (CLOC
2222          TO
2224          LEN
2226          FRM
2228  RELOCATE I
2229          TO
222B          LEN V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 21F1
222D          FRM
222F          FOR  CONTENTS
2232          AD
2233  END OF TAB
                  =$B142
                  =$69
                  =$B142
                  ADRS=$C1-C1
                      =$F1-F1
                  ST BY=$S0 AND $C0

                  64K PRODOS RELOC TABLE *********

                  UPT VECTORS)
                  =$FF80
                  =$80
                  =$7080
                   GLOBAL PAGE)
                  =$BF00
                  =$100
                  =$4E00
                  S KERNEL DATA AREA)
                  =$F100
                  =$700
                  S KERNEL)
                  =$D000
                  =$2100
```

```
227D  NO, SKIP ENTRY >>223B
2281  CHECK ALL CHARACTERS IN NA

        ******** LOAD INTERPRETER (093B)

2283  ---
2285  ---
2286  COPY NAME TO $281
228D  AND TO "UNABLE TO LOAD" MSG
2295  ADD BLANK AT END OF NAME
2297  IN MESSAGE (093C)
229B  NAMELEN + ERRORMSGLEN
229D  SAVE AT $2383 (094F)
22A0  MLI: OPEN .SYSTEM FILE <BF
22A4  (PARM LIST AT $2384)
```

```
2316 ********** DATA AREA **********

2316  '**            UNABLE TO FIND A .S
233E  '**            SYSTEM PROGRAM TOO L
235E  '**           UNABLE TO LOAD X.SYS"
2383  NAME LEN +13H (LEN OF MSG)
```


NEXT OBJECT ADDR: 22A6

```
AN 84          NEXT OBJECT ADDR: 2234

ProDOS Relocator -- V1.0.1 -- 1 J
ADDR    DESCRIPTION/CONTENTS
                                  TO $800)
                                  R ENTRIES

2234 ********** INTERPRETER LOAD
       (LOADED AT $2234, MOVED TO BIT)

  2234  $10/11 --> VOLUME DIRECTO FOR INTERP ******
  2236  INITIALLY AT $C00
  2238  OFFSET BEYOND LINKS (+4)
  223A  (TURN NEXT INSTRUCTION N)

        ******** SCAN DIRECTORY
                                  RY? (0C23)
  223B  PICK UP LSB
  223E  BUMP BY ENTRY LENGTH (0C2
  2241  UPDATE LSB
  2243  PAGE OVERFLOW? >>2257      RECTORY >>2271
  2245  NO, ROOM FOR ONE MORE ENT
  224A  NO, CHECK MSB
  224D  START OF A BLOCK? >>2259
  224F  NO, AT END OF DIRECTORY?
  2251  YES, FILE NOT FOUND IN DIR "SYS" FILE
  2253  NO, START NEW BLOCK AT +4
  2255  AND UPDATE LSB
  2257  BUMP MSB
  2259  ---                         0280)
  225D  CHECK FILE TYPE FOR PRODOS ONG >>223B
  225F  NOT IT? >>223B             2274
  2262  INACTIVE ENTRY?            UND >>22E1
  2264  IF SO, SKIP IT >>223B
  2268  SAVE NAME LENGTH AT $280
  226D  MUST BE AT LEAST 8 CHARS I
  226F  JUMP AROUND ERROR CODE >>2
  2271  ERROR - INTERP FILE NOT FO
  2273   HARD BREAK IN THAT CASE  ME >>2277
  2274  ---
  2277  IS THIS ".SYSTEM"?         R AT $2000 ******
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84
ADDR    DESCRIPTION/CONTENTS

  22A6  ERROR? >>22EE
  22A8  MLI: GETEOF <BF00>
  22AC  (PARM LIST AT $238A)
  22AE  ERROR? >>22EE
  22B0  GET MSB (SEE $238E) (095A)
  22B3  BIGGER THAN 64K???? >>2308
  22B8  MUST BE LESS THAN $9800 BYTES
  22BA  OR ERROR...  >>2308
  22BC  STORE LENGTH IN MLI READ LIST (0960
  22C2  AND LSB TOO (095F)
  22C5  MLI: READ INTERPRETER INTO $2000 <F
  22C9  (PARM LIST AT $238F)
  22CB  NO ERRORS? >>22D3
  22CD  ERROR, BAD BUFFER?
  22CF  YES, FILE WAS TOO LARGE >>2308
  22D1  ELSE, "UNABLE TO LOAD ..." >>22EE
  22D3  MLI: CLOSE INTERPRETER FILE <BF00> 90A)
  22D7  (PARM LIST AT $2397)
  22D9  ERROR? >>22EE
  22DB  NO, ENABLE MOTHERBOARD ROMS (C082)
  22DE  AND JUMP TO INTERPRETER >>2000

22E1 ********** ERROR HANDLERS **********

  22E1  ---
  22E3  PRINT "UNABLE TO FIND A .SYSTEM F
  22EC  THEN GO TO SLEEP >>2313

  22EE  GET NAME LENGTH (094F)
  22F1  LINE LENGTH
  22F4  LESS NAME LENGTH (094F)
  22F7  DIVIDED BY 2
  22F8  GIVES OFFSET TO CENTER THE LINE (09
  22FC  PRINT "UNABLE TO LOAD ..." (092A)
  2306  GO TO SLEEP FOREVER >>2313

  2308  ---
  230A  PRINT "SYSTEM PROGRAM TOO LARGE" (0
  2313  GO TO SLEEP FOREVER >>2313
```

```
ProDOS Relocator -- V1.Ø.1                     1 JAN 84         NEXT OBJECT ADDR: 2383
---------------------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENT
---------------------------------------------------------------------------------------

 2384  MLI: OPEN PARM LIST
 2385  PATHNAME IS AT $28ØS
 2387  I/O BUFFER AT $14ØØ
 2389  REFNUM=1

 238A  MLI: GET EOF PARM L
 238B  REFNUM=1
 238C  EOF MARK POSITION

 238F  MLI: READ LIST
 239Ø  REFNUM=1                ST
 2391  READ TO $2ØØØ
 2393  LENGTH (FROM EOF MA
 2395  ACTUAL LENGTH READ

 2397  MLI: CLOSE LIST
 2398  REFNUM=Ø, CLOSE ALL
                             RK)
 2399  '.SYSTEM'

23AØ *********** END OF INT
                              F
23AØ *********** 3 PAGE VEC

 23AØ  BRK HANDLER AT $FA
 23A2  RESET AT $FF59         ER
 23A4  POWER UP BYTE
 23A5  & VECTOR TO $FF59       ES
 23A8  CTL-Y VECTOR TO $FF
 23AB  NMI VECTOR TO $FF59
 23AE  IRQ HANDLER AT $BFF         LOADER ********************************

23BØ *********** DETERMINE 59  IMAGE **********************************
                 $ØC=ØØ..  >
                     Ø1..
                     1Ø..
                     11..
                     ..Ø1  MA 59
                     ..1Ø     >>FF59
                     ..11    >FF59
                     ....    (PRODOS)
                     ....
                     ....    CHINE ID **********************************
                     ....        APPLE II
                                 APPLE II+
                                 APPLE IIE
                                 APPLE /// EMULAT.
                                 48K RAM
                                 64K RAM
                                 128K RAM
                                 CURRENT MACHINE
                                 FUTURE MACHINE
                                 8Ø COL CARD
                                 THUNDER CLOCK
```

```
ProDOS Relocat
--------------------------------
ADDR     DESCRI
--------------------------------

 23BØ  ASSUME  TO $8Ø (CODE B
 23B4  GET A
 23B7  APPLE    LOOK FOR EXTE
 23B9  YES,     MOVED TO $8Ø T
 23BB  NO,
 23BD  APPLE    MACHID
 23BF  YES,  >>243A
 23C1  NO,
 23C3  APPLE    AUX MEMORY (C
 23C5  NO, WH   PATTERN THERE
 23CA  REALLY  SURE PATTERN STA
 23CC  YES >>
 23DØ  /// EM  , ONLY GOT 64K
 23D2  YES      GOT 128K TOTAL
 23D4  OTHER  BACK TO MAIN MEM
 23D6  CREAT >>243A
 23D8  AND G   INDICATE 128K
 23DA  UPDAT   HED
 23DF  READ/W   $A/B      APPL
 23E4  CHECK   START MONITOR
 23F6  IF PR  $9
 23FA  ELSE,   IT IN A CONVOL
 23FC  ADD T   TO CALLER
 23FE  THEN

2401 *********
         (CO

 24Ø1  UPDAT
 24Ø3  IIE?
 24Ø5  YES,
 24Ø7  BANK
 24ØD  STORE
 2416  MAKE
 2428  ---
 2429  IF NO
 242B   ELSE
 242C  BANK
 2432  64K?
 2436  NO, I
 2438  IN MA
 243A  SET U
 243D  IN AU
 243F  AT $F
 2441  BUT D
 2447   RETU                V1.Ø.1
```

```
PTION/CONTENTS
---------------------
NOTHING AT FIRS
ROM BYTE (FBB3)
 I?
ET BIT >>23DA

 E?
ET BIT >>23DA

 II+?
AT IS IT? >>23D4
 A II+?
 23DA
 LATION MODE?
>>23FE
ISE, UNKNOWN MAC
 INVALID INSTR A
 THERE >>23FE
 MACHID
RITE ENABLE 1ST
FOR L.C. EXISTAN
SENT, MARK IN MA
ONLY 48K AVAILAB
 MACHID
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2447
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------


2448 ************ DISPLAY LOAD MESSAGE *********************************

  2448  CLICK SPEAKER  (C030)
  244B  STORE IN MAIN MEMORY  (C00C)
  244E  80 COL DISPLAY OFF (C000)
  2451  SET NORMAL VIDEO <FE84>
  2454  CALL MONITOR INITIALIZATION <FB2F>
  2457  SET VIDEO PR#0 <FE93>
  245A  SET KEYBD IN#0 <FE89>
  245D   OUT OF DECIMAL MODE
  245E   DISABLE FOR INTERRUPTS
  245F  CLEAR SCREEN <FC58>
  2464  PRINT "APPLE II" (2492)
  246F  PRINT "PRODOS 1.0.1 ETC." (249A)
  247A  PRINT BLANKS (24B1)
  2485  PRINT "COPYRIGHT ETC." (24BF)
  248E  CLICK SPEAKER AGAIN (C030)
  2491   DONE

2492 ************ DATA AREA ********************************************

  2492  'APPLE         ]['
  249A  'PRODOS        1.0.1   1-JAN-84'
  24B1  '                              '
  24BF  'COPYRIGHT     APPLE COMPUTER, INC., 1983-84'


24E6 ************ DETERMINE SLOT CONFIGURATION ************************

  24E6  ---
  24E8  ZERO SOME THINGS
  24EF  NO DISKS ACTIVE YET (BF31)
  24F4  $10/11 --> $C700 (LOOP THRU ALL SLOTS)
  24F6  RESET I/O CARD ROMS (CFFF)
  24FB  CHECK SIGNATURE ON CARD FOR DISK DEVICE
  2501  NOT DISK? >>2569
  2507  GET $CSFF BYTE (TYPE OF DISK)
  2509  DISK II? >>252B
  250B  NO, PROFILE?
  250D  NO? THEN NOT A DISK >>2569

          ******** PROFILE FOUND ******************

  250F   ELSE, SAVE AS LSB OF BLOCK READ SUBRTN
  2511  GET $CSFE (STATUS BYTE)
  2514  CAN WE AT LEAST READ STATUS AND DATA?
  2518  YES? >>251F
  251A   NO,
  251D  NOT A DISK AFTER ALL >>2569
  251F   GET STATUS BYTE AGAIN
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2523
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  2523  TOP NIBBLE IS DEVICE ID
  2524  PROFILE SHOULD BE $04
  2526  CHECK NUMBER OF VOLS (SHOULD BE 0)
  2527  GET SLOT NO. FOR DEVICE DRIVER LOC.
  2529  AND GO DO COMMON PROCESSING FOR DISK >>2535

          ******** DISK II FOUND ******************

  252B  $12 ZERO FOR DISK II
  252D  GET DISK II DEVICE DRIVER LOCATION (2627)
  2531  ($F800 OR $B800) (2628)
  2534   DISK II HAS 2 DRIVES

          ******** DISK FOUND *********************

  2535   SAVE DEVICE ADDRESS
  2537  SET UP INDEX OF SLOT*2
  253F  BUILD ST (S=SLOT, T=0 DISKII,4 PROFILE)
  2542  BUMP DEVICE COUNT BY ONE (BF31)
  2546  AND ADD DRIVE TO SYSTEM SEARCH LIST (BF32)
  254A   NUMBER OF DRIVES
  254C  ONLY ONE? >>2552
  254E   NO, BUMP INDEX
  254F  AND MARK SECOND DRIVE IN SEARCH LIST (BF32)
  2552  STORE FINAL DEVICE COUNT (BF31)
  2557  SET UP DISK DEVICE DRIVER VECTORS (BF11)
  255A  IN SYSTEM GLOBAL PAGE >>2564
  255C  (SET UP TWO VECTORS FOR A DISK II) (BF21)
  2564  ---
  2568   I RECOGNIZE THIS CARD
  2569  GO MARK SLTBYT TO SHOW ROMS IN SLOT <25B6>
  2570  DO ALL CARDS EXCEPT
  2572  SLOT 0 ($C000) >>24F6
  2578  GET LAST DISK DEVICE IN SEARCH LIST (BF32)
  257E  BOOT DRIVE? (BF30)
  2582  NO, KEEP LOOKING >>2586
  2586  ---
  2589  GET DEVICE COUNT (BF31)
  258D  IS BOOT DRIVE IN LIST? >>25A3
  258F  SO IT WILL BE SEARCHED FIRST... (BF30)
  2592  STORE BOOT AT END OF SEARCH LIST (BF32)
  2596  ANY OTHERS? >>25AA
  2599  YES, SECOND DRIVE? >>25A3
  259D  STORE IT RIGHT BEHIND BOOT DRIVE (BF32)
  25A1  NOW ANY MORE? >>25AA
  25A3  ---
  25A4  YES, MOVE OTHERS AHEAD IN LIST (BF32)
  25AA  DO CHECKSUM ON ROM <2639>
  25AD  NOT AN AUTOSTART ROM? >>25B3
  25AF  AUTOSTART, STORE FINISHED MACHID (BF98)
  25B2   AND LEAVE
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 25B3
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  25B3  NONAUTOSTART, UNKNOWN MACHINE! >>23D4

25B6 ********** IDENTIFY I/O CARD **********************************

  25B6  DO WE ALREADY RECOGNIZE THIS CARD? >>2618
  25B8  NO,
  25BA  CHECK SIGNATURE ON CARD FOR THUNDER CLOCK
  25BF  NOT IT? >>25DE
  25C5  THUNDER CLOCK, WHICH SLOT?
  25C9  SAVE SLOT NUMBER (LESS 1) (21FC)
  25CC  IN CLOCK CODE RELOCATION TABLES (2232)
  25D1  ENABLE CLOCK/CALENDAR JUMP IN GLOBALS (BF06)
  25D6  IS THERE A MACHID? >>25AA
  25D8  IF SO, MARK THAT A CLOCK IS PRESENT
  25DA  AND UPDATE MACHID
  25DC  GO MARK ROM IN THIS SLOT >>2618
  25DE  ---
  25E0  CHECK SIGNATURE OF MYSTERY CARD
  25E2  STANDARD BASIC SUPPORTED?
  25E4  NO, UNKNOWN CARD >>2607
  25E8  YES,
  25EA  DOUBLE CHECK BASIC SUPPORTED
  25EC  NO, UNKNOWN CARD >>2607
  25F0  YES,
  25F2  GENERIC SIGNATURE?
  25F4  NO, UNKNOWN CARD >>2607
  25F7  YES,
  25F9  80 COLUMN CARD?
  25FB  NO, UNKNOWN CARD >>2607
  25FF  GET MACHID IF WE HAVE ONE >>25AA
  2601  MARK 80 COLUMN CARD PRESENT
  2603  AND UPDATE MACHID
  2605  GO MARK ROM ON CARD PRESENT >>2618
  2607  UNKNOWN CARD, CHECK ROM TO...
  260B  SEE IF IT WILL HOLD A VALUE...
  2611  FOR SOME TIME.
  2618  IF SO, WE HAVE A CARD IN SLOT
  261A  CONVERT SLOT NUMBER...
  261D  TO A BIT POSITION (2631)
  2620  AND OR INTO SLOT BYT (BF99)
  2626   RETURN TO CALLER

2627 ********** DATA AREA ******************************************

  2627  DISK DEVICE DRIVER ENTRY POINT
  2628  (2 BYTE ADDRESS)
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2628
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

                SIGNATURE FOR:
                +6 = THUNDERCLOCK
                +7 = DISK
  2629  DEVICE S
  262B  +0,+2,+4 CHECKED)
  262D  +1,+3,+5
  262F  (+7 NOT
                M FOR AUTOSTART ROM
                ION TABLE FOR SLOTS
          CHECKS
  2631  BIT POSI COMPUTE AUTOSTART ROM CHECKSUM **************

2639 **********

                IN INDEX REGISTER (2631)
  2639  ---     9 ("APPLE II") IN ROM
  263A  GET ZERO ECKSUM (2631)
  263D  SUM $FB0 ES IN ALL (2634)
  2644  UPDATE C STH TO HIGH NIBBLE
  264B  DO 8 BYT INE WITH CHECKSUM (2631)
  2651  MOVE LEN CTOR
  2656  AND COMB OME OUT ZERO >>2660
  2659  FUDGE FA , RETURN WITH MACHID
  265B  SHOULD C
  265D  IT DID.. TURN WITH ZERO MACHID
  265F  RETURN
  2660  ELSE, RE
  2662  RETURN

                RELOCATION ROUTINE **************************
                REGS CONTAIN TABLE ADDR)

2663 **********
          (X/Y SED TABLE ADDRESS

  2663  SAVE PAS ATION CODE
  2667  ---      ERATION? (4 OR LESS)
  2669  GET OPER R >>26E1
  266B  VALID OP -> OUTPUT BLOCK
  266D  NO, ERRO -> LENGTH
  2671  $14/15 - LENGTH? >>26E3
  267B  $16/17 - PERATION CODE
  2684  NEGATIVE CK? >>26EC
  2686   CHECK O 13 = $18/19 --> INPUT BLOCK
  2687  ZERO BLO -> END OF INPUT BLOCK
  268A  NO, $12/ CK ONLY? >>2710
  2694  $1A/1B - OCATION OPERATION CODE (283C)
  26A1  COPY BLO BER OF RANGES TO CHECK (283D)
  26A3  SAVE REL
  26A9  SAVE NUM RT PAGES TO TABLE
  26AD  ---
  26AE  COPY STA PAGES
  26B9  ---
  26BA  AND END  Y, RELOCATION FACTORS
  26C5  ---      NEXT TABLE ENTRY <2716>
  26C6  AND FIN=
  26CE  BUMP TO
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 26D1
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  26D1  RESTORE OPERATION CODE (283C)
  26D6  RELOCATE INSTRUCTIONS? >>26E6

26D8 ********** 2/3 - RELOCATE ADDRESSES ***************************

  26D8  NO, RELOCATE ADDRESS <277A>
  26DB  COPY BLOCK <2723>
  26DE  AND CONTINUE IF ALL WENT WELL >>2667
  26E1   NORMAL EXIT
  26E2  RETURN
  26E3  JUMP TO ERROR EXIT >>27B0

26E6 ********** 4 - RELOCATE INSTRUCTIONS **************************

  26E6  RELOCATE INSTRUCTIONS <278C>
  26E9  AND THEN COPY BLOCK >>26DB

26EC ********** 0 - ZERO BLOCK ***************************************

  26EC  BUMP TABLE POINTER TO NEXT ENTRY <2716>
  26F1  GET NUMBER OF PAGES TO DO
  26F3  NO FULL PAGES? >>2701
  26F6  ZERO AN ENTIRE PAGE
  26FB  BUMP PAGE POINTER
  26FD  AND DECREMENT LENGTH
  2701  GET LENGTH OF PARTIAL LAST PAGE
  2703  NO PARTIAL PAGE? >>270D
  2706  ZERO PARTIAL PAGE TOO
  270D  DONE, GET NEXT TABLE ENTRY >>2667

2710 ********** 1 - COPY BLOCK ***************************************

  2710  BUMP TABLE POINTER <2716>
  2713  AND GO COPY BLOCK >>26DB

2716 ********** ADVANCE TABLE POINTER ********************************

  2716   ADD FINAL ENTRY INDEX..
  271A  TO TABLE ENTRY ADDRESS
  2722  RETURN

2723 ********** COPY BLOCK ******************************************

  2723  ---
  2727  INPTR < OUTPTR? >>2734
  2729  NO, GREATER? >>2757
  272B  MSB'S ARE EQUAL, CHECK LSB'S ALSO
  2733   EXIT IF EQUAL
  2734  INPTR < OUTPTR, COPY LAST PAGES FIRST
  2738  BUMP BOTH INPTR AND OUTPTR BY...
  273A  LENGTH-1 TO POINT AT LAST BYTE
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2742
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  2742  START WITH SHORT LAS
  2746  ---                   T PAGE LENGTH
  2747  COPY BYTES BACKWARDS
  274E  DROP ADDRESSES AND   THROUGH MEMORY
  2754  AND CONTINUE UNTIL  ENGTH BY 256
  2756  RETURN               INISHED >>2746

  2757  INPTR > OUTPTR, COPY
  2759  HOW MANY FULL PAGES   PAGES FORWARD
  275B  NONE? >>276C        LEFT?
  275D  COPY A FULL PAGE
  2764  AND BUMP ADDRESSES
  2768  DECREMENT LENGTH BY
  276A  AND DO ALL PAGES >>2256
  276C  GET LENGTH OF LAST  275D
  276E  EVEN PAGE BOUNDARY?  AGE
  2770  NO, COPY SHORT LAST  >>2779
  2779  RETURN               PAGE

277A ********** ADDR/PAGE R
                           ELOCATE ***********************************
  277A  GET TABLE ENTRY TYPE
  277E  GET PAGE TO RELOCATE (283C)
  2780  RELOCATE A SINGLE AD
  2783  BUMP BY 1 OR 2 BYTES  DRESS <27B8>
  2786  ADVANCE POINTER <27D  (283C)
  2789  AND CONTINUE UNTIL C  >
  278B  RETURN               OMPLETE >>277A

278C ********** INSTRUCTION
                           S RELOCATE ********************************
  278C  ---
  278E  GET 6502 OPCODE
  2790  COMPUTE INSTRUCTION
  2793  INVALID OPCODE? >>27  LENGTH <27E7>
  2795  3 BYTE INSTRUCTIONS?  A6
  2797  NO >>27A0
  2799  YES, 3 BYTE ADDRESS
  279B  RELOCATE ADDRESS <27  TO CORRECT
  279E  AND ADVANCE BY 3 BYT  8>
  27A0  NEXT INSTRUCTION <27  S
  27A3  CONTINUE UNTIL FINIS  4>
  27A5  RETURN               HED >>278C

        ******** INVALID O
                           PCODE *****************
  27A6   POP THE STACK
  27A8  RETURN WITH POINTER
  27AC  DIE HORRIBLY         TO BAD INSTRUC.
  27AF  RETURN
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 27AF
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

27B0 *********** ERROR RETURN ***************************************

  27B0  RETURN WITH POINTER
  27B4  EXIT WITH ERROR CODE
  27B7  RETURN

27B8 *********** RELOCATE ABSOLUTE ADDRESS ***************************

  27B8  GET PAGE NUMBER TO CHECK
  27BA  GET NUMBER OF RANGES (LESS ONE) (283D)
  27BD  IS IT PRIOR TO START OF THIS RANGE? (283E)
  27C0  YES? >>27C9
  27C2  NO, IS IS AFTER END OF RANGE? (2846)
  27C5  NO? >>27CD
  27C9  ---
  27CA  CHECK EACH RANGE >>27BD
  27CC  RETURN

  27CD  ---
  27CE  ADD FUDGE FACTOR TO ADDRESS (284E)
  27D1  AND UPDATE IT
  27D3  RETURN

27D4 *********** BUMP POINTER TO NEXT ADDR ***************************

  27D4  ---
  27D5  ADD LENGTH TO POINTER
  27DC  CHECK TO SEE IF WE ARE DONE
  27E2  ---
  27E6  RETURN

27E7 *********** COMPUTE INSTRUCTION LENGTH ***************************

  27E7   A-REG CONTAINS OPCODE
  27E8  ISOLATE LAST TWO BITS FOR LATER
  27ED  USE LAST 6 BITS AS TABLE INDEX
  27EF  GET BYTE WITH 4 LENGTHS IN IT (27FC)
  27F2  ---
  27F3  USING TOP TWO BITS AS INDEX... >>27F9
  27F5  SHIFT DOWN THE PROPER LENGTH
  27F9  AND ISOLATE IT IN A-REG
  27FB  RETURN

27FC *********** 6502 OP LENGTH TABLE *********************************
          EACH BYTE CONTAINS FOUR 2 BIT LENGTHS
```



```
ProDOS Relocat
---------------
ADDR    DESCRI
---------------

  27FC  ---

283C ***********

  283C  RELOCA
  283D  NUMBER
  283E   START
  2846   END O
  284E   ADDIT
  2856   NOT U
  285A   PAD T
  28CB

28FF *********** RELOCATION DATA ***************************************

  28FF  ---
  2902  COPY R
  2905  THE LA
  290F  $3C/3D
  2912  $3E/3F
  291D  $42/43
  2923   MAIN
  2924  COPY $
  2929  SLOT 3
  292C  IS AT
  2931  BUMP D
  2937  ADD DE
  293C  RETURN

293D ***********

  293D   NOT U
  2969

2A00 ***********
          (COP

  2A00  SAVE T
  2A04  FORCE
  2A0C  COPY 1
  2A14  FIRST
  2A17  NO? >>

          ****
```

```
ION CODE (3,2,1)
OF RANGES
OF RANGE PAGES
F RANGE PAGES +1
VE FACTORS
SED
 NEXT PAGE BOUNDARY

** SET UP RAMDRIVE IN AUXMEM ***************************

AM DRIVE DEVICE DRIVER TO.. (2C00)
NGUAGE CARD (FF00)
 --> $2A00
 --> $2BFF
 --> $200
MEM TO AUX MEM COPY
2A00,L$200 TO AUXMEM $200 <C311>
, DRIVE 2 DEVICE DRIVER.. (BF26)
$FF00
EVICE COUNT (BF31)
VICE TO VOLUME SEARCH TABLE

** 293D-29FF NOT USED ***********************************
SED
```

```
** RAMDRIVE DEVICE DRIVER ********************************
IED TO $200 IN AUXILLARY MEMORY)

E 80STORE SETTING (C018)
RAM READ/WRITE (C000)
PUT PARAMETERS
TIME IN OR FORMAT COMMAND? (03BA)
2A4D

**** FORMAT RAMDRIVE ****************
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2A19
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  2A19  YES, SAVE BLOCK WANTED
  2A1D  ZERO SECTORS $E AND $F <0331>
  2A22  COPY VOLUME NAME ($F3,"RAM") (03D0)
  2A25  TO VOLUME DIRECTORY BLOCK (0E04)
  2A2B   $FF
  2A2E  HEX $FF'S TO TABLE (03C0)
  2A34  ZERO (03C0)
  2A39  COPY ACCESS/TOTAL BLOCKS TO (03D4)
  2A3C  VOLUME DIRECTORY BLOCK (0E22)
  2A42  REFORMAT? (03BA)
  2A45  YES >>2AA8
  2A47  NO, DONE FIRST TIME PROCESSING (03BA)
  2A4A  RESTORE BLOCK NUMBER (03BF)

          ******** READ/WRITE RAMDRIVE BLOCK ******

  2A4D  BLOCK NUMBER * 2 = SECTOR NUMBER (03BF)
  2A53  SECTOR BEYOND MAIN MEMORY?
  2A55  YES >>2A61
  2A57  NO, SECTOR 6? (VOLUME BIT MAP)
  2A59  NO >>2A5E
  2A5B  YES, DUMMY UP A PHONEY BIT MAP SECTOR >>038A
  2A5E  ELSE, READ/WRITE MAIN MEMORY SECTOR >>0340

          ******** READ/WRITE IN LANG. CARD *******

  2A61   SAVE SECTOR NUMBER
  2A62  FIND IT IN MEMORY <02E3>
  2A65   REMEMBER READ/WRITE STATUS
  2A66  WRITING? >>2AB6
0268
  2A68  ---
  2A69  NO, SECTOR FOLLOWS I/O 4K AREA?
  2A6B  YES >>2A71
  2A6D  NO, FORCE IT TO $DXXX
  2A6F  AND USE 2ND BANK OF CARD >>2A77
  2A71  ELSE, USE 1ST BANK OF CARD (C083)
  2A74  AND WRITE ENABLE IT (C083)
  2A77  SAVE SECTOR NUMBER IN BLOCK (03BF)
  2A7A  PRESERVE HIS BUFFER ADDR (03BE)
  2A7E  ACROSS THE FOLLOWING: (03BD)
  2A81  SELECT ALTERNATE ZEROPAGE (C009)
  2A86  USE $C00 AS A CROSS BANK XFER AREA (03BE)
  2A8B  PRETEND THAT WAS CALLER'S BUFFER (03BD)
  2A8E  AND SET UP POINTERS AGAIN <02E3>
  2A92  COPY SECTOR TO $C00
  2A9D  THEN BACK TO MAIN ZERO PAGE (C008)
  2AA0  RESTORE CALLER'S BUFFER ADDRESS (03BD)
  2AA7   READING OR WRITING?
  2AA8  IF WRITING, DONE >>2AB3
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2AAA
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  2AAA  IF READING, ENABLE L.C. 1ST BANK (C08B)
  2AB0  AND COPY BLOCK $C00 TO HIS BUFFER <02BC>
  2AB3  THEN EXIT >>03DC
  2AB6  IF WRITING, COPY HIS BLOCK TO $C00 <02BC>
  2AB9  THEN DO COMMON CODE ABOVE >>0268

2ABC ********** COPY BLOCK IN MAIN 48K ******************************

02BC
  2ABC  THIS ENTRY COPIES SECTOR $0C/$D
02BE
  2ABE  THIS ENTRY COPIES ANY BLOCK (03BF)
02C1
  2AC1  FIND SECTOR/SET POINTERS <02E3>
  2AC4  WRITING? >>2AD9
  2AC6  NO, WRITE TO MAIN 48K RAM (C004)
  2ACA  COPY BLOCK AUX MEM --> MAIN MEM
  2AD5  WRITE TO AUX MEM AGAIN (C005)
  2AD8   DONE
  2AD9  ---
  2ADB  GO BACK TO MAIN MEM LANG. CARD.. (03ED)
  2ADE  TO COPY MAIN MEM --> AUX MEM

2AE3 ********** FIND RAM SECTOR/SET POINTERS ************************

02E3
  2AE3  GET COMMAND (03BB)
  2AE6  READ OR WRITE?
  2AE7  WRITE? >>2B06
  2AE9  NO, READ OR FORMAT (03BE)
  2AF0  $42/43 --> BUFFER IN HIS MEMORY (03BD)
  2AF3  $40/41 --> SECOND PAGE OF SAME
  2AF7  GET PAGE NUMBER (03BF)
  2AFC  $3C/3D --> BLOCK IN /RAM DRIVE
  2AFE  $3E/3F --> SECOND PAGE OF SAME
  2B04  ALWAYS BRANCH AROUND WRITE CODE >>2B21

  2B06  WRITE,  (03BE)
  2B0D  $3C/3D --> BUFFER IN HIS MEMORY (03BD)
  2B10  $3E/3F --> SECOND PAGE OF SAME
  2B17  $42/43 --> BLOCK IN /RAM DRIVE
  2B19  $40/41 --> SECOND PAGE OF SAME
  2B21  SECOND PAGE FOLLOWS FIRST
  2B25   EXIT

2B26 ********** RETURN WITH DUMMY SECTOR ****************************
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2B26
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  2B26  ZERO SECTOR $C/D AND SELECT IT <032F>
  2B29  COPY TO/FROM HIS BUFFER <02C1>
  2B2C  AND EXIT >>03DC

2B2F ********** ZERO BLOCK BUFFER **********************************

032F
  2B2F  ZERO SECTOR $C/D ENTRY
0331
  2B31  ZERO ANY GIVEN SECTOR ENTRY (03BF)
0334
  2B34  FIND SECTOR/SET POINTERS <02E3>
  2B38  ZERO BOTH PAGES OF BLOCK
  2B3F   AND EXIT

2B40 ********** READ/WRITE IN LOW 48K ******************************

0340
  2B40  SECTOR 4 (VOLUME DIRECTORY)?
  2B42  NO >>2B48
  2B44  YES, MAKE THAT BLOCK 7 INSTEAD
  2B46  AND GO DO I/O NOW >>2B56
  2B48  ELSE, LESS THAN SECTOR $D?
  2B4A  IF SO, PASS BACK $C ZEROED >>2B26
  2B4C  START MSB AT ZERO
  2B4E  GET ORIGINAL BLOCK NUMBER
  2B50  BLOCK $5D THROUGH $5F?
  2B52  NO >>2B59
  2B54  YES, ADJUST TO $D THROUGH $F
  2B56  AND USE $1A00 THRU $1FFF IN /RAM >>0383
  2B59   ELSE, FOR SECTORS $D THRU $5C
  2B5A  SUBTRACT 8
  2B5C  AND DIVIDE BY 17 ($11)
  2B62   XREG IS QUOTIENT
  2B66   AND AREG IS REMAINDER
  2B67  REMAINDER OF 1?
  2B69  NO >>2B71
  2B6B   YES, EVERY 17TH BLOCK GOES...
  2B6C   AT $1200, $1400, $1600, $1800
  2B6D  BY ADDING 8
  2B6F  AND GO DO IT >>2B83
  2B71   BUMP QUOTIENT (START AT $2XXX)
  2B73  SHIFT IT TO TOP NIBBLE OF BYTE
  2B7B  GOT A REMAINDER? >>2B7F
  2B7D   IF SO, DECREMENT IT (NOT USING 1)
  2B7F   THEN ADD INTO TOP NIBBLE
  2B80  TO FORM $14 THRU $4F (03BF)
0383
  2B83  BLOCK*2 FOR SECTOR NUMBER
  2B84  COPY THE BLOCK <02BE>
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2B87
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  2B87  THEN EXIT >>03DC

2B8A ********** READ/WRITE BIT MAP BLOCK ****************************

038A
  2B8A  USE $C/D AS A DUMMY SECTOR
  2B8F  GO FIND IT AND SET POINTERS <02E3>
  2B92  WRITING? >>2BA7
  2B94  NO, READING - ZERO BLOCK AT $C/D <0334>
  2B99  COPY BIT MAP IMAGE TO DUMMY BLOCK (03C0)
  2BA1  COPY BLOCK BACK TO CALLER'S BUFFER <02C1>
  2BA4  THEN EXIT >>03DC

  2BA7  WRITING, COPY CALLER'S BUFFER TO $C/D <02C1>
  2BAA  FIND $C/D AND SET POINTERS <02E3>
  2BAF  COPY FROM SECTOR TO BIT MAP IMAGE
  2BB7  THEN EXIT >>03DC


2BBA ********** RAM DRIVE DATA (AT $3BA) ****************************

03BA
  2BBA  FIRST TIME ENTRY FLAG
03BB
  2BBB  COMMAND FROM PARM LIST
03BC
  2BBC  UNIT NUMBER FROM PARM LIST
03BD
03BE
  2BBD  BUFFER ADDRESS FROM PARM LIST
03BF
  2BBF  BLOCK NUMBER FROM PARM LIST

03C0
  2BC0  BIT MAP IMAGE FOR RAM DRIVE

03D0
  2BD0  /RAM VOLUME NAME
  2BD1  'RAM'
03D4
  2BD4  ACCESS, ENTRY LENGTH
  2BD6  NUMBER OF ENTRIES
  2BD7  FILE COUNT
  2BD9  BIT MAP BLOCK POINTER
  2BDB  BLOCKS ON DISK
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2BDC
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

2BDC ********** EXIT TO MAIN MEMORY *********************************

03DC
  2BDC  WRITE ENABLE RAM CARD (C08B)
  2BE3  RESTORE 80STORE STATUS >>2BEA
  2BE5  80STORE WAS ON (C001)
  2BEA  GO AROUND PARM TO XFER >>03EF
03ED
  2BED  CROSS BANK XFER ADDRESS LSB
03EE
  2BEE  AND MSB
03EF
  2BEF  RETURN TO $FF44 (NORMAL EXIT)
03F6
  2BFB  USE ROM XFER ROUTINE TO DO IT >>C314

2C00 ********** DISK DEVICE DRIVER FOR /RAM ************************
         (COPIED TO $FF00 IN KERNEL)

  2C00  ---
  2C03  SAVE ZPAGE STUFF I WILL CLOBBER
  2C05  FROM $3C THRU $47 (FF81)
  2C0D  SAVE $3ED/E (CROSS BANK XFER ADDR) (03ED)
  2C16  COMMAND = STATUS?
  2C18  IF SO, SIMPLE EXIT WILL DO >>2C44
  2C1A  ELSE, TOO BIG A COMMAND NUM?
  2C1C  IF SO, ERROR >>2C3B
  2C1E  ELSE, INVERT BITS OF CMD
  2C20  AND SAVE IT
  2C22  FORMAT? >>2C2C
  2C24  NO, CHECK BLOCK NUMBER
  2C28  MUST BE <128 FOR /RAM
  2C2C  GOING TO $200 IN AUX MEMORY
FF33
  2C38  USE XFER TO GET THERE >>C314

  2C3B  I/O ERROR RETURN CODE
  2C3D  EXIT >>2C41
  2C3F  WRITE PROTECTED RETURN CODE
  2C41  ---
  2C42  ERROR EXIT >>2C47
  2C44  NORMAL EXIT, RETURN CODE IS 0
  2C47  ---
  2C4B  RESTORE ZERO PAGE IS USED (FF81)
  2C53  AND $3ED/E (FF7F)
  2C61   AND EXIT TO CALLER WHEN THRU
```

```
ProDOS Relocator -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 2C61
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

2C62 ********** COPY MAIN TO AUX BLOCK ******************************
          (CALLED FROM AUX MEM HANDLER)

FF62
  2C62  WRITE IN AUX 48K (C005)
  2C67  COPY BOTH PAGES OF BLOCK
  2C72  WRITE IN MAIN 48K AGAIN (C004)
  2C77  GO TO $2D8 IN AUX MEMORY TO RETURN (03ED)
  2C7C  RETURN TO AUX MEM HANDLER AGAIN >>FF33

2C7F ********** DATA AREA ********************************************

FF7F
  2C7F  SAVED XFER ADDRESS
FF80

FF81
  2C81   ZERO PAGE SAVE AREA

2C8D ********** NOT USED ********************************************

  2C8D  ---

2D00 ********** START OF PRODOS LOAD IMAGE **************************

2D00    LOAD IMAGE AT $2D00

  2D00  ---
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D000
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

D000    MODULE STARTING ADDRESS

          ****************************************
          *                                      *
          *  PRODOS MACHINE LANGUAGE INTERFACE   *
          *       THIS CODE NORMALLY RESIDES IN  *
          *       THE LANGUAGE CARD (FOR 64K)    *
          *       IT PERFORMS ALL FILE MANAGEMENT *
          *       AND OTHER SYSTEM FUNCTIONS AND *
          *       SUPPORTS THE HARDWARE IN A     *
          *       DEVICE INDEPENDENT WAY.        *
          *                                      *
          *  VERSION 1.0.1 -- 1 JAN 84           *
          *                                      *
          ****************************************

D000 ********** ZERO PAGE USEAGE ************************************

0040    Pointer to callers parmlist
0041
          -- device driver parmlist --
0042    Command
0043    Unit Number
0044    Buffer Pointer
0045
0046    Block Number
0047
          ----------------------------
0048    I/O Pointer - Index Block or..
0048    pointer into $F600 work buffer or..
0048    caller's pathname buffer pointer
0049
004A    I/O Pointer - Data Block
004B
004C    I/O Pointer - Data Block
004D
004E    I/O Pointer - Caller's Data or..
004E    buffer pointer passed in parmlist or..
004E    old I/O buffer
004F

D000 ********** MLI ERROR CODES **************************************

0000    No Error
0001    Bad call type
0004    Bad parameter count
0025    Interrupt Table full
0027    I/O Error
0028    No device connected
002B    Write protected
002E    Volume switched
```

```
ProDOS MLI -- V1.0.1 -- 1
-------------------------
ADDR    DESCRIPTION/CONTEN
-------------------------

0040    Invalid pathname s
0042    Too many files ope
0043    Invalid REF NUM
0044    Nonexistent path
0045    Volume not mounted
0046    File not found
0047    Duplicate file nam
0048    Disk full
0049    Volume Directory f
004A    Incompatible ProDO
004B    Unsupported file t
004C    End of file
004D    Position past EOF
004E    Access error
0050    File already open
0051    File count bad
0052    Not a ProDOS disk
0053    Bad parameter
0055    VCB overflow
0056    Bad buffer address
0057    Duplicate volume n
005A    Bad volume bit map

D000 ********** SCREEN LOC

0750    For direct movemer
07D0
07F1
07F2
07F3
07F4
07F5
07F6
07F7
07F8    Slot in use

D000 ********** SYSTEM GLO

BF00    Jump to MLI entry
BF03    JSPARE (Jump to $I
BF06    DATETIME vector
BF09    Jump to System Er
BF0C    Jump to System Dea
BF0F    System Error numbe
BF10    Device Driver addr
BF30    Slot/Drive last de
BF31    Count (-1) active
BF32    List of active dev
BF58    Memory BITMAP for
BF70    Open file 1 buffer
BF7E    Open file 8 buffer
```

```
-- 1 JAN 84                    NEXT OBJECT ADDR: D000
------------------------------------------------
)NTENTS
------------------------------------------------

iler 1
iler 2
iler 3
iler 4
:ing interrupt
:ing interrupt
:ing interrupt
:ing interrupt
:ing interrupt
ırn address

3L

ø = no prefix)
ag
 return address
earea
earea
 entry/exit routines
ry/exit routines
aved state ($E000 byte)
n number

SWITCHES ****************************************

nn mode

t/graphics
ry page
phics mode
te I/O ROMs

AIN ENTRY POINT *********************************

l mode
s (BF9F)
 Address of function code -1
 True return address
age System error to ø (BF0F)
Code
dex into Command Table (X reg)
valid?

Parameter list
 count required (EF45)

eter count correct?

f function (EF25)
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84            NEXT OBJECT ADDR: D04F
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

  D04F  no,
  D050  $8X - Calls to I/O Drivers >>D066
  D052  $CX/DX - Non System calls >>D071
  D054  Else, $4X - Interrupt support
  D055  Isolate type (DEALLOC = 1, ALLOC = ø)
  D057  Call Interrupt Support <D0F3>
  D05A  Then Exit to Caller >>D078
  D05D  Go to quit code via global page >>BF03

D060 ************************************************************
          ****** MLI GET_TIME CALL ******
          ******************************

  D060  Call Date/Time driver <BF06>
  D063  and exit to caller >>D078

D066 ************************************************************
          ****** MLI READ_BLOCK CALL *******
          ****** MLI WRITE_BLOCK CALL ******
          ******************************
          $80 - Read Block
          $81 - Write Block

  D066  ---
  D067  Set $42 -> 1 for READ, 2 for WRITE
  D06B  Do Block I/O <D0B2>
  D06E  Then Exit to Caller >>D078

D071 ********** $CX and $DX CALLS ***************************************

  D071  ---
  D072  Isolate function Index
  D075  Perform function and exit to caller <D23C>

D078 ********** EXIT TO CALLER ******************************************

  D078  Clear Backup
  D080  Error occurred?
  D083   Save test results
  D084   Disable interrupts
  D085  MLI no longer active (BF9B)
  D088   Get test results back
  D089   Store in X reg
  D08A  Set up Return Address on stack (BF9D)
  D092   Put test results on stack
  D094   Put error code in A reg
  D095  Restore X reg (BF9E)
  D098  Restore Y reg (BF9F)
  D09B   Put error code on stack
  D09C  Get RAM/ROM orientation (BFF4)
  D09F  Exit via RAM Global Page >>BFA0
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR:
------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------

D0A2 ********** NO DEVICE CONNECTED ******************************

  D0A2  ---
  D0A4  Call System Error Handler (Global Page) <BF09>

D0A7 ********** BAD SYSTEM CALL NUMBER ***************************

  D0A7  ---
  D0A9  Branch always taken >>D0AD

D0AB ********** BAD PARAMETER COUNT ******************************

  D0AB  ---
  D0AD  Call System Error Handler <D0D7>
  D0B0  Exit to Caller >>D078

D0B2 ********** BLOCK I/O SETUP **********************************

  D0B2  ---
  D0B4   Save Old Processor Flags
  D0B5   Disable Interrupts
  D0B6  Copy Parameters to $43-$47
  D0BE  Save Starting Buffer Page in $4F
  D0C3   Find last page + 1
  D0C6  Round up if Buffer not page aligned >>D0C9
  D0C9  Is this Memory already in use? <EE89>
  D0CC  Yes, then exit with error >>D0D6
  D0CE  No, do Block I/O <D0DA>
  D0D1  Error? >>D0D6
  D0D3   No, then exit normally
  D0D5  RETURN
  D0D6   Error Exit
  D0D7  Call System Error Handler <BF09>

D0DA ********** Block I/O ****************************************

  D0DA  ---
  D0DC  Force off unused UNIT bits
  D0E3   Put Drive number in X reg
  D0E7  Put Device Handler Address in Jump Vector (F0B5)
  D0F0  Exit through Device Handler >>F0B5

D0F3 ********** Interrupt Handler ********************************
         ALLOC/DEALLOC

  D0F3  Save Call Type
  D0F5  Which Type?
  D0F6  DEALLOC? >>D124
```

```
D14E  And RTI Address (BF8E)
D155   Replace stack to original condition
D159  Save active slot index (D1C4)
D15C   Is stack full?
D15F  Pop off 16 bytes and save them
D161  ---
D168  Save $FA - $FF (top of zero page)
D16A  ---
D172  Is there a User Vector #1 (BF81)
D175  No >>D17C
D177  Yes, call it <D1CE>
D17A  His interrupt? >>D19F
D17C  Is there a User Vector #2 (BF83)
D17F  No >>D186
D181  Yes, call it <D1D1>
D184  His interrupt? >>D19F
D186  Is there a User Vector #3 (BF85)
D189  No >>D190
D18B  Yes, call it <D1D4>
```



```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D0F6
------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------

         ALLOC

  D0F8  ---
  D0FA  Look for empty slot (BF7E)
  D101  His Address better be non-zero
  D105  Store Address of His routine in Global Page (BF7E)
  D10E   And return the position number we used
  D114   Exit
  D115   Skip this Vector
  D117  Last one?
  D119  No, check another >>D0FA
  D11B  Yes, Table Full Error
  D11D  Always taken >>D121
  D11F  Bad Parameter Error
  D121  Call System Error Handler <BF09>

         DEALLOC

  D124  ---
  D126  Get Position Number
  D128  Can't be zero >>D11F
  D12C  Or greater than 4 >>D11F
  D12F   Make Index into Table from it
  D132  And zero His Vector (BF7E)
  D139   Then Exit

D13A ********** IRQ Handler ******************************************

  D13A  ---
  D13C  Save A reg from Monitor (BF88)
  D13F  And X,Y,S and P (BF89)
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D18E
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  D18E  His interrupt? >>D19F
  D190  Is there a User Vector #4 (BF87)
  D193  No >>D19A
  D195  Yes, call it <D1D7>
  D198  His interrupt? >>D19F
  D19A  Indicate error type 1
  D19C  Call System Death Handler <BF0C>
  D19F  Interrupt Serviced
  D1A1  Restore zero page (EFA5)
  D1A9  And stack (BF8B)
  D1B9  Reload X and Y (BF8A)
  D1BF  Disable I/O ROMS (CFFF).
  D1C2  Replace active slot number (C100)
  D1CB  Exit from Interrupt >>BFD0
  D1CE  User Interrupt Handlers (#1 - #4) >>BF80

D1DA ********** SYSTEM ERROR HANDLER **********************************

  D1DA  Save Error Code (BF0F)
  D1DE   Pop out of subroutine
  D1DF  Exit to caller with Error Code (BF0F)
  D1E3  RETURN

D1E4 ********** SYSTEM DEATH HANDLER **********************************

  D1E4  ---
  D1E6   ; Entry from System Global Page here
  D1E7  Turn off 80 column card (C00C)
  D1EA  Select standard Text display (C051)
  D1F6  Blank out a line
  D1F8  ---
  D1FD  Print "INSERT SYSTEM DISK AND RESTART" (EFDE)
  D207  Go into infinate loop if no error code >>D239
  D20B  "-" (07F1)
  D210  "E" (07F2)
  D215  "R" (07F3)
  D218  "R" (07F4)
  D21C  Convert error code to Hex
  D228  And print it (07F6)
  D22C  Second digit also
  D239  Infinite loop >>D239

D23C ********** PERFORM FILING OR ***************************************
          ******* HOUSEKEEPING FUNCTIONS ******

  D23C  Save function index (F077)
  D23F  Get INFO flags for this command (EF8D)
  D242  Times 2
  D243  Store Command Number times 2 (F073)
  D248   And use it to index into Address Table
  D24C  Set up Jump Vector with this funtion's (F0B5)
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D24F
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  D24F  ..handler address (EF66
  D255  Signal Backup required
  D25A  PATHNAME not required?
  D25C  Required - parse and v
  D25F  Bad Name? >>D278
  D261  Reference Number in li
  D264  No >>D26B
  D266  Yes - check it out <D3
  D269  Bad Number? >>D278
  D26B  Date/Time in list? (F0
  D26E  No >>D273
  D270  Yes - set System date
  D273  Call Function Handler
  D276  If no errors the exi
  D278  Else - call System err
  D27B   Return to caller
  D27C  Indirect JUMP to Handl
  D27F ********* CHECK CALLER'S
          ****** COPY TO MY AR
  D27F  Set ($48) -> Pathname
  D28A  ---
  D28E  Assume partial Pathnam
  D291  No Pathname in my area
  D294  Check length of caller
  D296  Zero is no good >>D2F0
  D29A  Nor is 65 or more >>D2
  D29C  Save length (F053)
  D29F  Length + 1 (F058)
  D2A3  Get first character of
  D2A7  Is it "/"?
  D2A9  No >>D2AF
  D2AB  Yes - indicate fully q
  D2AE   Bump past "/"
  D2AF  ---
  D2B1  Length of Index leve
  D2B4  First character of Ind
  D2B7  Start of upcomming Ind
  D2BA  At end of name yet? (F
  D2BD  Yes >>D2F4
  D2BF  No - get next characte
  D2C5  Is it "/"?
  D2C7  Yes >>D309
  D2C9  No - lower case?
  D2CB  No >>D2CF
  D2CD  Yes - force upper case
  D2CF  Copy to my Pathname buff? (F073)
  D2D2  Increment Index level
  D2D5  Subsequent characters
  D2D7  Increment Index level
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN
-------------------------------
ADDR    DESCRIPTION/CONTENTS

                                  his name

                                  alified name (F07C)

                                  s -1 initially (F100)
                                  ex level (counter) (F078)
                                  ex level in name (F07A)
                                  5E)
                                   in his name

                                  fer (F100)
                                  ounter (F078)
                                  may be A-Z,0-9 or . >>D2DC
                                  ounter (F078)
```

```
                                  after call
                                  >>D261
                                  lidity check <D27F>

                                  ust in case <BF06>
                                  D27C>
                                  >>D27B
                                  r handler <BF09>

                                  r >>F0B5

                                  PATHNAME  ********************************
                                  2A          ******

                                  e (F07C)
                                  yet  (F100)
                                  s Pathname
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D2DA
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  D2DA  First character must be alphabetic >>D2E8
  D2DC  Is it "."?
  D2DE  Yes - get next character >>D2BA
  D2E0  No - is it special or control character
  D2E2  Yes - Bad Pathname then >>D2F0
  D2E4  Is it numeric?
  D2E6  Yes - get next character >>D2BA
  D2E8  Is it Alphabetic?
  D2EE  If so get next character >>D2BA
  D2F0   Else
  D2F1  Bad Pathname
  D2F3  RETURN
  D2F4  ---
  D2F6  Any characters in last Index level? (F078)
  D2F9  Yes >>D2FF
  D2FB  No, zero characters in it (F078)
  D2FE   And toss out last "/"
  D2FF  ---
  D300  Mark end of name with $00 (F100)
  D303  Name too long? >>D2F0
  D305  No - save final length (F05E)
  D308   Set X -> 0
  D30C  Last Index more than 15 characters?
  D30E  Yes - then no good >>D2F0
  D310  Save output Index (F07D)
  D313  Store length of previous Index level (F07A)
  D316  Just before it in buffer (F100)
  D319  Restore output index (F07D)
  D31C  And continue >>D2AF
  D31E   End of Name
  D31F  Fully qualified name? (F07C)
  D322  Yes >>D329
  D324  No - Got a Prefix (BF9A)
  D327  No - error >>D2F0
  D329   Else, okay to exit

D32A ************************************************************
       ****** MLI SET_PREFIX CALL ******
       ********************************

  D32A  Copy Pathname <D27F>
  D32D  Its okay >>D339
  D32F  Check length of Volume name (F100)
  D334  If zero - no Prefix wanted (BF9A)
  D337   Exit with no error
  D338  RETURN
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                N
-------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------

  D339  Get File entry for last index <D798>
  D33C  Okay? >>D342
  D33E  Invalid Pathname?
  D340  No - Out now! >>D380
  D342  Sub Directory file? (F01F)
  D349  No, error >>D37E
  D34B  Fully qualified path? (F07C)
  D34E  Yes >>D353                                5F)
  D350  No - use old Prefix also (BF9A)
  D353  ---
  D355  Compute new Prefix Index (F05E)           (F100)
  D358  Does new Prefix exceed 64 characters?
  D35A  Yes - Bad Path error >>D2F0
  D35D  Store new Prefix pointer (BF9A)
  D363  Set Device Number of Prefix Directory (F0
  D369  Save Keyblock for Prefix Directory (F060)
  D372  Copy Prefix to top of Path buffer (F100)
  D375  (preceeded by old Prefix if one exists) (**********************
  D37D   Exit normally

  D37E  Bad File Type Error
  D380  ---
  D381  RETURN

D382 ****************************************
       ****** MLI GET_PREFIX CALL ******
       ********************************

  D382   Set ($4E) -> Data Buffer
  D38E  Set Length = 64 (max)
  D398  Validity check buffer storage <EE6C>
  D39B  Error? >>D380                             (F100)
  D39F  Get Prefix index (BF9A)
  D3A3  No Prefix? - Length = 0 >>D3A9
  D3A5  Compliment for length
  D3A9  Store in first byte of buffer
  D3AB  If null Prefix exit >>D3C3
  D3AD  ---
  D3AE  Copy Prefix to caller's buffer replacing
  D3B1  index level name length bytes with "/"
  D3BB  ---
  D3BF  End it with a "/"
  D3C3  ---
  D3C4   Exit normally
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D3C5
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

D3C5 ********** VALIDITY CHECK REFERENCE NUMBER **********************
      ,             (PASSED BY CALLER)

  D3C5  Get Reference Number
  D3C9  If zero then no good >>D426
  D3CD  If > 8 then no good >>D426
  D3CF   Save Reference Number
  D3D0  Multiply by 32
  D3D6  Result gives offset into FCB's (F052)
  D3DA   Get back Reference Number
  D3DB  File Control Block active this Reference? (F300)
  D3DE  No - Bad Reference Number  >>D421
  D3E0  Get Buffer Number (F30B)
  D3E3  Find Buffer address in Global Page <EE26>
  D3E9  No Buffer? >>D412
  D3EB  Buffer okay, save Page Pointer in $48
  D3EF  Second block in $49
  D3F1  Set last Device used in Global Page (F301)
  D3F7  Finish setting up pointers (F09D)
  D3FA  ($4A) -> 1st Block of Buffer (data)
  D3FC  ($48) -> 2nd Block of Buffer (index)
  D3FE  ---
  D3FF  Search all Volume Control Blocks (F210)
  D402  for the one which goes with requested unit (F301)
  D407  ---
  D40D  Can't find matching Volume Control Block
  D40F  So die with error type $0A <BF0C>
  D412  No Buffer in open File Control Block
  D414  So die with error type $0B <BF0C>
  D417  Is Volume mounted? (F200)
  D41A  No, keep looking >>D407
  D41C  Save Volume Control Block index (F051)
  D420   Exit normally

  D421  ---
  D423  !!!!! (F052)
  D426  Bad Reference Number error
  D429  RETURN

D42A **************************************************************
        ****** MLI ONLINE CALL ******
        ****************************

  D42A  Set ($4E) -> Data Buffer <E403>
  D42D  Set Length = 0
  D437  Get Unit Number
  D439  Do all Units? >>D442
  D43B  No, just one
  D43D  Set length = 16 (F09A)
  D440  Always taken >>D447
  D442  If all Units
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D444
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  D444  Set Length = 256 (maximum) (F09B)
  D447  Is Buffer in main RAM? <EE6C>
  D44A  No, then exit >>D47F
  D44C  Yes, zero out Buffer
  D451  ---
  D456  Index into Data Buffer = $00 (F07A)
  D45B  Get Unit Number again
  D45D  Isolate valid bits
  D45F  Specific Unit requested? >>D480
  D461  No, copy Devise List from Global Page <DA57>
  D464  Save Device Count (F07D)
  D467  Get last Device (F08A)
  D46A  Generate return data for it <D480>
  D46D  Bump data buffer index by 16 (F07A)
  D476  Get next Device (F07D)
  D47A  And go do it >>D464
  D47C  When done, exit
  D47F  RETURN

  D480  Save Device Number (BF30)
  D483  Scan for the Volume Control Block <DA69>
  D486  Error? >>D4B8
  D488  We need Block 2 (Key Block of VolDir)
  D490  Read Volume Directory Key Block <DDE1>
  D493  Error? >>D4B8
  D495  Was something already mounted? (F051)
  D49B  No >>D4A2
  D49D  Yes, Files open? (F211)
  D4A0  Yes >>D4AE
  D4A2  No, set up Volume Control Block for new VOL <DAC4>
  D4A5  Error? >>D4B8
  D4A7  No
  D4A9  Was a duplicate Volume Control Block found? (F075)
  D4AC  Yes, then error >>D4B8
  D4AE  See if the same Volume is still there (F051)
  D4B4  If not, Disk Switch Error
  D4B6  Else, all is well - continue >>D4D6

D4B8 ********** ERROR ************************************************
          Store code in data buffer entry

  D4B8  ---
  D4B9  Store Device Number in entry <D4EB>
  D4BE  Store error code next
  D4C0  Duplicate Volume error?
  D4C2  No - done >>D4D4
  D4C5  Store Device Number for duplicate next (F076)
  D4CD  No Duplicate now
  D4D4   Exit with error
  D4D5  RETURN
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D4D5
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

D4D6 ********** MAKE ONLINE VOLUME ENTRY ****************************

  D4D6  Get name length for loop index (F200)
  D4DF  Copy name to Buffer entry (F200)
  D4E6  Done yet? (F078)
  D4E9  No, do another >>D4DF
  D4EB  Yes, find current Buffer entry (F07A)
  D4EE  Store Device number (BF30)
  D4F6   Return to caller

D4F7 ************************************************************************
         ****** MLI CREATE CALL ******
         ****************************

  D4F7  Follow Path to File <D7AB>
  D4FA  Error? - I'm expecting one >>D500
  D4FC  If File was found - Duplicate error
  D4FE  ---
  D4FF   Return to caller

  D500  File not found?
  D502  No, then a real error occured >>D4FE
  D504  Yes, get requested storage type
  D508  Is it 00, $01, $02 or $03?
  D50A  Yes, carry on >>D510
  D50C  Is it $0D?
  D50E  No, then exit with error >>D520
  D510  Get status of this device (BF30)
  D516  Exit on error >>D523
  D518  Is there a free Directory entry? (F05B)
  D51B  No >>D524
  D51D  Yes - continue >>D5B6

  D520  Indicate Bad Storage Type
  D523   Return to caller

  D524  Is this the Volume Directory? (F006)
  D52A  No, we can extend it >>D530
  D52C  Yes, indicate Volume Directory Full error
  D52F   Return to caller

         * EXTEND DIRECTORY FILE *

  D530  Save old current Block number
  D536  Allocate a Block on Disk <DCA9>
  D539   Save the number
  D53A   Replace BLKNUM
  D540   Was there a free Block?
  D541  No, then exit >>D523
  D543  Yes, set up forward pointer in old one (F602)
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D546
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  D546  to point to it (F603)
  D549  and Write old Directory Block <DD
  D54C  Error? Yes, then exit >>D523
  D550  Set BLKNUM -> new Block number
  D555  Back point to old Directory Block
  D55B  Loop until done >>D550
  D55F  Zero remainder of Block Buffer (E
  D562  (including forward pointer) (F700
  D566  Loop until done >>D55F
  D568  Write new Directory Block <DDDD>
  D56B  Error? Yes, then exit >>D523
  D56D  Set BLKNUM -> Parent Directory nu
  D577  Read Block with my entry <DDE1>
  D57A  Entry number of my Directory (F00
  D57D  None relocatable!!
  D57F  Set ($48) -> Buffer
  D581  Skip link pointers
  D583  ---
  D584   Count entries
  D587  Skip to next (F009)
  D590  Save LSB
  D594  Add 1 to Blocks used
  D596  and $200 to EOF mark (EF8E)
  D599  in entry
  D59F  Loop until done >>D594
  D5A1  Write back Block to Parent Direc
  D5A4  Error? then exit  >>D5B5
  D5A6  Start all over now that there's

D5A9 ********** ZERO $F600 *************

  D5A9  Zero $F600 Block Buffer
  D5B5   Return to caller

D5B6 ********** BUILD NEW FILE *********

  D5B6  Call Zero $F600 routine <D5A9>
  D5B9  Copy Datetime (Creation)
  D5BB  to my variables
  D5C7  Loop until done >>D5BB
  D5C9   Did he give Datetime (Creation)
  D5CA  Yes, carry on >>D5D7
  D5CC  No, then use
  D5CE  System Datetime instead (BF90)
  D5D7  If Storage type is $00, $01, $02
  D5D9  force it to $10
  D5DF  else use a $D0
  D5E1  Find File name (F07A)
  D5E4  OR Storage type to name length (
  D5E7  Store Type/Length (F01F)
  D5EA  Isolate name length
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D5EE
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  D5EE  Copy File name to File Entry Buffer (F07A)
  D5FC  Copy caller's Access Byte
          NOTE: This should be validity checked!!!
  D604  and copy File type
  D609  ---
  D60A  and AUX_TYPE
  D613  Copy Version and Min_Version (0,0) (EFB0)
  D616  constants to entry (F03B)
  D61F  Indicate 1 Block used
  D624  Copy Directory Header Block number (F01A)
  D633  Is this a Seedling file?
  D635  Yes >>D66E
  D637  No, Directory file - Build Header in $F600
  D639  Copy completed Directory entry (F01F)
  D63C  to $F600 buffer first (F604)
  D640  Loop until done >>D639
  D642  Make Storage type $E in Header itself
  D647  Put "HUSTON" (Author) in Reserved area
  D64F  and Version, Min_Version, Access, (EFB0)
  D652  Entry-length, File count and (F620)
  D655   Parent pointer from constants
  D656  Loop until done >>D649
  D65A  Copy Parent Block entry number (F01C)
  D661  Loop until done >>D65A
  D663  Copy Parent entry Length (F011)
  D66B  EOF = $200 (F035)
  D66E  Allocate a new disk block <DCA9>
  D671  error? >>D6AA
  D673  Store it in key pointer of entry (F030)
  D679  and in BLKNUM for I/O
  D67D  Write zeroed (or DIR HDR) key block <DDDD>
  D680  error? >>D6AA
  D682  Bump parent's file count (F013)
  D68A  Go update directory <D6AB>
  D68D  error? >>D6AA
  D68F  Checkpoint Volume Bit Map and exit >>DD86

D692 ********** POINT $48/49 AT DIRECTORY ENTRY **********************

  D692  $48/$49 --> Entry
  D696  Skip link pointers (+4)
  D698  File entry number counter (F01E)
  D69B  ---
  D69C   Skip to proper entry
  D69F  Add entry length (F011)
  D6A4  (bump MSB)
  D6A8  (store LSB)
  D6AA  RETURN
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D6AA
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

D6AB ********** UPDATE DIRECTORY(S) **********************************

  D6AB  System date avaiable? (BF90)
  D6AE  no, forget it >>D6BB
  D6B2  yes, copy to last modified date field (BF90)
  D6BB  turn on BUBIT (backup) if appropriate (F03D)
  D6C4  set DEVNUM of parent (F019)
  D6CA  and BLKNUM (F01C)
  D6D4  reread DIR block containing entry <DDE1>
  D6D7  error? >>D6AA
  D6D9  Point to proper entry in buffer <D692>
  D6E0  Copy constructed entry to buffer (F01F)
  D6EB  Is this block the DIR HDR block?
  D6F6  no, write back new entry <DDDD>
  D6F9  error? >>D6AA
  D705  and then read DIR HDR block <DDE1>
  D708  error? >>D6AA
  D70A  in any case..
  D70C  copy back update file count to HDR (F013)
  D715  and ACCESS byte (with Backup) (F010)
  D71B  write back HDR block <DDDD>
  D71E  error? >>D778
  D720  is this the VOL DIR? (F604)
  D727  yes, all done -- exit >>D796
  D729  no, subdirectory.. (F627)
  D72C  get parent pointer
  D733  get parent entry no.. (F629)
  D739  and entry len (F62A)
  D73F  read parent DIR block <DDE1>
  D742  error? >>D778
  D744  find entry for this subdirectory <D692>
  D747  system date available? (BF90)
  D74A  no >>D759
  D74C  yes,
  D750  copy system date/time to... (BF90)
  D753  modified date/time in entry
  D759  write it back <DDDD>
  D75C  error? >>D778
  D760  BLKNUM = HDR block number
  D769  same block we have now?
  D76D  yes, go back and date stamp >>D720
  D76F  no,
  D773  read HDR block <DDE1>
  D776  and go back to date stamp parent DIR >>D720
  D778   error? then exit
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D778
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

D779 ********** NOT ProDOS VOLUME ERROR ******************************

  D779  ---
  D77C  RETURN

D77D ********** IS THIS ProDOS VOLUME? *******************************

  D77D  Does previous block ptr = 0? (F600)
  D78B  no, not a ProDOS volume >>D779
  D78D  else, (F604)
  D792  does VOL DIR's STORAGE TYPE = $E or $F?
  D794  no, error >>D779
  D796   else, ok
  D797  RETURN

D798 ********** GET FILE ENTRY ***************************************

  D798  follow path to it's end <D7AB>
  D79B  error? >>D7AA
  D7A0  copy file entry
  D7A8  and exit
  D7AA  RETURN

D7AB ********** FOLLOW PATH TO A FILE ********************************

  D7AB  get base dir's data <D92F>
  D7AE  error? >>D802
  D7B0  another subdirectory in the path? >>D7DA
  D7B2  no, at end of path (D82A)
  D7B5  $48/$49 --> $F604 (HDR)
  D7BD  copy part of HDR to file entry
  D7C7  File type = $F (Directory) (EFA8)
  D7CA  BLOCK = 2 (F01F)
  D7CD   No. blocks used = 4
  D7CE  ECF = $800
  D7D2  TYPE = subdirectory ($D0)
  D7D7  return to caller
  D7D9  RETURN

          *** SCAN DIRECTORY FOR FILE ***

  D7DA  indicate no free entry found as yet
  D7DF   signal in HDR block
  D7E0  zero count of names examined
  D7E5  find name in block <D8D8>
  D7E8  got it! >>D84F
  D7EA  not yet, how many entries expected? (F058)
  D7ED  less entry no. I just searched (F057)
  D7F2  more file entries left to search? >>D804
  D800  no, directory error
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: D802
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  D802  ---
  D803  RETURN

  D804  yes, update entries left counter (F058)
  D80A  back to first buffer page ($49)
  D80C  check next block pointer (F602)
  D814  if zero, directory error >>D800
  D816  BLKNUM = next directory block
  D81D  read next block <DDE1>
  D820  no errors, loop back for more >>D7E0
  D822   exit if error

          *** NO MORE FILE ENTRIES ***

  D823  free entry found in directory? (F05B)
  D826  yes >>D843
  D828  no, check pointers (F602)
  D82B  is there another block after this one? >>D832
  D830  no... >>D843
  D832  yes, free entry will be.. (F01C)
  D83B  first in that block
  D840  indicate free entry available (F05B)
  D843  find next index name <D970>
  D846   exiting with error
  D847  no more indicies in path, file not found >>D84C
  D849  else, path not found
  D84B  RETURN

  D84C  file not found error
  D84E  RETURN

          *** FOUND FILE ENTRY ***

  D84F  advance to next subdir in path <D969>
  D852  end -- save entry no. and exit >>D8C0
  D856  get type of entry
  D85A  subdir?
  D85C  no, bad path then >>D846
  D860  copy key block no...
  D862  to BLKNUM
  D865  and to current DIR block no (F01A)
  D86F  go read key block of subdirectory <DDE1>
  D872  error? >>D898
  D877  new file count (F058)
  D880  check minimum version (F621)
  D883  too new? >>D896
  D88B  count bits in reserved field of DIR hdr
  D88C  --- >>D88F
  D88F  ---
  D892  there must be 5 bits on (normally $75)
  D894  (there are) >>D89A
```

```
ADDR    DESCRIPTION/CONTENTS
--------------------------------------------------------------------------------

D896  ***** COPY DIRECTORY *****

D896  Copy:
D898  CREATION, VERSION, MIN_VERS, ACCESS, (F61C)
D899  ENTRY_LEN, ENTRIES_PER_BLK, FILE_COUNT (F00A)
      Volume directory? (F614)
      If so, exit now >>D89A
D89A  Else, copy PARENT_POINTER, (F627)
D89D  PARENT_ENTRY_NO., and PARENT_ENTRY_LEN (F006)
      RETURN

D8A0 ********** COPY DIR HDR <D8A0> AND NO. & BLOCK **************************

      ***** SAVE DIR ENTRY *****

D8A0  Compute entry number (F012)
D8A2  Save it (F01E)
D8A5  And the block it's in (F01C)
D8AB  exit

D8B6  ***** SEARCH ONE DIR FOR A BLOCK FOR FILE ************************

D8BF  Get entries in this block (F012)
D8C0 ********** $48/$49 --> first entry? (F100)
      ---
D8C0  Skip HDR? >>D91C
D8C9  No, non empty entry?
D8CE  Yes >>D8FC
D8D7  No, do we need one? (F05B)
      No >>D91C
D8D8 ********** Yes, remember it <D8C0>
      Don't need another one now (F05B)
D8D8  Skip to next entry >>D91C
D8DE  Get length of name
D8E5  Count it (F057)
D8E7  Save it for loop (F07A)
D8E9  Same len as we are wanting? (F100)
D8ED  No, skip it >>D91C
D8EF  ---
D8F2  Compare names (F100)
D8F4  We found it! exit
D8F7  RETURN
D8FA
D901
D907
D90A
D90C
D910
D91A
D91B
```



```
ADDR    DESCRIPTION/CONTENTS
--------------------------------------------------------------------------------

D91C  skip to next entry (F05A)
D920  end of block? if so, exit >>D91B
D926  bump $48/$49 by entry len
D92D  and go check next >>D8E5

D92F ********** GET DIRECTORY DATA ************************************

D92F  find base directory <D988>
D932  error? >>D987
D938  zero out my variables (F006)
D93E  set up device number (BF30)
D944  copy DIR HDR to my variables <D8A0>
D94D  copy TOTAL BLOCKS from VCB (F212)
D953  copy BIT MAP Pointer from VCB (F21A)
D959  copy Block No. of this directory (0046)
D95F  make second copy of file count (F013)
D969  advance to next subdir in path <D970>
D96C  and update index (F07A)
D96F  RETURN

D970 ********** ADVANCE TO NEXT DIR NAME ******************************

D970  get this DIR's index (F07A)
D977  add len of name to move index to next name (F07A)
D97B  still in prefix portion? >>D983
D97D  no, now starting caller's path suffix (BF30)
D980  save last DEVNUM accessed (F05F)
D983  return with len of next dir in path (F100)
D987  RETURN

D988 ********** FIND BASE DIRECTORY ***********************************

D988  ---
D98A  get old PFIXPTR (BF9A)
D98D  fully qualified pathname? (F07C)
D990  no >>D993
D992   yes, no old PFIXPTR anymore
D993  save old prefix index (F07B)
D996  DEVNUM=0 (BF30)
D999  ---

        *** SCAN VCB'S FOR A MOUNTED VOLUME ***

D99B  scan (F200)
D99E  got one >>D9AC
D9A5  else, bump to next VCB
D9A9  no mounted vols? remount them >>D9FD
```

```
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------

        *** FIND LAST DIR IN PREFIX OR VO    NEXT OBJECT ADDR: D9A9

 D9AC  store name length (F078)
 D9AF  same name as in pathname? (F100)
 D9B2  no -- skip it >>D9A0
 D9C0  save VCB index (F051)
 D9C3  DEVNUM = VCB's unit no. (F210)
 D9C9  BLOCK = 2 (read VOLDIR if no old PF
 D9D1  get old prefix index (F07B)
 D9D4  ---
 D9D5  accumulate a new index (F07A)
 D9D8  no previous prefix? >>D9EA
 D9DB  find last name in prefix (F100)
 D9E0  read prefix directory instead of vo
 D9EA  read block <DDE1>
 D9ED  error? >>D9F5
 D9EF  is this the right directory? <DA91>
 D9F2  no >>D9F5
 D9F4   yes -- exit!

        *** IF NOT THERE, REMOUNT ALL VOL
        *** AND CHECK THEM

 D9F5  open files? (F051)
 D9FB  yes, give up now >>DA16
 D9FD  else, (F07B)
 DA00  put back old prefix length (F07A)
 DA03  copy DVCLST from global page <DA57>
 DA09  use last device accessed first >>DA
 DA0B  if none, get last in my device tabl
 DA16  volume not found error
 DA19  RETURN

 DA1A  ---
 DA1D  search for device in device table (
 DA25  when found, make it active device (
 DA2A  remove it from table (F08A)
 DA2D  find its VCB <DA69>
 DA30  not found? >>DA56
 DA32  volume mounted there? (F051)
 DA38  no >>DA3F
 DA3A  yes, open files here? (F211)
 DA3D  yes, skip it -- get next unit >>DA0
 DA3F  else,
 DA41  BLKNUM = 2 (vol dir)
 DA47  read volume directory <DDE1>
 DA4A  error?  >>DA0B
 DA4C  mount volume on VCB <DAB7>
 DA4F  error? >>DA0B
 DA51  is this his chosen volume? <DA91>
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: DA54
-----------------------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------

 DA54  no, try again >>DA0B
 DA56   yes, exit

DA57 ********* COPY GLBL DEVLST TO MY TABLE **************************

 DA57  start with last device (BF31)
 DA5A  get a unit number (BF32)
 DA5F  copy it to device table (F08A)
 DA65  return count of devices (BF31)
 DA68  RETURN

DA69 ********* SCAN VCB'S FOR DEVICE NO. *****************************

 DA69  ---
 DA6D   scan VCB's for a given device number
 DA74  not it? >>DA7B
 DA76  is it, save VCB index (F051)
 DA79   and exit normally
 DA7A  RETURN

 DA7B  else, volume mounted here? (F200)
 DA7E  yes >>DA84
 DA81  no, save VCB index to empty unit (F051)
 DA84  ---
 DA86  bump to next VCB
 DA88  and go look at it >>DA6D
 DA8A   not found...
 DA8B  any free entries? if not, error >>DA8E
 DA8D   else, all is well -- return empty VCB
 DA8E  VCB table full error
 DA90  RETURN

DA91 ********* COMPARE DIR NAME WITH PATH LVL ************************

 DA91  ---
 DA96  check DIR type (F604)
 DA99  VOL DIR or SUB DIR?
 DA9B  neither >>DAA4
 DA9D  yes..
 DA9F  store len of its name (F078)
 DAA2  and go on >>DAA9
 DAA4   error exit
 DAA5  RETURN

 DAA6  compare directory names (F604)
 DAAC  no match? >>DAA4
 DAB5   they match! exit
 DAB6  RETURN
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: DAB6
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------


DAB7 ********* MOUNT NEW VOLUME ************************************

  DAB7  volume mounted? (F051)
  DABD  no, continue >>DAC4
  DABF  yes, same one as one wanted? <DB1C>
  DAC2  if so exit, else fall thru >>DB1B

DAC4 ********* SET UP VCB FROM VOLDIR ******************************

  DAC4  zero out VCB
  DACF  is this a ProDOS volume? <D77D>
  DAD2  no -- exit >>DB1B
  DAD4  duplicate vol in VCB's? <DB3D>
  DAD7  yes -- exit with that one instead >>DB1A
  DAD9  get new volume's name length (F604)
  DAE0  add to VCB index (F051)
  DAE4  and copy to VCB name field in empty VCB (F604)
  DAEF  store in VCB name len field (F200)
  DAF2  copy DEVNUM to VCB unit field (BF30)
  DAF8  copy total blocks to VCB (F629)
  DB04  copy block no. of vol dir to VCB
  DB0E  copy bit map block no. to VCB (F627)
  DB1A   exit
  DB1B  RETURN

DB1C ********* COMPARE VOL NAMES TO MAKE ***************************
          ****** SURE THEY MATCH           ******

  DB1C  get length (F604)
  DB21  same in VCB? (F200)
  DB24  no >>DB34
  DB27  yes, add len to VCB index to point at (F050)
  DB2A  last char of name in VCB (F050)
  DB31  compare names (F200)
  DB34   SEC if no match
  DB3B   CLC if match
  DB3C  RETURN

DB3D ********* LOOK FOR DUPLICATE VOL ******************************

  DB3D  start with first VCB
  DB3F  ---
  DB40  this VCB has same name? <DB1C>
  DB43  no >>DB54
  DB45  yes, files open? (F211)
  DB48  yes >>DB5E
  DB4C  no, mark VCB empty (NAME=0) (F200)
  DB4F  (UNIT=0) (F210)
  DB52  and exit with no error >>DB5C
  DB54   else,
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: DB56
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  DB56  bump to next VCB
  DB5A  and loop >>DB3F
  DB5C   exit no errors
  DB5D  RETURN

  DB5E  save flag (F075)
  DB61  and VCB index of duplicate vol (F076)
  DB64   exit with error
  DB65  RETURN

DB66 ********* SEE IF A QUANTITY OF FREE  ***************************
          ****** BLOCKS IS AVAILABLE ON VOL ******

  DB66  any free blocks counted in VCB? (F051)
  DB6F  yes >>DBC3

          *** COMPUTE VCB FREE BLOCK COUNT ***

  DB71  no, how many bit map blocks are there? <DC15>
  DB74  save it (less 1) (F05C)
  DB79  zero scratch (will count free blocks) (F046)
  DB7F  no block found yet
  DB84  checkpoint bit map buffer <DD86>
  DB87  error? >>DBD7
  DB8C  BLKNUM = bit map pointer (F21A)
  DB96  read block to buffer <DDE1>
  DB99  error? >>DBD7
  DB9B  count free blocks marked <DBD8>
  DB9E  drop no. remaining to do (F05C)
  DBA1  none left? >>DBAC
  DBA3  some, BLKNUM = BLKNUM + 1
  DBA9  go process that >>DB96

  DBAC  did we find a free bit? (F051)
  DBB2  no -- volume full >>DBD4
  DBB4  save VCB bitmap block offset (F21C)
  DBB7  save free block count in VCB also (F047)
  DBC3  are there enough to satisfy request? (F214)
  DBD2   yes, exit
  DBD3  RETURN

  DBD4  volume full error
  DBD7  RETURN

DBD8 ********* SCAN AND COUNT BITMAP BLOCKS ************************

  DBD8  scan through both buffer pages
  DBDF  counting one bits <DC05>
  DBEA  ---
  DBED  found free block already? (F05B)
  DBF0  if so -- done >>DC04
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: DBF2
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  DBF2  any blocks found yet? (F046)
  DBF8  no >>DC04
  DBFA  yes, compute total no. of bitmap blocks <DC15>
  DBFE  less number remaining (F05C)
  DC01  gives bitmap block with first free bit (F05B)
  DC04   exit

DC05 ********* COUNT ONE BITS IN A BYTE *****************************

  DC05  shift and...
  DC08  count bits that are on (F046)
  DC10  exit when byte goes to zero
  DC14  RETURN

DC15 ********* COMPUTE NO. BITMAP BLKS -1 ***************************

  DC15  get blocks on vol count (-1) (F051)
  DC21  ---
  DC22  isolate top nibble of block count
  DC23  for bit map block count
  DC26  RETURN

DC27 ********* FREE A BLOCK ON DISK *********************************

  DC27  save MSB (F05C)
  DC2A   and LSB
  DC2E  block number passed too big for (F213)
  DC31  volume size? (F05C)
  DC35  yes, error >>DCA5
  DC38  no, get bit position for block no.
  DC3E  save it (F05B)
  DC42  divide block no. by 8 (F05C)
  DC45  giving byte offset as remainder
  DC4E  save byte offset (F062)
  DC51  make quotient/2 into block index (F05C)
  DC54  remember which page in that block (F064)
  DC57  read bit map block (after checkpoint) <DD57>
  DC5A  error? >>DCA4
  DC5C  are we at proper block of bitmap yet? (F069)
  DC62  yes! >>DC7A
  DC64  no -- checkpoint <DD86>
  DC67  error? >>DCA4
  DC69  indicate block wanted in VCB (F05C)
  DC72  DEVNUM of bitmap (F066)
  DC75  read actual block directly <DD97>
  DC78  error? >>DCA4
  DC7A  get byte offset into page (F062)
  DC7D  which page? (F064)
  DC80  get bit pattern to set (F05B)
  DC83  page 0? >>DC8D
  DC85  no, turn bit on in page 1 (F500)
```

```
CEE  (with that bit turned off) >>DCFD
D00  store LSB of block no. (F046)
D03  store updated byte back in proper page (F064)
D10  indicate bitmap needs checkpoint
D18  one less block available in VCB (F051)
D25  ---
D23  return with new block no. (F046)
D34  RETURN

D35 ********* GET NEXT BITMAP BLOCK *********************************
D35  use blocks of vol to compute (F051)
D38  number of blocks in bitmap (F213)
D3F  just scanned last block? (F21C)
D42  yes, no space >>DD53
D44  no, get next block (F21C)
```



```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: DC8B
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

DC88  and continue >>DC93
DC8D  turn bit on in page 0 (F400)
DC93  mark bitmap needs checkpoint
DC98  count block freed (F082)
DCA3   exit normally
DCA4  RETURN

DCA5  bad bitmap error
DCA8  RETURN

DCA9 ********* FIND A FREE DISK BLOCK AND *****************************
       ****** AND ALLOCATE IT              ******

DCA9  go read bitmap <DD57>
DCAC  error? >>DCD1
DCAE  first page 0
DCB0  scan 1st page of bitmap for free block(s) (F400)
DCB9  bump to page 1 of buffer (F064)
DCBB  bump page offset (F063)
DCC1  scan 2nd page too (F500)
DCC9  bump page (F063)
DCCC  get next block <DD35>
DCCF  continue >>DCAE
DCD1   error exit

DCD2  save byte index (F062)
DCD5  shift combination of page no. and (F063)
DCD8  byte offset left 3 bits to make (F047)
DCD9   room for bit position.
DCDA  depending on buffer page ...  (F064)
DCDE  reload bit pattern from page 0... (F500)
DCF4  or page 1 (F400)
DCF7  shift bit pattern, bumping block no. LSB
DCF8  until a one bit is found >>DCFD
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: DD4D
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  DD4D  checkpoint old one <DD86>
  DD50  go read block >>DD57

  DD53  disk full error
  DD56  RETURN

DD57 ********* READ BITMAP BLOCK ************************************

  DD57  have we read bitmap for this unit yet? (F051)
  DD60  yes >>DD70
  DD62  no, checkpoint bitmap of some other unit  <DD86>
  DD65  error? >>DD85
  DD6A  get new bitmap unit no. (F210)
  DD70  was bitmap modified? (F065)
  DD73  yes >>DD7A
  DD75  no, read it <DD97>
  DD78  error? >>DD85
  DD7A  save bitmap block offset times 2 (F051)
  DD7D  (page number) (F21C)
  DD84   exit
  DD85  RETURN

DD86 ********* CHECKPOINT VOLUME BITMAP ****************************

  DD86  ---
  DD87  needs checkpoint? (F065)
  DD8A  no >>DD85
  DD8C  yes, write it <DDD9>
  DD8F  error? >>DD85
  DD91  doesn't need checkpoint now
  DD96   exit

DD97 ********* READ BITMAP *****************************************

  DD97  save DEVNUM (F066)
  DD9A  copy block offset wanted (F051)
  DDA4  BITMAP BLOCK = BITMAP PTR + BLOCK OFFSET (F21A)
  DDB2  set up read command

          *** READ OR WRITE BITMAP ***

  DDB4  save I/O command
  DDBA  device = bitmap device (F066)
  DDC0  block = bitmap block (F067)
  DDCA  point to bitmap buffer (DC8F)
  DDCD  do the I/O <DDE8>
  DDD2  restore old DEVNUM (BF30)
  DDD5  ok? >>DDD8
  DDD7   no, error exit
  DDD8  RETURN
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 8(                NEXT OBJECT ADDR: DDD8
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

DDD9 ********* WRITE BITMAP ***(
                                ****************************************

  DDD9  set up write command
  DDDB  and go do it >>DDB4

DDDD ********* WRITE BLOCK ****(
                                ****************************************

  DDDD  set up write command
  DDDF  and go do it >>DDE3

DDE1 ********* READ BLOCK *****(
                                ****************************************

  DDE1  set up read command

DDE3 ********* READ OR WRITE BL(
                                OCK *************************************

  DDE3  save I/O command
  DDE5  where is my buffer? (D8(
  DDE8   save flags                2A)
  DDE9   and disable
  DDEC  Set low byte of Buffer (
  DDEE  to zero                  pointer
  DDF0  Initialize Global Page (
  DDF3  set I/O transfer occurs  System error to 0 (BF0F)
  DDF8  set unit to do I/O on (  flag
  DDFD  do block I/O <D0DA>      BF30)
  DE00  error? >>DE05
  DE02   no errors, restore thi(
  DE04  RETURN                   ngs and exit

  DE05   error exit
  DE07  RETURN

DE08 ************************(
         ****** MLI GET_MARK C****************************************
         ********************ALL ******
                               **********
  DE08  copy mark to caller's (
  DE18   exit with no errors,  ist from FCB (F052)
  DE19  RETURN

  DE1A  bad position error
  DE1D  RETURN

DE1E ************************(
         ****** MLI SET_MARK C****************************************
         ********************ALL ******
                               **********
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: DE1E
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

 DE1E  set up to...
 DE26  copy user's mark to temporary
 DE28  new mark variable (F068)
 DE2D  make sure it will not exceed EOF (F315)
 DE32  else, error >>DE1A
 DE35  ---

         *** STILL IN SAME DATA BLOCK? ***

 DE3B  get old mark (F052)
 DE3E  find its block no. (*2) (F313)
 DE46  compute distance in pages from old mark's (F06B)
 DE4A  block to new mark (F046)
 DE50  earlier -- need new data block >>DE61
 DE54  too far forward -- need new block >>DE61
 DE59  MSB's match? (F314)
 DE5E  then mark is still in this block >>DF7C

 DE61  check storage type (F307)
 DE64  zero? >>DE6D
 DE66  seedling, sapling or tree?
 DE6A  no, special handling for DIR files >>DFAE

 DE6D  stomp on FCB2's mark??? (F300+$52)
 DE6F  (this should never happen anyway) (F300)
 DE72  and return with bad REFNUM error
 DE75  RETURN

         *** NEED DIFFERENT DATA BLOCK ***

 DE76  copy storage type (F307)
 DE7C  old data block needs writing? (F308)
 DE81  no >>DE88
 DE83  yes, do so <E087>
 DE86  error? >>DEF1
 DE88  see if new mark is outside the range of  (F052)
 DE8B  the current index block (F314)
 DE9A  yes >>DEBA
 DE9E  yes >>DEBA
 DEA0  no, same index block (F056)
 DEA3   check storage type
 DEA4  sapling or tree are ok >>DF20

         *** SEEDLING ***

 DEA6  seedling, check position (F06B)
 DEA9  if position is outside of block 0..
 DEAD  promote to sapling >>DF0E
 DEAF  else, (F30C)
 DEB7  go get key block (seedling data block) >>DF72
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: DEB7
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

         *** NEED TO CHANGE DATA BLOCKS ***

 DEBA  does old index block need dumping? (F308)
 DEBF  no >>DEC6
 DEC1  yes, do so <E09B>
 DEC4  error? >>DEF1
 DEC6  check storage type (F056)
 DEC9  tree file?
 DECB  yes >>DEF3
 DECD  no, sapling (F06C)
 DED2  is position in first index block?
 DED5  no, need master index, subindex and data >>DF39
 DED7  yes, first index, reset flags <DFA2>
 DEDA   is this a seedling?
 DEDB  if so, see if in first block >>DEA6

         *** SAPLING ***

 DEDD  no, sapling, read its only index block <E02E>
 DEE0  error? >>DEF1
 DEE5  set block no. of index block
 DEEF  and continue below >>DF20
 DEF1   error exit
 DEF2  RETURN

         *** TREE FILE/NEED ANOTHER INDEX BLOCK ***

 DEF3  reset flags  <DFA2>
 DEF6  read master index block <E02E>
 DEF9  error? >>DEF1
 DEFB  make index into block from (F06C)
 DEFE  MSB_of_position/2
 DF04  is there a subindex there?
 DF06  yes! >>DF13
 DF0C  no, fall thru to make one

         *** GET NEW INDEX BLOCK ***

 DF0E  need an index and data block
 DF10  go allocate them >>DF39

 DF13  set up block no. of subindex
 DF1B  read it <E010>
 DF1E  error? >>DEF1

         *** SAPLING/TREE - THIS INDEX BLOCK ***
```

```
 -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: DF20
-------------------------------------------------------------
SCRIPTION/CONTENTS
-------------------------------------------------------------


te block no. out of position (F06C)
 as an index to examine index block
ry
 its zero...
d new data block
 flags for what to allocate (F052)
 index block being created?
o data block in any case <DF5A>
not index block that's it >>DF7C
se,
o out index block I/O buffer
 continue >>DF7C

ProDOS MLI
---------
ADDR    DES
---------
        ***
        o both pages of buffer
        -
  DF20  RETURN
  DF29  ***
  DF2B  **** READ FILE DATA BLOCK ***********************************
  DF31  --
  DF35  block no. LSB
  DF39  py MSB from index entry
  DF42  --
  DF44  d new data block <DFF7>
  DF47  or? >>DFA1
  DF49  set block allocation flags <DFA2>
  DF50  --
  DF57  *** GOT DATA BLOCK WANTED ***

DF5A ****
        ve previous mark in my variables (F312)
  DF5A  t new mark in the FCB (F06A)
  DF5D  4A/$4B --> data block buffer)
  DF64  C/$4D --> start of the page in
  DF6B  e data block buffer which contains (F06B)
        e mark.
DF6C ****xit

  DF6C  **** RESET BLOCK ALLOC FLAGS *****************************
  DF6E  --
  DF72  t flags (F052)
  DF74  rn off low 3 bits (allocate no new
  DF77  ocks to file) (F308)
  DF79  TURN
        -
        -
        -
  DF7C  --
  DF83  --
  DF89  --
  DF94  ($
  DF96  $4
  DF98  --
  DF9B  --
  DFA1  --

DFA2 ****

  DFA2  --
  DFA8  --
  DFAA  --
  DFAD  --
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: DFAD
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

DFAE ********* SET DIR FILE POSITION *********************************

  DFAE  DIR file?
  DFB0  yes! >>DFB7
  DFB2  no, bad storage type error
  DFB4  got to SYSERR <BF09>
  DFB7  else, get page distance (F046)
  DFBA  make it into blocks (divide by 2)
  DFC1  new position beyond old? (F06B)
  DFC4  yes >>DFD4
  DFC6  else, use previous mark
  DFC8  copy to BLKNUM <DFE2>
  DFCB  error? >>DFF1
  DFCD  count it (F05A)
  DFD0  more to skip? >>DFC6
  DFD2  no, got it >>DF7C
  DFD4  use next block pointer in DIR block
  DFD6  copy to BLKNUM <DFE2>
  DFD9  error? >>DFF1
  DFDB  count it (F05A)
  DFDE  more to skip >>DFD4
  DFE0  got it now! >>DF7C

          *** COPY LINK TO BLKNUM ***

  DFE2  copy block number link
  DFE4  to BLKNUM
  DFE7  if non zero,
  DFED  then go read block. >>DFF3
  DFEF  else, EOF error
  DFF1  ---
  DFF2  RETURN

DFF3 ********* READ FILE BLOCK ***************************************

  DFF3  set block number to read
  DFF7  store read I/O command
  DFFB  read to $48/$49 buffer
  DFFD  read the block <E054>
  E000  error? >>E00F
  E005  copy block no. just read to FCB
  E00F   exit

E010 ********* READ SUB-INDEX BLOCK **********************************

  E010  set read I/O command
  E014  read to $48/$49 buffer
  E016  read the block <E054>
  E019  error? >>E029
  E01E  save BLKNUM in FCB as current index
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT AD
-----------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------------------------------

  E020  block. (F30E)
  E029   exit

E02A ********* WRITE KEY INDEX BLOCK *************************

  E02A  set write I/O command
  E02C  and go do the I/O >>E030

E02E ********* READ KEY INDEX BLOCK **************************

  E02E  set read I/O command
  E030   common code, save command
  E033  block no. is key block in FCB (F052)
  E038  use $48/$49 buffer

          *** I/O BLOCK ***

  E03A  set I/O command
  E03C  and block no. (F300)
  E046  must be non-zero block number
  E04A  or horrible death!
  E04F  fall through to read/write block (F301)

          *** SET UP AND DO FILE BLOCK I/O ***

  E054   (xreg = buff ptr in zero page)
  E055   disable
  E056  set up buffer pointer
  E061  get DEVNUM from FCB (F301)
  E067  set I/O transfer has occured flag
  E06C  set unit no. from DEVNUM (BF30)
  E071  no errors have occured yet
  E076  do block I/O <D0DA>
  E079  error? >>E07E
  E07B   no, exit normally
  E07D  RETURN

  E07E   else, exit with error
  E080  RETURN

E081 ********* CHECKPOINT BITMAP & KEY BLOCK *****************

  E081  checkpoint bitmap buffer <DD86>
  E084  go write key block for file >>E02A

E087 ********* CHECKPOINT DATA BLOCK BUFFER ******************
```

```
  E0E2  copy file ID fields to FCB
  E0E5  (DEVNUM, DIR HDR BLK, DIR BLK, (F052)
  E0E8   DIR ENTRY NO.)
  E0F3  isolate storage type (F01F)
  E0FB  and copy to FCB (F307)
  E0FE  get access (F03D)
  E103  DIR file?
  E105  no >>E109
  E107  yes, we are only reading (I hope)
  E109  update access flag in FCB (F309)
  E10E  write protected? >>E115
  E110  no, another FCB open on this file? (F057)
```



```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: E087
-----------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------------------------------

  E087  buffer pointer at $4A/$4B
  E089  point to block no. in FCB
  E091  go write buffer to disk <E03A>
  E094  error? >>E0B8
  E098  go turn off $40 flag in FCB and exit >>E0AF

E09B ********* CHECKPOINT INDEX BLOCK BUFFER *****************

  E09B  checkpoint volume bitmap <DD86>
  E09E  use $48/$49 buffer
  E0A0  block no. is current index block in FCB
  E0A6  set to write
  E0A8  go write it to disk <E03A>
  E0AB  error? >>E0B8
  E0AD  no longer needs checkpoint
  E0AF  set flags accordingly (F052)
  E0B8   and exit

E0B9 *****************************************************************
          ****** MLI OPEN CALL ******
          ***************************

  E0B9  search path for file <D798>
  E0BC  found it? >>E0C2
  E0BE  no, bad path error
  E0C0  exit >>E0C9
  E0C2  else, see if FCB already open on file <E1A9>
  E0C5  for write. if not, continue. >>E0CB
  E0C7  else, file already open error
  E0C9  ---
  E0CA  RETURN

  E0CB  get FCB index (F052)
  E0D1  free FCB found? >>E0D7
  E0D3  no, all FCB's in use error
  E0D6  RETURN

  E0D7  zero out unused FCB
```

```
1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: E1C2
------------------------------------------------------------
TION/CONTENTS
------------------------------------------------------------


dex to free FCB (F052)
at we found one
p this FCB >>E1ED

 file ID's to see if this FCB (F300)
 on the requested file. (F018)
h? >>E1ED
e FCB already open on file (F057)
nabled? (F309)
 allow multiple open access to file >>E1ED
error exit


 index to start of FCB
 next FCB
p >>E1B4
one, exit normally


************************************************************
* MLI READ CALL ******
**********************

o data buffer <E403>
quest length <E3E8>
ccess
marks <E415>
cess permitted?
20A
ess error
 read past EOF? >>E231
052)
= EOF - current_mark (F315)
already at EOF? (F09A)
3C
F error

ero length request? (F09A)
3C
t mark and exit >>E2EF

y check data buffer <EE6C>
? >>E22E
 storage type for file <E40E>
d kind of file?
24B
 file >>E3B1
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: E248
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  E24B  else, set mark (to read proper buffers) <DE3B>
  E24E  error? >>E22E
  E250  set up buffer indexing <E306>
  E253  move all that can be moved out of data buff <E330>
  E256  newline or len=0: exit now!  >>E239
  E258  newline enabled? continue block by block >>E24B
  E25A  at least 1 block's worth left to be read? (F06E)
  E25E  if not, never mind >>E24B
  E260  if so, store block count wanted (F06F)
  E263  get FCB flags <E7FC>
  E266  data block modified?
  E268  yes, continue block by block for now >>E24B

          *** FAST DIRECT READ ROUTINE ***

  E26A  signal no read occured yet (F072)
  E26D  read directly into caller's data buffer
  E275  set mark/read data block to caller's buff <DE3B>
  E278  error? >>E2E3
  E27A  bump buffer pointer to next location
  E27E  drop length remaining by 512 bytes (F06E)
  E284  bump mark (F06B)
  E28C  and mark's MSB as necessary (F06C)
  E28F  check if we are out of index block (F06C)
  E295  drop counter of multi-blocks (F06F)
  E298  and keep on >>E2A7
  E29A  end of multi-block read, put ptrs back <E3A3>
  E29D  more to read? (F06D)
  E2A3  no, exit through finish-up >>E2EF
  E2A5  yes, conventional block by block read then >>E24B

  E2A7  crossed index block? go do set mark >>E275
  E2A9  make index block offset from mark (F06C)
  E2B2  BLKNUM = next block in index block
  E2B8  zero entry?
  E2C0  if so, no direct read can occur until next (F072)
  E2C3  set-mark/read >>E2C8
  E2C5  get MSB of BLKNUM
  E2C8  (put index ptr back)
  E2CC  finish setting BLKNUM MSB
  E2CE  if no read occured within setmark, (F072)
  E2D1  go back to setmark call >>E275
  E2D5   disable
  E2D6  do I/O to caller's buffer directly
  E2DA  do block I/O directly <D0DA>
  E2DD  error? >>E2E2
  E2E0  go back for more >>E27A
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: E2E0
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

          *** ERROR CLEANUP ***

  E2E2  ---
  E2E3  ---
  E2E4  set buffer ptrs/VCB <E3A3>
  E2E8  ---
  E2E9  finish up I/O <E2EF>
  E2ED   exit with error
  E2EE  RETURN

E2EF ********* I/O FINISH UP ***************************************

  E2EF  ---
  E2F2  return actual length read in caller's list (F09A)
  E303  and exit by setting new mark >>DE3B

E306 ********* SET UP BUFFER INDEXING *********************************

  E306  ---
  E30A  back up pointer to data buffer by an
  E30C  amount equal to the LSB of the mark (F06A)
  E30F  (which makes indexing easier)
  E315  newline mode enabled? (F31F)
  E319  no, CLC >>E325
  E31B   yes, SEC
  E31C  copy newline mask (F071)
  E31F  and newline character (F30A)
  E325  first char index is LSB of mark in YREG (F06A)
  E328  $4C/$4D --> page containing mark
  E32C  request count LSB in XREG (F06D)
  E32F   exit

E330 ********* COPY FROM I/O BLOCK BUFF ******************************
          ****** TO DATA BUFFER           ******
          EXITS IF:   LENGTH GOES TO ZERO
                      NEXT BLOCK IS NEEDED
                      NEWLINE IS FOUND
          ON EXIT: OVERFLOW FLAG SET IF DONE
                   OVERFLOW ZERO IF NEXT BLOCK NEEDED

  E330  ---
  E331  partial page to move? >>E33B
  E333  no, any full pages left? (F06E)
  E336  no, read complete >>E38A
  E338  yes, drop MSB of request length (F06E)
  E33B  ---
  E33C  copy one byte $4C --> $4E
  E341  end of requested chunk? >>E35E
  E343  no, newline enabled? >>E373
  E345  ---
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                    NEXT OBJECT ADDR: E347
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  E347  no, loop for more >>E33C
  E349  end of page, bump pointers
  E34D  bump new mark (F06B)
  E355  finished first page of block buffer?
  E359  if so, continue >>E33C
  E35C  no, need another block from disk >>E38
  E35E  another page in request length? (F06E)
  E361  no >>E37D
  E364  more in this block-page? >>E36C
  E366  no, on last page of block?
  E36A  no >>E36F
  E36C  yes, drop request len by one page (F06
  E36F   back up to next byte again
  E370  go copy next page >>E343

  E373  check for newline
  E37B  not it, never mind! >>E345
  E37D   else, were we done with page?
  E37E  no >>E38A
  E380  yes, bump pointer
  E382  and mark (F06B)
  E38A  set overflow flag (read completed) (E3

  E38D  update mark LSB (F06A)
  E392   bump request count if necessary
  E393  update count LSB (F06D)
  E399  point beyond data in caller's buffer
  E3A1  ---
  E3A2   and exit

E3A3 ********* CLEANUP AFTER DIRECT I/O *******

  E3A3  restore caller's data buffer pointer
  E3AE  go set buffers/find VCB and exit >>D3E

E3B1 ********* DIRECTORY FILE READ ************

  E3B1  set mark/read <DE3B>
  E3B4  error? >>E3E5
  E3B6  set up buffer indexing <E306>
  E3B9  move data from I/O buffer <E330>
  E3BC  need next block? >>E3B1
  E3BE  no, finish up I/O <E2EF>
  E3C1  ok? exit >>E3E3
  E3C3  not ok. EOF error?
  E3C6  no, out now >>E3E4
  E3C8  yes, point beyond EOF anyway? <DF7C>
  E3CB  zero out data block I/O buffer <DF5A>
  E3D3  dummy up an empty DIR block with previ
  E3D6  pointer and no forward pointer in I/O
  E3D8  buffer.
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                    NEXT OBJECT ADDR: E3DA
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  E3DA  zero out current block no. (F310)
  E3E3   return to caller
  E3E4  RETURN

  E3E5  finish up and error exit >>E2E8

E3E8 ********* COPY CALLER'S I/O LENGTH ******************************

  E3E8  copy request length to LENGTH and
  E3EA  a temporary variable
  E3FB  pick up ACCESS flags for file (F052)
  E401   exit to caller
  E402  RETURN

E403 ********* POINT $4E/$4F TO CALLER'S ******************************
          ****** DATA BUFFER                ******

  E403  set up pointer
  E40E  YREG --> FCB (F052)
  E411  AREG = storage type (F307)
  E414   exit

E415 ********* COPY FILE MARK AND COMPUTE *****************************
          ****** AND COMPARE END MARK       ******

  E415  ---
  E41B  copy file mark (F312)
  E421  and set previous mark also (F04D)
  E424  add length giving new mark in scratch area (F09A)
  E42B  (3 byte addition)
  E433  will new mark exceed EOF? (F046)
  E441   return with carry set accordingly

E442 ********* SET NEW MARK & EOF *************************************

  E442  set up indexes <E474>
  E445  set new EOF in FCB (F04A)
  E44B  and new mark (F04D)
  E451  save new mark in scratch variable too (F046)
  E458  does mark exceed EOF? <E474>
  E45B  if so, we must extend EOF <E433>
  E461  save old EOF (F315)
  E469  set new EOF to mark if necessary (F046)
  E46F  ---
  E473   exit

  E474  subroutine to set 3 byte indexes
  E47B  RETURN
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: E47B
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

E47C ************************************************************
         ****** MLI WRITE CALL ******
         ****************************

  E47C  copy request length <E3E8>
  E480  copy file mark <E415>
  E483  extend EOF if needed <E45E>
  E487  write access enabled?
  E489  yes >>E48F
  E48B  no, access error
  E48F  check status of this device <E64E>
  E492  error? >>E4CF
  E494  request length = 0? (F09A)
  E49A  no >>E49F
  E49C  yes, exit through finish-up >>E2EF

  E49F  find caller's data buffer <E403>
  E4A2  check storage type
  E4A4  if DIR file, error >>E48B
  E4A6  set mark/read blocks <DE3B>
  E4A9  error? >>E4CF
  E4AB  get FCB flags <E7FC>
  E4AE  any new blocks needed?
  E4B0  no >>E514
  E4B2  yes, allocating them
  E4B4  ---
  E4B5  count number of blocks needed
  E4B8  store number needed (F054)
  E4BE  see if the blocks are available <DB66>
  E4C1  no, disk full >>E4CF
  E4C3  yes, get FCB flags <E7FC>
  E4C6  master index block needed?
  E4C8  no >>E4D7
  E4CA  yes, go add it <E58F>
  E4CD  and go on if no errors >>E4E3

  E4CF   error,
  E4D0  set new mark/EOF <E442>
  E4D4  and finish I/O, exit with error >>E2E8

  E4D7  check FCB flags again <E7FC>
  E4DA  need sub-index block?
  E4DC  no >>E4E3
  E4DE  yes, go do it  <E5DA>
  E4E1  error? >>E4CF
  E4E3  buy a new block for data <E62E>
  E4E6  error? >>E4CF
  E4E8  get FCB flags <E7FC>
  E4EB  indicate index buffer changed
  E4ED  no new blocks needed now
```

```
ProDOS MLI                                      NEXT OBJECT ADDR: E4EF
----------                                      ----------------------
ADDR    DES-- V1.0.1 -- 1 JAN 84                ----------------------
------------------------------------------------
        CRIPTION/CONTENTS
  E4EF  upd                                              7)
  E4F5  mak                                              2)
  E4FD  sto e FCB flags (F308)
  E50A  and  index block offset from mark
  E514  set e new block no. in index block (F04
  E517  sta  store it as current data block (F05
  E51A  go   up buffer indexing <E306>
  E51C  I/O  t writing <E51F>                    **********************
        see if more blocks are needed >>E4A6
E51F ****** finish up when done >>E2EF

  E51F  ---*** COPY WRITE DATA TO I/O BLOCK ***
  E522  low
  E52A  ---
  E52B  cop er request count by 1 (F06E)
  E52D  to
  E532  --- y partial page from caller's data
  E535  nex I/O block buffer
  E539  bum
  E541  sti t page in caller's area                    56F
  E545  yes p mark by $100 (F06B)
  E548  no  i in same I/O block page?                  )
          >>E52A
  E54A  any clear overflow (I/O incomplete) >>E
  E54D  no
  E54F   ye complete pages left to write? (F06E
  E550  yes >>E55F
  E552  no  s, more in this page?                      )
  E556  no  >>E558
  E558  yes first block-page?
  E55B   re >>E55B
  E55C  com , one less complete page to do (F06E
        adjust index
  E55F  --- tinue with full page >>E532
  E560  a
  E562  no
  E564  any ew bytes left to write? >>E56C
  E56C  set bump data buffer by $100
  E56F  sto mark (F06B)
  E572  and overflow (I/O complete) (E3A2)
  E576  inc e LSB of mark (F06A)                     06A)
  E579  and of request count (F06D)                  EC50>
  E57F  add icate data block modifed <E7FC>
  E58A  set DIR entry needs update
  E58E   ev ance pointer into caller's buffer (
         FCB flag to indicate write occured
        it
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: E58F
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

E58F ********* ADD NEW MASTER INDEX BLOCK ****************************
         (MAKE A TREE FILE)

  E58F  add higher level <E5E7>
  E592  error? >>E5E6
  E594  get storage type <E40E>
  E597  tree?
  E599  yes >>E5A0
  E59B  no, add another level <E5E7>
  E59E  error? >>E5E6
  E5A0  buy another block <E62E>
  E5A3  error? >>E5E6
  E5A5  make offset into current index block (F06C)
  E5A8  from current mark
  E5AA  point index to new block (F046)
  E5B9  also save as current data block (F052)
  E5C3  checkpoint bitmap & key block <E081>
  E5C6  error? >>E5E6
  E5CB  zero out new index block
  E5D2  ---
  E5D9   and exit

E5DA ********* ADD NEW INDEX BLOCK *********************************

  E5DA  check storage type <E40E>
  E5DF  seedling? >>E5E7
  E5E1  no, read key index block <E02E>
  E5E4  and go add data block >>E5A0
  E5E6   exit if error occurs

          *** ADD A HIGHER INDEX LEVEL TO FILE ***

  E5E7  buy a block <E62E>
  E5EA  error? >>E62D
  E5EF  save old key block number (F30C)
  E5F7  make new block the key block (F30C)
  E604  and current index block in FCB (F30F)
  E60D  store pointer to old key block
  E610  in first position of new index
  E617  checkpoint bitmap and new key block <E081>
  E61A  error? >>E62D
  E61C  get storage type <E40E>
  E621  upgrade it to next higher type (F307)
  E624  indicate DIR entry needs update (F308)
  E62D   exit
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: E62E
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

E62E ********* BUY A DISK BLOCK ***************************************

  E62E  allocate a disk block <DCA9>
  E631  error? >>E64D
  E633  get FCB flags <E7FC>
  E636  indicate DIR entry needs update
  E63F  add 1 to blocks in use for file
  E64C  ---
  E64D   exit

E64E ********* DO STATUS IF NO I/O YET ********************************

  E64E  get FCB flags <E7FC>
  E651  any buffers in use? (I/O activity)
  E653  if so, assume its ok >>E64C
  E655  no, (F301)
  E658  select new device (BF30)

          *** STATUS CALL ***

  E65B  Save Unit Number
  E65D  Save Block Number on stack
  E663  Indicate Status call
  E667  Indicate Block 0
  E66B  Go do I/O <D0DA>
  E66E   Restore Block Number to original value
  E676   Exit

E677 *************************************************************************
          ****** MLI CLOSE CALL ******
          ****************************

  E677  check REF NUM
  E67B  specific close? >>E6B2

          *** CLOSE ALL OPEN FILES ***

  E67D  no errors yet (F07E)
  E682  store FCB index (F052)
  E686  get its level (F31B)
  E689  if below system LEVEL, skip it (BF94)
  E68C  yes, skip it >>E6A3
  E68E  no, active FCB? (F300)
  E691  no >>E6A3
  E693  yes, flush it and update directory <E714>
  E696  error? >>E6E5
  E698  no, close specific FCB  <E6B7>
  E69D  is this a close-all?
  E69F  yes, ignore errors >>E6A3
  E6A1  no, stop on error >>E6E5
  E6A3  bump FCB index to next one (F052)
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: E6A9
---------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
---------------------------------------------------------------
  E6A9   and continue >>E682
  E6AB   when done, load error number (F07E)
  E6B1    and exit

     *** CLOSE SPECIFIC FILE ***

  E6B2   flush it <E71C>
  E6B5   error? >>E6E5
  E6B7   get buffer number (F052)
  E6BD   free its pages <EE34>
  E6C0   error? >>E6E5
  E6C2   release FCB
  E6CA   set DEVNUM (F301)
  E6D0   find VCB for device <DA69>
  E6D3   decrement count of open files in VCB (F051)
  E6D9   some are open... >>E6E3
  E6DB   if all are closed, turn off (F211)
  E6DE   "files open" flag
  E6E3   ---
  E6E4    exit

  E6E5   jump to handle close error >>E7ED

E6E8 ***************************************************************
        **** MLI FLUSH CALL ******
        **** ********************

  E6E8   flush specific file?
  E6EC   yes >>E71C
  E6EE   no, clear flush-all error code (F07E)
  E6F1   do all FCBs
  E6F3   set FCB index for next FCB (F052)
  E6F7   is this file open? (F300)
  E6FA   no >>E70A
  E6FC   yes, flush it <E714>
  E6FF   error? >>E711
  E701   bump to next FCB (F052)
  E707   and go flush it too >>E6F3
  E709   ---
  E70A   return with error code if any (F07E)
  E710   RETURN

  E711   ---

E714 ********* FLUSH A FILE & UPDATE DIRECTORY **********************

  E714   find buffer/VCB <D3E0>
  E717   no error? >>E726
  E719   error exit >>E7ED
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: E719
---------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
---------------------------------------------------------------
  E71C   zero out close-all error
  E721   validity check REF NUM <D3C5>
  E724   error? >>E711
  E726   is write access allowed? (F309)
  E72B   no, exit >>E709
  E72D   has a write occured since last flush? (F31C)
  E730   yes >>E739
  E732   no, <E7FC>
  E735   does anything need flushing anyway?
  E737   no, then exit now >>E709
  E739   else, get FCB flags <E7FC>
  E73C   has data buffer changed?
  E73E   no >>E745
  E740   yes, checkpoint it <E087>
  E743   error? >>E711
  E745   get flags again <E7FC>
  E748   has index buffer changed?
  E74A   no >>E751
  E74C   yes, checkpoint it <E09B>
  E74F   error? >>E711
  E751   ---
  E758   copy file identifier data to my variables (F300)
  E762   set DEVNUM (BF30)
  E765   BLKNUM current DIR block (F01A)
  E76F   read DIR block <DDE1>
  E772   error? >>E711
  E774   copy directory header <D8A0>
  E777   are we in block with this file's entry? (F01C)
  E780   no >>E787
  E785   yes >>E78E
  E787   no, set new block number
  E78B   read it <DDE1>
  E78E   point at directory entry in block  <D692>
  E791   copy file entry from directory <D79D>
  E797   copy blocks_used count to entry (F318)
  E7A5   copy new EOF (F315)
  E7B0   and new key block no. (F30C)
  E7B9   isolate new storage type (F305)
  E7C3   combine it with name length (F01F)
  E7CB   and update type/len field in entry (F01F)
  E7CE   write entry back to directory <D6AB>
  E7D1   error? >>E7ED
  E7D6   turn off "write occured" flag (F31C)
  E7DE   same bitmap in memory (F019)
  E7E4   no, exit now >>E7EB
  E7E6   yes, checkpoint it also <DD86>
  E7EB    no errors, exit
  E7EC   RETURN
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: E7EC
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------


E7ED ********** CLOSE ERROR ***************************************

  E7ED  is this a close or flush all?
  E7F2  no >>E7FA
  E7F6  yes, save error code (F07E)
  E7F9  RETURN

  E7FA   else, real error right now
  E7FB  RETURN

E7FC ********** GET FCB FLAGS ************************************

  E7FC  load FCB flags (F052)
  E7FF  from FCB (F308)
  E802   and exit

E803 ********** FILE ACCESS ERROR ********************************

  E803  exit with file access error code
  E806  RETURN

E807 ************************************************************
          ****** MLI SET_EOF CALL ******
          ******************************

  E807  get storage type <E40E>
  E80A  if DIR file...
  E80C  its an access error >>E803
  E80E  else, save type for truncate to
  E80F  mess with.
  E815  write access permitted? (F309)
  E81A  no, error >>E803
  E81C  check device status <E64E>
  E81F  error? >>E803
  E828  copy EOF from FCB (F315)
  E836  copy caller's new EOF
  E841  compare old EOF to new (F04A)
  E847  if less than or equal to... >>E84E
  E849  if greater... >>E863

          *** OLD EOF <= NEW EOF ***
          *** NO TRUNCATE NEEDED ***

  E84E  new eof beyond old
  E855  copy caller's EOF to FCB
  E860  exit by indicating flush needed >>EC50
```

```
)OS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: E860
-------------------------------------------------------------------------
:    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

          *** OLD EOF > NEW EOF ***
          *** TRUNCATE FILE     ***

  E863  flush first <E71C>
  E866  error? >>E806
  E868  $43/$49 --> end of data block I/O buffer
  E872  compare current mark to new EOF (F052)
  E87F  it is prior to EOF >>E898
  E887  if past EOF, force mark back to EOF (F052)
  E898  construct EOF block number and (F06A)
  E89B  byte offset into block from new (F086)
  E89E  EOF mark. (F06B)
  E8B6  on a block boundary? (F087)
  E8B9  yes >>E8D8
  E8BB  no, (F085)
  E8BF  decrement block by 1
  E8CD  but don't let it fall below 0
  E8D8  copy key block number (F052)
  E8E7  set blocks freed to zero
  E8EF  truncate file at new EOF <EC62>
  E8F2   save status
  E8FA  set new key block in FCB (F07F)
  E900  drop FCB block count by number (F318)
  E903  of blocks freed in truncate routine. (F082)
  E910  copy new storage type (F081)
  E91D  turn off all block allocation flags <DFA2>
  E920  update VCB free block count <EBDD>
  E92A  copy mark (F312)
  E932  force current mark to infinity (F312)
  E939  go set mark <DE3B>
  E93C  no errors? >>E945
  E93E   if error, indicate in saved status
  E944   but continue
  E945  copy caller's EOF to FCB <E84E>
  E94A   exit

 ************************************************************
          ****** MLI GET_EOF CALL ******
          ******************************

  E94B  ---
  E950  copy EOF to caller's list (F315)
  E95C   exit -- no errors

 ************************************************************
          ****** MLI NEW_LINE CALL ******
          ******************************


E95D
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                    NEXT OBJECT ADDR: E95D
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  E95D  ---
  E95F  copy newline mask
  E968  and newline character
  E96E   return, no errors

E96F ********************************************************************
       ****** MLI GET FILE INFO CALL ******
       ************************************

  E96F  get the file entry <D798>
  E972  ok? >>E9B6
  E974  no, bad path?
  E977  no, real error >>E9D3
  E979  else, make it VOL DIR type
  E97B  with name length = 0 (F01F)
  E980  no free blocks needed (F054)
  E986  go through the motions to u
  E989  VCB block count. <DB71>
  E98F  copy blocks free from VCB (
  E99B  copy total blocks on volume
  E9A9  total - free = blocks_used
  E9B6  shift type down from high n
  E9C2  copy the data to caller's p
  E9D3   and exit

E9D4 ********************************************************************
       ****** MLI SET FILE INFO CALL ******
       ************************************

  E9D4  get the file entry <D798>
  E9D7  error? >>E9FE
  E9D9  indicate backup needed now
  E9E8  copy 13 parms from caller's
  E9EB  file entry staging area >>E
  E9F2  ---
  E9F7  if any spurious access bits
  E9FB  access error!
  E9FE  RETURN

  E9FF  else, anything in his modi
  EA03  no >>EA08
  EA05  yes, go update directory >>

  EA08  no, use system date then up
```

```
pdate the (F051)
F215)
 to AUX_ID (F213)
(F054)
ibble (F01F)
armlist (EFCC)

(BF95)
 list to (EFCC)
9F2

 are on...

fication date?
>D6BB

date directory >>D6AB
```

```
ProDOS MLI -- V1.0.1 -- 1
-------------------------
ADDR    DESCRIPTION/CONTE
-------------------------

EA0B ********************
       ****** MLI REN
       **************

  EA0B  follow path to f
  EA0E  ok? >>EA4D
  EA10  no, bad name?
  EA12  no, real error >

       *** RENAME VOL

  EA14  yes, copy new na
  EA17  error? >>EA2C
  EA19  get first length
  EA1D  get next (F100)
  EA20  bad path if more
  EA25  files open on vo
  EA28  no, continue >>E
  EA2A  yes, file open e
  EA2C  ---
  EA2D  RETURN

  EA2E  make type/len fo
  EA35  write new name t
  EA38  error? >>EAA3
  EA3F  copy new name to
  EA4B   exit, no errors
  EA4C  RETURN

       *** RENAME FIL

  EA4D  get path index <
  EA50  copy old name wi
  EA5C  copy new name to
  EA5F  error? >>EAA3
  EA61  get path index <
  EA67  compare all leve
  EA6A   including the l
  EA6B  differ.
  EA6F  save indicies in
  EA72  final name. (F07
  EA75  ---
  EA7F   exit if they ma
  EA80  RETURN

  EA81  index to differi
  EA84  point past it (F
  EA8C  must be the last
  EA8F  it isn't >>EAA1
  EA91  it is, (F07A)
  EA94  do the same with
```

```
A)

ch completely


y new name (F079)
00):
 (F100)


he old name (F600)
```



```
JAN 84                    NEXT OBJECT ADDR: EA0B
-------------------------------------------------
NTS
-------------------------------------------------
*************************************************
ME CALL ******
**************

ie <D7AB>
EA2C
E ***

e  <EB35>

(F100)
nan one name for vol >>EAA1
me? (F211)
A2E
ror

 a VOL DIR HDR
 VOL HDR <EB26>
device's VCB (F100)

 ***
B43>
th prefix to my buffer (F100)
buffer <EB35>

B43>
s of names up to and (F600)
ast. Find first which

e names which point to (F079)
```

```
.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: EA9F
-------------------------------------------------------
ION/CONTENTS
-------------------------------------------------------

ce is only in last index? >>EAA5
path error



od, follow path to new file <D7AB>
et an error >>EAAE
, duplicate name in directory


, better be file not found
its really an error... >>EAA3
 pathname again <D27F>
file entry <D798>
>EAA3
CB's <E1A9>
the file is open for write >>EAA3
ESS permit rename?
CC
ss error



/len from entry (F01F)
?
>>EADD
, sapling or tree?
>>EADD
mpatibility error
 path again <EB35>
>EAA3
th of last name (F079)
and name to file entry buffer (F100)
new len with type (F100)
?
pdate entry and exit >>EB23
30)
 block of this subdirectory <DDE1>
>EAA3
 name to DIR HDR (F100)
te directory's key block <EB26>
>EAA3
e directory entry and exit >>D6BB

OPY PATH TO BUFF & WRITE ****************************

e/len and path to my buffer
 the block >>DDDD
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: EB32
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------


EB35 ********* POINT TO NEW NAME ************************************
          COPY TO BUFFER

  EB35  $48/$49 --> second pathname
  EB40  go copy it >>D28A

EB43 ********* LOAD PATH INDEX **************************************

  EB43  load pathname index
  EB4A  (including prefix if any) (BF9A)
  EB4D  ---
  EB4F  RETURN

EB50 ************************************************************************
          ****** MLI DESTROY CALL ******
          ******************************

  EB50  get file entry <D798>
  EB53  error? >>EB9F
  EB55  find FCB if any <E1A9>
  EB58  FCB open? (F057)
  EB5B  no >>EB61
  EB5D  yes, file open error
  EB60  RETURN

  EB61  no free blocks needed
  EB69  go compute VCB free block count <DB66>
  EB6C  ok? >>EB73
  EB6E  error, disk full?
  EB71  no, real error >>EB9F
  EB73  DESTROY enabled in ACCESS? (F03D)
  EB78  yes >>EB7F
  EB7A  no, access error
  EB7F  check status of device (BF30)
  EB85  error? >>EB9F
  EB87  point to key block (F030)
  EB96  DIR file?
  EB9A  no >>EBA0
  EB9C  yes, handle differently >>EBF8

  EB9F  RETURN

          *** DESTROY NON-DIRECTORY FILE ***

  EBA0  set new storage type (F081)
  EBA7  zero EOF mark (F081)
  EBAD  byte offset = $200
  EBB2  free all blocks in file <EC62>
  EBB5  error? >>EB9F
  EBB7  free key block of seedling (F080)
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: EBC0
-----------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

 EBC0   error? >>EB9F
 EBC2   mark DIR entry free
 EBC7   decrement DIR file count (F013)
 EBD2   checkpoint volume bit map <DD86>
 EBD5   error? >>EB9F
 EBD7   update free block count in VCB <EBDD>
 EBDA   and go update the directory >>D6AB

     *** SUBROUTINE TO UPDATE FREE BLOCK ***
     *** COUNT IN VCB                    ***

 EBDD   add blocks freed to total free blocks (F051)
 EBE0   in VCB. (F082)
 EBF2   start next search for free blocks at
 EBF4   start of bitmap. (F21C)
 EBF7    exit

     *** DESTROY DIRECTORY FILE ***

 EBF8   DIR file? >>EC4B
 EBFA   no, error >>EC4B
 EBFC   read volume bitmap block <DD57>
 EBFF   error? >>EC4A
 EC01   BLKNUM = key block pointer (F030)
 EC0B   read it <DDE1>
 EC0E   errors? >>EC4A
 EC10   if DIR has any files... (F625)
 EC1A   access block marking entry free (F604)
 EC1F   write b >>EC4A
 EC25   error? >>EC4A
 EC27   if "next_pointer" is zero.... (F602)
 EC31   go back and pretend it's a seedling >>EBB7
 EC33   else, (F603)
 EC36   free next block <DC27>
 EC39   error? >>EC4A
 EC3B   BLKNUM = next block (F602)
 EC45   read it <DDE1>
 EC48   if ok, continue in loop >>EC27
 EC4A    else, error exit

 EC4B   incompatible file format error

EC50 *********SET WRITE OCCURED FLAG **********************************

 EC50    save some registers
 EC53   indicate write occured (F052)
 EC5E    restore regs and exit
 EC61   RETURN
```

```
BLKNUM (F0..) zero index block
 when a ...(F0..)
 the sub-... (F08A)
 ...? >>ECD...
 all its ... 8 left to do, zero (F08A)
 ...? >>ECDF ... table (F092)
 loop to do ...
 go back ... index counter (F088)
 ... exit ... es: (F089)
RTN        ... (F08A)

ProDOS MLI -- ...
ADDR     DESC...

EC62 *******...

 EC62   chec...   entry is found) >>EC7F
 EC65   seed...   index block <DDE1>
 EC67   yes
 EC69   no,       blocks <EDA0>
 EC6B   yes
 EC6D   no,       all 8 >>ECBA
 EC6F   yes       reread master index >>EC7F
 EC71   no,
 EC74   go t...

 EC77   go t...

 EC7A   trun...
 EC7C   at m...
 EC7F   read...
 EC82   erro...
 EC84   at ...
 EC8A   yes
```



```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: EC62
-----------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

       *** TRUNCA... THE HORRIBLE FILE AT EOF *************************
       (f...
       ma...
       sh...

 EC8C   copy storage
 EC8E   numb... ing?
 EC91   a ha... >>EC74
 ECA2   --- sapling?
 ECAB   if t... >>EC77
 ECAE   rema... tree?
 ECB4   --- >>EC7A
 ECB5   upda... die horrible FILE AT EOF **********************************
 ECBA   for seedling
 ECBD   set ... type*16 (F081)
 ECC5   (ex... sapling
 ECCC   read ... date tree,
 ECCF   erro... just 128 bl...
 ECD1   free the maste...
 ECD4   erro...? >>ECDF
 ECDA   and ... yet? (F... <BF0C>
 ECDC   then >>ECE0     truncate >>ED46
 ECDE    no...
 ECDF   RETU...
        FREE WHO... truncate >>ED0D
        ...ee 8 sub...
        master index
        ...are its blocks in master index (F088)
        ...    index <ED71>
        up to 8 ...
        ...s to (F088)
        ...y table

       *** ...here were... INDEX BLOCKS AFTER EOF ***
       ...inder of the index blocks each time the
       ...      block is read since we must
       ...e master ...
       ...all 8 entr...
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                 NEXT OBJECT ADDR: ECDF
-----------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

ECE0    now go free all the sub-index blocks (F084)
ECE4    which follow EOF <EDA2>
ECE7    error? >>ECDF
ECE9    write back master index <DDDD>
ECEC    error? >>ECDF
ECEE    EOF in first subindex? (F084)
ECF1    if so, demote to sapling file >>ED08
ECF3    else, BLKNUM = subindex block which (F600)
ECF6    contains the EOF mark
ECFB    (exit if none there) >>ECDE
ED02    else, read subindex block <DDE1>
ED05    and continue below >>ED12
ED07    unless there is an error

ED08    demote tree to sapling <ED7E>
ED0B    error? >>ECDF
 --
        *** TRUNCATE SAPLING FILE ***

ED0D    read key block <ED71>
ED10    error? >>ECDF
ED12    get LSB of block number (F085)
ED16    if zero, no blocks to free >>ED22
ED18    else, free rest of blocks in index <EDA2>
ED1B    following the EOF. check for error >>ECDF
ED1D    write index block back <DDDD>
ED20    error? >>ECDF
ED22    get LSB of block number (F085)
ED25    might be block 0? >>ED3C
ED27    no, get BLKNUM of data block (F600)
ED2A    from index block
ED2F    (no block allocated?) >>ECDE
ED36    read data block <DDE1>
ED39    and continue below >>ED4B
ED3B    unless error occured
 --
ED3C    back to block 0? (F084)
ED3F    no >>ED27
ED41    yes, demote to seedling <ED7E>
ED44    error? >>ED70
 --
        *** TRUNCATE SEEDLING FILE ***

ED46    read key block <ED71>
ED49    error? >>ED70
ED4B    first page? (F087)
ED4E    yes >>ED56
ED51    no, better be second >>ED6F
ED53    get byte offset (F086)
ED56    ---
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                 NEXT OBJECT ADDR: ED58
-----------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

ED58    zero beyond EOF mark (F700)
ED66    in both pages if necessary (F600)
ED6C    then write block back and exit >>DDDD

ED6F    exit normally
ED70    RETURN

ED71    ****** READ KEY BLOCK ******

ED71    BLKNUM = key block number (F07F)
ED7B    exit by reading the block >>DDE1

ED7E    ****** DEMOTE FILE TO SMALLER FILE TYPE******

ED7E    free block (F080)
ED87    error? >>ED9F
ED89    get block from old index (F600)
ED96    reduce storage type by one (F081)
ED9E    and exit
ED9F    RETURN

EDA0    ****** FREE ALL BLOCKS IN AN INDEX BLK ******

EDA0    ---
EDA2    save BLKNUM
EDA8    for each index entry after mark, (F05D)
EDB3    if it is non-zero....
EDBA    free the block <DC27>
EDBD    error? >>EDCE
EDBF    zero the index entry now (F05D)
EDCA    ---
EDCB    loop through all entries >>EDA8
EDCE    ---
EDD0    restore old BLKNUM
EDD6    and exit

EDD7    ****** ALLOCATE I/O BUFFER ******

EDD7    ---
EDD9    get I/O buffer page number
EDDC    can't be below $800
EDDE    else, error >>EE22
EDE0    can't be above $BC00
EDE2    else, error >>EE22
EDE7    $4A/$4B --> I/O buffer
EDEB    must be page aligned! >>EE22
EDF1    ---
EDF2    check each page of I/O buffer for <EE5D>
EDF5    proper allocation in system bit map (BF58)
EE02    ---
EE03    if ok, mark each page as allocated <EE5D>
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: EE06
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  EE06  in system memory bit map (BF58)
  EE13  assign buffer number (REFNUM*2) in FCB (F300)
  EE1B  and save buffer location in buffer list
  EE20   exit
  EE21  RETURN

  EE22  bad I/O buffer error
  EE25  RETURN

EE26 ********** LOCATE I/O BUFFER ***********************************

  EE26  ---
  EE27  AREG contains buffer number *2 (BF6E)
  EE2A  move buffer pointer to NXTBUF variable (F09D)
  EE33   exit

EE34 ********** FREE I/O BUFFER *************************************

  EE34  is buffer already free? <EE26>
  EE39  yes, exit >>EE5B
  EE3D  zero its address in system global page (BF6F)
  EE4A  ---
  EE4B  free each page in buffer <EE5D>
  EE4E  by marking system bit map
  EE5B   exit
  EE5C  RETURN

EE5D ********** LOCATE BIT MAP POSITION ******************************
          (GIVEN PAGE NUMBER)

  EE5D   XREG contains page number
  EE5E  compute page number times 8
  EE61  use as offset for bitmask (EFC0)
  EE68  page number / 8 = byte offset
  EE69   into bitmap
  EE6B   exit

EE6C ********** CHECK BUFFER VALIDITY ********************************
                  START > $200    END < $BF00

  EE6C  get buffer address (MSB)
  EE70  must be >$200 else error  >>EE22
  EE72  get length (F09B)
  EE78  compute last page no. of buffer
  EE7D  ---
  EE84  may not extend into $BF00
  EE86  else, error >>EE22
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: EE88
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

          *** CHECK IF BLOCK OF MEMORY IS FREE ***

  EE89  ---
  EE8A  see if this page is allocated <EE5D>
  EE90  if so, error >>EE22
  EE92  else, check other page also
  EE96   then exit if both have been checked
  EE97  RETURN

EE98 ************************************************************
          ****** MLI GET_BUFF CALL ******
          ******************************

  EE98  get next available buffer
  EE9D  put its address in caller's parmlist
  EEA5   and exit
  EEA6  RETURN

EEA7 ************************************************************
          ****** MLI SET_BUFF CALL ******
          ******************************

  EEA7  mark his buffer allocated
  EEAC  error? >>EECE
  EEAE  get old buffer address (F09E)
  EEB8  free old buffer's pages in map <EE43>
  EEBF  copy old buffer contents
  EEC1  to new buffer
  EECD   then exit
  EECE  RETURN

EECF ********* GO TO QUIT CODE HANDLER *******************************

  EECF  enable 2nd 4K bank of language card (C083)
  EED2  (it lives at $D100-$D3FF) (C083)
  EED5  Save zeropage $00 through $03 on stack
  EEE1  Set ($00) -> $D100
  EEE3  Set ($02) -> $1000
  EEEF   Set Y = 0
  EEF0  3 pages of code to copy
  EEF2  ---
  EEF3  copy quit code handler to $1000
  EF01   Restore zero page to original state
  EF0D  enable 1st 4K bank of language card (C08B)
  EF10  (MLI) (C08B)
  EF15  point RESET vector at $1000 (03F2)
  EF1D  set power-up byte properly
  EF22  go to quit code handler at $1000 >>1000
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: EF22
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

EF25 ************************************************************
       *       DATA AREA                  *
       ************************************

EF25 ********** MLI COMMAND TABLE ***********************************
         IN HASH CODE ORDER: IF COMMAND IS...
         ABCD EFGH (IN BINARY BITS)
         INDEX IS COMPUTED AS:
            000D EFGH
           +0000 ABCD

  EF25  GET BUF
  EF26  UNUSED
  EF27  UNUSED
  EF28  UNUSED
  EF29  ALLOC INTERRUPT
  EF2A  DEALLOC INTERRUPT
  EF2B  UNUSED
  EF2C  UNUSED
  EF2D  READ BLOCK
  EF2E  WRITE BLOCK
  EF2F  GET TIME
  EF30  EXIT
  EF31  CREATE
  EF32  DESTROY
  EF33  RENAME
  EF34  SET FILE INFO
  EF35  GET FILE INFO
  EF36  ON LINE
  EF37  SET PREFIX
  EF38  GET PREFIX
  EF39  OPEN
  EF3A  NEWLINE
  EF3B  READ
  EF3C  WRITE
  EF3D  CLOSE
  EF3E  FLUSH
  EF3F  SET MARK
  EF40  GET MARK
  EF41  UNUSED
  EF42  SET EOF
  EF43  GET EOF
  EF44  SET BUF

EF45 ********** PARAMETER COUNT TABLE ********************************
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: EF45
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  EF45  GET BUF
  EF46  UNUSED
  EF47  UNUSED
  EF48  UNUSED
  EF49  ALLOC INTERRUPT
  EF4A  DEALLOC INTERRUPT
  EF4B  UNUSED
  EF4C  UNUSED
  EF4D  READ BLOCK
  EF4E  WRITE BLOCK
  EF4F  GET TIME
  EF50  EXIT
  EF51  CREATE
  EF52  DESTROY
  EF53  RENAME
  EF54  SET FILE INFO
  EF55  GET FILE INFO
  EF56  ON LINE
  EF57  SET PREFIX
  EF58  GET PREFIX
  EF59  OPEN
  EF5A  NEWLINE
  EF5B  READ
  EF5C  WRITE
  EF5D  CLOSE
  EF5E  FLUSH
  EF5F  SET MARK
  EF60  GET MARK
  EF61  UNUSED
  EF62  SET EOF
  EF63  GET EOF
  EF64  SET BUF

EF65 ********** MLI COMMAND ADDRESS TABLE ****************************

  EF65  CREATE
  EF67  DESTROY
  EF69  RENAME
  EF6B  SET FILE INFO
  EF6D  GET FILE INFO
  EF6F  ON LINE
  EF71  SET PREFIX
  EF73  GET PREFIX
  EF75  OPEN
  EF77  NEWLINE
  EF79  READ
  EF7B  WRITE
  EF7D  CLOSE
  EF7F  FLUSH
  EF81  SET MARK
```

```
ProDOS MLI -- V1.0.1 -- 1 JA
-----------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------

  EF83  GET MARK
  EF85  SET EOF
  EF87  GET EOF
  EF89  SET BUF
  EF8B  GET BUF

EF8D ********** MLI COMMAND

      PATHNAME FLAG
        | REFERENCE NUMBER
        | | DATETIME STAMP
        | | |     COMMAND N
        | | |     |
  EF8D  1 0 1 - 00
  EF8E  1 0 1 - 01
  EF8F  1 0 1 - 02
  EF90  1 0 1 - 03
  EF91  1 0 0 - 04
  EF92  0 0 0 - 05
  EF93  0 0 0 - 06
  EF94  0 0 0 - 07
  EF95  1 0 0 - 08
  EF96  0 1 0 - 09
  EF97  0 1 0 - 0A
  EF98  0 1 0 - 0B
  EF99  0 0 1 - 0C
  EF9A  0 0 1 - 0D
  EF9B  0 1 0 - 0E
  EF9C  0 1 0 - 0F
  EF9D  0 1 0 - 10
  EF9E  0 1 0 - 11
  EF9F  0 1 0 - 12
  EFA0  0 1 0 - 13

EFA1 ********** CONSTANTS -

  EFA1  Blocks Used
  EFA3  End of File
  EFA6  Special ID (Must be
  EFA7  'HUSTON!'
  EFAE  Previous Block of Vo
          ---
        THE FOLLOWING IS C
  EFB0  Version of ProDOS
  EFB1  Minimum Version
  EFB2  Access Byte  (D|Rn|B
  EFB3  Entry Length
  EFB4  Entries per Block
  EFB5  File Count
  EFB7  Parent LSB (copied t
          ---
```

```
DATA AREA *********************************

5 bits on)
Author's name
 Dir Key Block

OPIED TO SUBDIR HDR+$20

000|W|R)

o SUBDIR HDR +$20)
```

```
  EFCF  Access
  EFD0  File Type
  EFD1  Aux Type
  EFD3  Storage Type
  EFD4  Blocks Used (MSB on means GET only no SET)

  EFD6  Datetime (Last Mod)

  EFDA  Datetime (Creation)

EFDE ********** FATAL ERROR MESSAGE **********************************

  EFDE  '              INSERT SYSTEM DISK AND RESTART

  F006  ---

F006 ********** VARIABLES - DATA AREA ********************************

  F006  Parent Pointer Block
  F008  Parent Entry Number
  F009  Parent Entry Length
  F00A  Datetime (Creation)
  F00E  Version
  F00F  Min Version
  F010  Access Byte
```



```
N 84                    NEXT OBJECT ADDR: EF83
-----------------------------------------
=========================================
-----------------------------------------

INFO BYTE *********************************

FLAG
FLAG
UMBER
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: EFB8
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  EFB8  File Type  (Directory)
  EFB9  Block Number
  EFBB  Number of Blocks
  EFBD  End of File

EFC0 ********** BITMASK TABLE ****************************************

  EFC0  10000000
  EFC1  01000000
  EFC2  00100000
  EFC3  00010000
  EFC4  00001000
  EFC5  00000100
  EFC6  00000010
  EFC7  00000001

EFC8 ********** OFFSETS TO DATA AT $F300 *****************************

  EFC8  Key Block

  EFCA  # Blocks Used

  EFCC  End of File

EFCE ********** SET/GET FILE INFO OFFSETS ****************************
```

ADDR	DESCRIPTION/CONTENTS
F011	Entry Length
F012	Entries per Block
F013	File Count
F015	Bit Map Pointer
F017	Total Blocks
	THE FOLLOWING 6 BYTES UNIQUELY IDENTIFY A FILE:
F019	Device Number
F01A	Current Directory Block Number (HDR)
F01C	Block Number of File Entry in Directory
F01E	File Entry Number in Directory
F01F	********** FILE ENTRY BUFFER **********
F01F	Type/Length (TTTTLLLL)
F020	File Name (Max 15) >>000F
F02F	File Type
F030	Key Pointer
F032	Blocks Used
F034	End of File
F037	Datetime (Creation)
F03B	Version
F03C	Min Version
F03D	Access Attribute
F03E	Aux Type (Load Address/Record Length)
F040	Datetime (Last Mod)
F044	Header Pointer
F046	********** Variable Work Area **********
F046	3 Byte Scratch
F049	---
F04A	End of File
F04D	Previous Mark
F050	Compare Vol Name Scratch
F051	Offset into VCB Table ($F200)
F052	Offset into FCB Table ($F300)
F053	Free FCB found Flag
F054	Number of Free Blocks needed
F056	Storage Type
	Number of Entries Examined or..
F057	FCB already open flag
F058	File Count

ADDR	DESCRIPTION/CONTENTS
F05A	Entries/Block Loop Count/Fre
	Free Entry Found Flag (if
	# of 1st bitmap block with
F05B	bit for free
F05C	# Blocks in Bitmap left to s
F05D	Y Register temp
F05E	Pathname Length
F05F	Devnum for Prefix Directory
F060	Block of Prefix Directory Re
F062	Bitmap Byte Offset in Page
F063	Bitmap Page Offset
F064	Bitmap Buffer Page (0 or 1)
F065	Bitmap Flag (if $80, needs
F066	Bitmap DEVNUM
F067	Bitmap Block Number
F069	Bitmap Block offset for Mul
	New Mark to be Positioned
	or New Moving Mark (for RE
F06A	or New EOF for SET_EOF
F06D	Request Count (Read/Write et
F06F	Multi-Block I/O count
F070	Newline character
F071	Newline mask
F072	I/O Transfer occurred flag
F073	MLI Command * 2
F074	ORed into Access Flags ($20
F075	Duplicate Volume Flag (if $8
F076	Duplicate Volume's VCB inde
F077	MLI function code (low 5 bi
	Characters in current Path
F078	ONLINE: volname len - loop f
F079	new pathname: index to last
	old pathname: index to las
F07A	ONLINE: index to data buffe
F07B	Old PFIXPTR value
F07C	Pathname fully qualified fla
	Pathname: temp save area f
F07D	ONLINE: DEVCNT
F07E	close-all error code
F07F	Set EOF: new Key Block poin
F081	New storage type (SET_EOF)
F082	Freed Blocks count
F084	EOF Block number (MSB then
F086	EOF byte offset into Block
F088	EOF - Master index counter
F089	Save area for index into ta

e FCB's refnum
= 0) or..
free bit on or..
earch
Header
ader
riting)
iblock Bitmaps
to for Set Mark
AD)
c.)
- Backup)
F)
s)
name indx lvl or
ndex
name
t name or..
g (if $FF)
or index or..
er
SB)
ole below

```
ProDOS MLI -- V1.0
------------------
ADDR    DESCRIPTIO
------------------

F08A ********** DE
         (also us
         8 blocks

  F08A  device tab
  F092  device tab

  F09A  length of
  F09D  next buffe
  F09F  6 byte zer
  F0A5  not used >
  F0AF  16 byte in
  F0B5  Jump Vecto

  F0B7   not used

F100 ********** PA
           ------
           | L1 |
           ------
         Prefix i
         negative
         wrapping

  F100  pathname b

F200 ********** VO

         VCB0 sta
  F200  Length  (0
  F201  File Name
  F210  Unit Numbe
  F211  Files Open
  F212  Total Bloc
  F214  Blocks Fre
  F216  Block Numb
  F218  not used
  F219  not used
  F21A  Bit Map Po
          Block of
  F21C  next free
  F21E  Count of c

  F220  VCB1 throu
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: F089
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

F08A ********** DEVICE TABLE BUILT BY ONLINE **************************
         (also used by SET_EOF to keep track of
         8 blocks to be freed at a time)

F100 ********** PATHNAME BUFFER ***************************************

F200 ********** VOLUME CONTROL BLOCKS *********************************

  F200  Length  (0 thru 15)
  F201  File Name
  F210  Unit Number
  F211  Files Open
  F212  Total Blocks
  F214  Blocks Free
  F216  Block Number
  F218  not used
  F219  not used
  F21A  Bit Map Pointer
          Block of
  F21C  next free
  F21E  Count of

  F220  VCB1 through VCB7 >>00E0
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: F300
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

F300 ********* FILE CONTROL BLOCKS ************************************

          FCB0 starts here..
  F300  Reference Number

          THE FOLLOWING 6 BYTES ARE THE FILE ID
  F301  Device Number
  F302  Dir Block HDR for Dir describing this File
  F304  Dir Block containing entry itself
  F306  File entry # in this Directory

  F307  Storage Type
          Flags
          1XXX XXXX   Index Block Buffer Changed
          X1XX XXXX   Data Block Buffer Changed
          XX1X XXXX   Unused
          XXX1 XXXX   Directory entry needs update
          XXXX 1XXX   Storage Type Changed
          XXXX X1XX   Allocate new Master Index Block
          XXXX XX1X   Allocate new Sub Index Block
  F308  XXXX XXX1   Allocate new Data Block
  F309  Access Byte
  F30A  Newline Character
  F30B  Buffer Number  (REF_NUM * 2)
  F30C  Master Index/Key Block Number
  F30E  Current Index Block
  F310  Current Data Block
  F312  Mark
  F315  End of File
  F318  Blocks Used
  F31A  not used
  F31B  Level
  F31C  Flag - Write occured if MSB on
  F31D  not used
  F31F  Newline Enable Mask

  F320  FCB1 through FCB7 >>00E0

F400 ********** BITMAP BUFFER ******************************************

  F400  Buffer 1st half >>0100

  F500  Buffer 2nd half >>0100

F600 ********** PRIMARY BUFFER *****************************************
          (used for several things, VOL DIR HDR is
          mapped into it below)
```

```
ProDOS MLI -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: F600
-------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-------------------------------------------------------------------------


  F600  Pointer Fields
        *** VOLUME DIRECTORY HEADER ***
  F604  Type/Length  (TTTTLLLL)
  F605  File Name  (Max 15) >>000F
  F614  Reserved >>0008
  F61C  Creation Datetime
  F620  Version
  F621  Min Version
  F622  Access Byte
  F623  Entry Length
  F624  Entries per Block
  F625  File Count
  F627  Bitmap Pointer
  F629  Total Blocks
  F62B  (remainder of first page of block) >>00D5
  F700  (second page of block) >>0100
```

ProDOS SYSTEM GLOBAL PAGE--MLI Global Page

Portions of this page of memory are rigidly defined by the MLI and are unlikely to move in later versions of ProDOS. However, some portions are less stable and could change in future releases.

ProDOS System Global Page NEXT OBJECT ADDRESS: BF00

ADDR	LABEL	CONTENTS
		Jump Vectors
BF00-BF02	ENTRY	JMP to MLI.
BF03-BF05	JSPARE	JMP to system death code (via $BFF6).
BF06-BF08	DATETIME	JMP to Date/Time routine (RTS if no clock).
BF09-BF0B	SYSERR	JMP to system error handler.
BF0C-BF0E	SYSDEATH	JMP to system death handler.
BF0F	SERR	System error number.
		Device Information
BF10-BF11	DEVADR01	Slot 0 reserved
BF12-BF13	DEVADR11	Slot 1, drive 1 device driver address.
BF14-BF15	DEVADR21	Slot 2, drive 1 device driver address.
BF16-BF17	DEVADR31	Slot 3, drive 1 device driver address.
BF18-BF19	DEVADR41	Slot 4, drive 1 device driver address.
BF1A-BF1B	DEVADR51	Slot 5, drive 1 device driver address.
BF1C-BF1D	DEVADR61	Slot 6, drive 1 device driver address.
BF1E-BF1F	DEVADR71	Slot 7, drive 1 device driver address.
BF20-BF21	DEVADR02	Slot 0 reserved.
BF22-BF23	DEVADR12	Slot 1, drive 2 device driver address.
BF24-BF25	DEVADR22	Slot 2, drive 2 device driver address.
BF26-BF27	DEVADR32	/RAM device driver address (need extra 64K).
BF28-BF29	DEVADR42	Slot 4, drive 2 device driver address.
BF2A-BF2B	DEVADR52	Slot 5, drive 2 device driver address.
BF2C-BF2D	DEVADR62	Slot 6, drive 2 device driver address.
BF2E-BF2F	DEVADR72	Slot 7, drive 2 device driver address.
BF30	DEVNUM	Slot and drive (DSSS0000) of last device.
BF31	DEVCNT	Count (minus 1) of active devices.
BF32-BF3F	DEVLST	List of active devices (slot, drive and identification--DSSSIIII).
BF40-BF4F		Copyright notice.
BF50-BF55	IRQXITX	Switch in language card and call IRQ handler at $FFD8.
BF56-BF57	TEMP	Temporary storage for IRQ code.
BF58-BF6F	BITMAP	Bitmap of low 48K of memory.
BF70-BF71	BUFFER1	Open file 1 buffer address.
BF72-BF73	BUFFER2	Open file 2 buffer address.
BF74-BF75	BUFFER3	Open file 3 buffer address.
BF76-BF77	BUFFER4	Open file 4 buffer address.
BF78-BF79	BUFFER5	Open file 5 buffer address.
BF7A-BF7B	BUFFER6	Open file 6 buffer address.
BF7C-BF7D	BUFFER7	Open file 7 buffer address.
BF7E-BF7F	BUFFER8	Open file 8 buffer address.

ProDOS System Global Page NEXT OBJECT ADDRESS: BF80

ADDR	LABEL	CONTENTS
		Interrupt Information
BF80-BF81	INTRUPT1	Interrupt handler address (highest priority).
BF82-BF83	INTRUPT2	Interrupt handler address.
BF84-BF85	INTRUPT3	Interrupt handler address.
BF86-BF87	INTRUPT4	Interrupt handler address (lowest priority).
BF88	INTAREG	A-register savearea.
BF89	INTXREG	X-register savearea.
BF8A	INTYREG	Y-register savearea.
BF8B	INTSREG	S-register savearea.
BF8C	INTPREG	P-register savearea.
BF8D	INTBANKID	Bank ID byte (ROM, RAM1, or RAM2).
BF8E-BF8F	INTADDR	Interrupt return address.
		General System Info
BF90-BF91	DATE	YYYYYYYM MMMDDDDD.
BF92-BF93	TIME	...HHHHH ..MMMMMM.
BF94	LEVEL	Current file level.
BF95	BUBIT	Backup bit.
BF96-BF97	SPARE1	Currently unused.
BF98	MACHID	Machine ID byte. 00.. 0... II 01.. 0... II+ 10.. 0... IIe 11.. 0... III emulation 00.. 1... Future expansion 01.. 1... Future expansion 10.. 1... IIc 11.. 1... Future expansion ..00 .... Unused ..01 .... 48K ..10 .... 64K ..11 .... 128K .... .X.. Reserved .... ..0. No 80-column card .... ..1. 80-column card present ....0 No compatible clock ....1 Compatible clock present
BF99	SLTBYT	Slot ROM map (bit on indicates ROM present).
BF9A	PFIXPTR	Prefix flag (0 indicates no active prefix).
BF9B	MLIACTV	MLI active flag (1... .... indicates active).
BF9C-BF9D	CMDADR	Last MLI call return address.
BF9E	SAVEX	X-register savearea for MLI calls.
BF9F	SAVEY	Y-register savearea for MLI calls.

ProDOS System Global Page NEXT OBJECT ADDRESS: BFA0

ADDR	LABEL	CONTENTS
		Language Card Bank Switching Routines
BFA0-BFCF		Language card entry and exit routines.
BFA0	EXIT	
BFAA	EXIT1	
BFB5	EXIT2	
BFB7	MLIENT1	
		Interrupt Routines
BFD0-BFF3		Interrupt entry and exit routines.
BFD0	IRQXIT	
BFDF	IRQXIT1	
BFE2	IRQXIT2	
BFE7	ROMXIT	
BFEB	IRQENT	
		Data
BFF4	BNKBYT1	Storage for byte at $E000.
BFF5	BNKBYT2	Storage for byte at $D000.
BFF6-BFFB		Switch on language card and call system death handler ($D1E4).
		Version Information
BFFC	IBAKVER	Minimum version of Kernel needed for this interpreter.
BFFD	IVERSION	Version number of this interpreter.
BFFE	KBAKVER	Minimum version of Kernel compatible with this Kernel.
BFFF	KVERSION	Version number of this Kernel.

```
ProDOS Quit Code -- V1.0.1
-------------------------
ADDR    DESCRIPTION/CONTEN
-------------------------

1000    MODULE STARTING AD

            **************
            *
            * Quit Code:
            *     Resides
            *     bank ($D
            *     executed
            *
            *
            * Versions 1.0
            *
            **************

1000 ********** ZERO PAGE

0024    Cursor Horizontal
0025    Cursor Vertical

1000 ********** EXTERNAL E

0280    Prefix Buffer
1800    Buffer
2000    Buffer
BF00    MLI Entry
BF58    Bitmap

1000 ********** SOFT SWITC

C000    Keyboard
C000    Disable 80 column
C00C    Disable 80 column
C00F    Select alternate c
C010    Keyboard Strobe
C082    ROM select

1000 ********** MONITOR EQ

FC58    Home
FC9C    Clear to end of li
FD0C    Read a key
FD8E    Output a Carriage
FDED    Output a Character
FE89    Set Keyboard
FE93    Set Video
FF3A    Sound Bell
```

```
QUATES **************************************

QUATES **************************************

ES **************************************

store
card
aracter set

ATES **************************************

e

Return
```

```
1012  Mark pages $0, $1, $4 through $7
1014  and $BF as in use

1027 ********** DISPLAY CURRENT PREFIX ******************************

1027  Clear Screen and Home cursor <FC58>
102A  Go down 1 line <FD8E>
102D  Get Pointer to Prompt1 (Prefix)
102F  and store it in Print Routine (11E9)
1037  Call Print Routine <11E6>
103A  Position to line 3
1041  Call MLI (GET_PREFIX) <BF00>
1044  Data: GET_PREFIX command number
1045  Data: Pointer to Parameter list
1047  Terminate Prefix with 0 (0280)
104A  for Print routine
104F  Get Pointer to Prefix
1051  and store it in Print Routine (11E9)
1059  And Print it <11E6>

105C ********** GET PREFIX NAME **************************************

105C  Initialize counter
1063  Read a key <FD0C>
1066  Is it CARRIAGE RETURN?
1068  Yes, then accept Prefix >>10B8
106A  No, then save character
106B  Clear to end of line <FC9C>
106E  Retrieve character
106F  Is it ESCAPE?
1071  Yes, then start all over again >>1027
1073  Is it CANCEL?
1075  Yes, then start all over again >>1027
1077  Is it TAB?
1079  Yes, then sound Bell, get another character >>108E
107B  Is it BACKSPACE?
107D  No, then keep checking >>108C
107F  Yes, then is there room to move back?
1081  No, then don't try >>1086
```



```
-- 1 JAN 84          NEXT OBJECT ADDR: 1000
-------------------------------------------
S
-------------------------------------------

RESS

*********************
                    *
                    *
 alternate 4K       *
00) and is          *
at $1000            *
                    *
                    *
1 -- 1 JAN 84       *
                    *
*********************
```

```
ProDOS Quit Code -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 1000
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

1000 ********** INITIALIZATION ***************************************

1000  Select ROM (C082)
1003  Set Video <FE93>
1006  Set Keyboard <FE89>
1009  Disable 80 column card (C00C)
100C  Select Alternate character set (C00F)
100F  Disable 80 column store  (C000)

1012 ********** INITIALIZE MEMORY BITMAP *****************************
```

```
ProDOS Quit Code -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 1083
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  1083  Decrement cursor horizontal position
  1085  Decrement counter
  1086  Clear to end of line <FC9C>
  1089  Try again >>1063

  108C  Continue if greater than or equal to BACKSPACE >>1094
  108E  Else, sound Bell <FF3A>
  1091  Try again >>1063

  1094  Is it less than or equal to "Z"?
  1096  Yes, keep checking >>109A
  1098  Turn off lowercase
  109A  Is it less than "."?
  109C  Yes, Invalid - try again >>108E
  109E  Is it greater than "Z"?
  10A0  Yes, Invalid - try again >>108E
  10A2  Is it less than or equal to "9"?
  10A4  Yes, keep checking >>10AA
  10A6  Is it less than "A"?
  10A8  Yes, Invalid - try again >>108E
  10AA  Else, valid character - increment counter
  10AB  Found 39 characters?
  10AD  Yes, then start all over >>1075
  10AF  Put valid character in buffer (0280)
  10B2  and Print it <FDED>
  10B5  Go back for more >>1063

  10B8  Check counter
  10BA  If 0 then go on >>10CE
  10BC  Else, save length (0280)
  10BF  Call MLI (SET_PREFIX) <BF00>
  10C2  Data: SET_PREFIX command number
  10C3  Data: Pointer to Parameter list
  10C5  Carry on if no error >>10CE
  10C7  Sound Bell <FF3A>
  10CA  Force branch to
  10CC  always be taken >>1075

10CE ********** GET APPLICATION NAME **********************************

  10CE  Clear Screen and Home cursor <FC58>
  10D1  Go down 1 line <FD8E>
  10D4  Get Pointer to Prompt2 (Application)
  10D6  and store it in Print Routine (11E9)
  10DE  Print it <11E6>
  10E1  Position to line 3
  10E8  Initialize counter
  10EA  Output a RUB
  10F1  Poll Keyboard latch (C000)
  10F4  Loop until keypress found >>10F1
  10F6  Clear latch (C010)
```

```
ProDOS Quit Code -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 10F9
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  10F9  Is it ESCAPE?
  10FB  No, keep checking >>1103
  10FD  Yes, get Cursor horizontal position
  10FF  If not 0 try again  >>10CE
  1101  If 0 start all over again >>10CC
  1103  Is it CANCEL?
  1105  Yes, try again >>10CE
  1107  Is it TAB?
  1109  Yes, sound Bell - try again >>1114
  110B  Is it BACKSPACE?
  110D  No, keep checking >>1112
  110F  Yes, then handle it >>11D0

  1112  Continue if greater than or equal to BACKSPACE >>111A
  1114  Sound Bell <FF3A>
  1117  Go back and try again >>10EA

  111A  Is it CARRIAGE RETURN?
  111C  Yes, then go load Application >>1147
  111E  Is it less than or equal to "Z"?
  1120  Yes, keep checking >>1124
  1122  Turn off lower case
  1124  Is it less than "."?
  1126  Yes, Invalid - try again >>1114
  1128  Is it greater than "Z"?
  112A  Yes, Invalid - try again >>1114
  112C  Is it less than or equal to "9"?
  112E  Yes, keep checking >>1134
  1130  Is it less than "A"?
  1132  Yes, Invalid - try again >>1114
  1134  Else, valid character - save it
  1135  Clear to end of line <FC9C>
  1138  Retrieve character
  1139  and Print it <FDED>
  113C  Increment counter
  113D  Found 39 characters?
  113F  Yes, start again >>1105
  1141  No, save character in buffer (0280)
  1144  and go get another >>10EA

1147 ********** LOAD AND EXECUTE APPLICATION ************************

  1147  Output a blank
  114C  Store length of Application name (0280)
  114F  Call MLI (GET_FILE_INFO) <BF00>
  1152  Data: GET_FILE_INFO command number
  1153  Data: Pointer to Parameter list
  1155  Continue if no error >>115A
  1157  Else, go to Error Handler >>11F6
```

```
ProDOS Quit Code -- V1.0.                    84          NEXT OBJECT ADDR: 1157
-------------------------
ADDR    DESCRIPTION/CONTE
-------------------------

  115A  Get File Type (12
  115D  Is it ProDOS Syst
  115F  Yes, continue >>1
  1161  No, indicate Erro
  1163  Go to Error Handl

  1166  Set Reference num
  116B  Call MLI (CLOSE)
  116E  Data: CLOSE comma
  116F  Data: Pointer to
  1171  Continue if no er
  1173  Else, go to Error
  1176  Get Access Byte (
  117B  Yes, >>1182
  117D  No, Indicate Erro
  117F  Go to Error Handl

  1182  Call MLI (OPEN) <
  1185  Data: OPEN comman
  1186  Data: Pointer to
  1188  Continue if no er
  118A  Else, go to Error

  118D  Get Reference Num
  1190  and update READ a
  1193  GET_EOF parameter
  1196  Call MLI (GET_EOF
  1199  Data: GET_EOF com
  119A  Data: Pointer to
  119C  Continue if no er
  119E  Else, go to Error

  11A1  Is EOF mark less
  11A4  Yes, continue on
  11A6  No, Indicate Erro
  11A8  Go to Error Handl

  11AB  Transfer EOF to R
  11AE  in READ parameter
  11B7  Call MLI (READ) <
  11BA  Data: READ comman
  11BB  Data: Pointer to
  11BD  Save status of RE
  11BE  Call MLI (CLOSE)
  11C1  Data: Get_Prefix
  11C2  Data: Pointer to
  11C4  Continue if no er
  11C6  Else, retrieve st
  11C7  and go to Error H
```

```
ProDOS Quit Code -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 11C7
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  11CA  Was READ good?
  11CB  No, go to Error Handler >>11C7
  11CD  Yes, execute application >>2000

11D0 ************ BACKSPACE ROUTINE ************************************

  11D0  Get cursor position horizontal
  11D2  If 0 exit routine >>11E3
  11D4  Decrement counter
  11D5  Output a space
  11DA  Move cursor back 2 spaces
  11DE  Output a space <FDED>
  11E1  Move cursor back 1 space
  11E3  Return to get another character >>10EA

11E6 ************ PRINT TEXT ROUTINE ***********************************

  11E6  Initialize offset
  11E8  Get a character (11E8)
  11EB  If it is 0 then exit >>11F5
  11EF  Output it <FDED>
  11F2  Increment offset
  11F3  Get another character unless we've done 256 >>11E8
  11F5  Return to caller

11F6 ************ PRINT ERROR MESSAGE **********************************

  11F6  Save Accumulator (Error Number)
  11F8  Position to line 12
  11FF  Get Error number
  1201  Is it $01?
  1203  No, then keep checking >>1211
  1205  Get Pointer to Error1 (Not System file)
  1207  And store it in Print Routine (11E9)
  120F  Branch always taken >>1237
  1211  Is it $40?
  1213  Yes, then indicate Error3 >>122D
  1215  Is it $44?
  1217  Yes, then indicate Error3 >>122D
  1219  Is it $45?
  121B  Yes, then indicate Error3 >>122D
  121D  Is it $46?
  121F  Yes, then indicate Error3 >>122D
  1221  Else, Get Pointer to Error2 (I/O Error)
  1223  And store it in Print Routine (11E9)
  122B  Branch always taken >>1237
  122D  Get Pointer to Error3 (Path not found)
  122F  And store it in Print Routine (11E9)
  1237  Print Error message <11E6>
  123A  Position to line 0
```

```
ProDOS Quit Code -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 123E
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  123E  Return to Get Application code >>10D1

1241 ********** ASCII TEXT ****************************************

        Prompt1
  1241  'ENTER          PREFIX (PRESS "RETURN" TO ACCEPT)'

        Prompt2
  1269  'ENTER          PATHNAME OF NEXT APPLICATION'

        Error1
  128C  Ring Bell
  128D  'NOT           A TYPE "SYS" FILE'

        Error2
  12A3  Ring Bell
  12A4  'I/O           ERROR            '

        Error3
  12BA  Ring Bell
  12BB  'FILE/PATH     NOT FOUND  '

12D1 ********** PARAMETER LISTS ***********************************

        GET_FILE_INFO Parmlist
  12D1  Parmcount
  12D2  Pathname
  12D4  Access
  12D5  File Type
  12D6  Aux Type
  12D8  Storage Type
  12D9  Blocks Used
  12DB  Datetime (modified)
  12DF  Datetime (creation)

        OPEN Parmlist

  12E3  Parmcount
  12E4  Pathname
  12E6  I/O Buffer
  12E8  Reference Number

        CLOSE Parmlist

  12E9  Parmcount
  12EA  Reference Number
```

```
ProDOS Quit Code -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: 12EA
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

        READ Parmlist

  12EB  Parmcount
  12EC  Reference Number
  12ED  Data Buffer
  12EF  Request Count
  12F1  Transfer Count

        GET_EOF Parmlist

  12F3  Parmcount
  12F4  Reference Number
  12F5  EOF Mark

        GET/SET_PREFIX Parmlist

  12F8  Parmcount
  12F9  Pathname

          ******* UNUSED ********************

  12FB  --- >>0005
```

```
Disk II Device Driver -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: F800
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

F800    MODULE STARTING ADDRESS

            ***********************************
            *                                 *
            *  Disk Device Driver:            *
            *     Resides from $F800 - $FEFF  *
            *                                 *
            *                                 *
            *                                 *
            *                                 *
            *                                 *
            *                                 *
            *  Version 1.0.1 -- 1 JAN 84      *
            *                                 *
            ***********************************

F800 ********** ZERO PAGE EQUATES ************************************

003A    Checksum
003A    Workbyte
003E    Slot (Temporary)
0042    Command
0043    Unit Number
0044    I/O Buffer Pointer (low)
0045    I/O Buffer Pointer (high)
0046    Block Number (low)
0047    Block Number (high)

F800 ********** INTERNAL EQUATES *************************************

1000    Dummy Block Buffer (1st half)
1100    Dummy Block Buffer (2nd half)

F800 ********** EXTERNAL EQUATES *************************************

C080    Phase Zero Off
C088    Motor Off
C089    Motor On
C08A    Drive Select
C08C    Read Data Register
C08D    Write Data Register
C08E    Set Read Mode
C08F    Set Write Mode
C0EC    Read Data Register (slot 6)

F800 ********** CONVERT BLOCK TO TRACK/SECTOR ************************
```

```
Disk II Device Driver -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: F800
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

 F800  Get Block Number
 F804  Is Block Number good? (FB56)
 F807  Yes, if less than $100 >>F810
 F80A  No, if greater than or equal to $200  >>F836
 F80E  No, if greater than or equal to $118 >>F836
 F810  Convert Block Number to a Track and Sector
 F812  ---
 F816  0000000T TTTTTABC
 F817        .      . >>F812
 F819      .      .
 F81A    .      . >>F81E
 F81C  00TTTTTT 0000BC0A
 F81E  ---
 F822   Preserve Sector Number
 F823  Execute command <F83A>
 F826  Restore Sector Number - Was prior action ok?
 F827  No, then exit >>F832
 F829  Increment Buffer Pointer
 F82B  Increment Sector Number by 2 for rest of Block
 F82D  Execute command <F83A>
 F830  Decrement Buffer Pointer (to start of block)
 F832  Get error number (if any - 0 indicates no error) (FB58)
 F835  Return to caller

F836 ********** I/O ERROR ROUTINE ************************************

 F836  Indicate "I/O Error"
 F838  Set Carry flag
 F839  Return to caller

F83A ********** MAIN ROUTINE ****************************************

 F83A  Set recalibration count to 1
 F83F  Preserve sector number (FB57)
 F842  Get "Unitnum"   DSSS0000
 F844  Strip out Drive 0SSS0000
 F846  Preserve slot number
 F848  Check for slot change, turn off motor if so <FE9B>
 F84B  See if motor is on <FCDA>
 F84E  Save test results
 F851  Initialize counter for delay routine (FB70)
 F856  See if slot or drive has changed (FB59)
 F859  Update "current" unit number (FB59)
 F85C  Save test results
 F85D  Put drive number in Carry flag
 F85E  Turn motor on (C089)
 F864  Select appropriate drive (C08A)
 F867  Check test results - Same slot/drive?
 F868  Yes, then skip delay >>F874
 F86B  Wait for new Drive
```

```
F88E  No, then exit with error >>F8EC
F890  Is command a "status" request?
F892  Yes, then determine status >>F8FD
F894  Is command a "read" request?
F895  Yes, then continue on >>F89A
F897  Prepair data for write (prenibblize)
F89A  ---
F89C  Initialize "retry" count at 64 (FB69
F89F  ---
F8A1  Read an address field - Good read? <
F8A4  Yes, then continue on >>F8C0
F8A6  Decrement "retry" count - More to tr
F8A9  Yes, then try again >>F89F
F8AB  No, just in case indicate "I/O Error
F8AD  Decrement "recalibration" count - MoE
F8B0  No, then exit with error >>F8EC
F8B2  Get "current" track (FB5A)
F8B5  Preserve it
F8B6  Double it and
F8B7  add 16 to it for recalibration
F8B9  Reinitialize Retry Count
F8BE  Branch always taken >>F8CE
F8C3  Was the right track found? (FB5A)
F8C6  Yes, then continue on >>F8D7
F8C8  Get "current" track (FB5A)
F8CB  Preserve it
F8CC  Get track we found
F8CD  Double it
F8CE  Put new value in Device Track Table
F8D1  Get track we want
F8D2  And go there <F90C>
F8D5  Branch always taken >>F89F
F8DA  Was the right sector found? (FB57)
F8DD  No, then try again >>F8A6
F8E1  Is command a "write" request?
F8E2  Yes, then go do it >>F8F4
F8E4  Read the data - Good read? <FBFD>
F8E7  No, then try again >>F8A6
F8E9  Indicate no errors
F8EB  BNE Instruction, never taken
F8EC  Indicate error
```

NEXT OBJECT ADDR: F86D

(FB56)

<FDF0>

FB98>

y? (FB69)

re to try? (FB6A)

<FCD3>

Disk II Device Driver -- V1.0.1 -- 1 JAN 84

ADDR	DESCRIPTION/CONTENTS
F86D	to come up to speed <FB85>
F874	Is command a status request?
F876	Yes, then do not move disk arm >>F87
F878	Get track number for current request
F87B	And go there <F90C>
F87E	Check test results - Was motor on?
F87F	Yes, then skip delay >>F890
F881	Wait for Drive
F883	to come up to speed <FB85>
F88B	Is motor on yet? <FCDA>

Disk II Device Driver -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: F8ED

ADDR	DESCRIPTION/CONTENTS
F8ED	Preserve error number (FB58)
F8F0	Turn motor off (C088)
F8F3	Return to caller
F8F4 **********	HANDLE WRITE REQUEST **********
F8F4	Write data - Good write? <FD00>
F8F7	Yes, then exit >>F8E9
F8F9	Indicate "Write-protect error"
F8FB	Branch always taken >>F8EC
F8FD **********	GET STATUS **********
F8FD	Get Slot number
F902	Check "write-protect" status (C08E)
F905	Put result in Carry flag
F906	Select read mode (C08C)
F909	Exit with appropriate status >>F8F7
F90C **********	LOCATE DESIRED TRACK **********
F90C	Double the track number for proper phase
F90D	Preserve destination track * 2 (FB6F)
F910	Turn all phases off <F925>
F913	Get offset into Device Track Table <FCF1>
F916	Get track (FB59)
F919	Update "current" track (FB5A)
F91C	Get destination track (FB6F)
F91F	Update Device Track Table (FB59)
F922	Move arm to desired track <F933>
F925	Initialize phase number, starting with 3
F927	---
F928	Clear a phase <F98A>
F92B	Decrement phase number - More to do?
F92C	Yes, then continue until all phases done >>F927
F92E	Divide track number by 2 (FB5A)
F932	Return to caller
F933 **********	ARM MOVE ROUTINE **********
F933	Preserve track to find (FB72)
F936	Are we already there? (FB5A)
F939	Yes, then set appropriate phase and exit >>F987
F93D	Initialize phase count (halftracks) (FB6B)
F943	Preserve "current" track for comparisons (FB71)
F946	Subtract track to find to compute delta-tracks
F947	Are we already there? (FB72)
F94A	Yes, then clear prior phase and exit >>F983
F94C	Positive delta-tracks - go move arm out >>F955
F94E	Negative delta-tracks - Get absolute value delta-tracks less 1
F950	Increment current phase to move in (FB5A)

```
Disk II Device Driver -- V1.0.1 -- 1
-----------------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------------
  F953  Branch always taken >>F95A
  F955  Compute absolute value delta
  F957  Decrement current phase to m
  F95A  Compair delta-tracks with ph
  F95D  Use smaller value for offset
  F962  Are we pointing at last tabl
  F964  Yes, then continue to use cu
  F966  Else, use new offset
  F967  Set Carry flag for set phase
  F968  Set a phase <F987>
  F96B  Get delay value from table (
  F96E  Delay <FB85>
  F971  Get prior phase number (FB71
  F974  Clear Carry flag for clear p
  F975  Clear a phase <F98A>
  F978  Get delay value from table (
  F97B  Delay <FB85>
  F97E  Increment phases moved (FB6B
  F983  Delay <FB85>
  F987  Get "current" phase number (
  F98A  Use low two bits only, zero
  F98C  Multiply by two and bring in
  F98D  Merge in slot number
  F98F  Put in X-reg for following c
  F990  Toggle appropriate phase (C0
  F993  Restore slot number to X-reg
  F995  Return to caller

F996 ********** TABLE 1 ***********
         Read Translate Table with
         Bit mask Tables and Epilo
         unused areas

         Read Translate

         Bit Mask 1
  F9A0  0000000
  F9A1  0000000
  F9A2  1000000
  F9A3  1000000

         Read Translate

         Bit Mask 2
  F9C0  0000000
  F9C1  0100000
  F9C2  0010000
  F9C3  0110000
```

```
JAN 84     NEXT OBJECT ADDR: F953
-----------------------------------

tracks less 1
ove out (FB5A)
ases moved (FB6B)
to delay tables >>F962
e value yet?
rrent offset  >>F968

 operation

FB73)

hase operation

FB7C)

FB5A)
to three - 000000PP
Carry    - 00000PPC
         - 0SSS0PPC
peration
80)

**********************************
renibblize
 Table in
```

```
Disk II Device Driver -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: F9C3
-----------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

         Epilog Table ($DE,$AA,$EB)

         Read Translate

         Bit Mask 3
  F9E0  0000000
  F9E1  0001000
  F9E2  0000100
  F9E3  0001100

         Read Translate

FA00 ********** TABLE 2 ***********************************************

         Write Translate Table
                Every 4th byte starting at $FA03

         Postnibblize Bit mask Tables
                Bit mask 1 (Every 4th byte starting at $FA00
                Bit mask 2 (Every 4th byte starting at $FA01
                Bit mask 3 (Every 4th byte starting at $FA02

  FA00  Entry for Bit Mask 1
  FA01  Entry for Bit Mask 2
  FA02  Entry for Bit Mask 3
  FA03  Entry for Write Translate

FB00 ********** AUXILIARY BUFFER ************************************

  FB00  Auxiliary Buffer ($56 bytes) >>0056

FB56 ********** VARIABLE AREA ***************************************

  FB56  Track number
  FB57  Sector number
  FB58  Error number

         Disk Device Track Table
FB59    Table Entry
  FB59  Current Unit
  FB5A  Current Track
  FB5B  Slot 1, Devices 1 & 2
  FB5D  Slot 2, Devices 1 & 2
  FB5F  Slot 3, Devices 1 & 2
  FB61  Slot 4, Devices 1 & 2
  FB63  Slot 5, Devices 1 & 2
  FB65  Slot 6, Devices 1 & 2
  FB67  Slot 7, Devices 1 & 2
```

```
FC43  Loop until data valid >>FC40
FC45  Is is 2nd header mark ($AA)?
FC47  No, then see if it is 1st header mark >>FC3B
FC49  Delay for register to clear
FC4A  Read data register (C08C)
FC4D  Loop until data valid >>FC4A
FC4F  Is is 3rd header mark ($AD)?
FC51  No, then see if it is 1st header mark >>FC3B
FC53  Initialize offset into data buffer
FC57  Initialize checksum
FC59  Read a byte (C0EC)
FC5E  Translate it (F900)
FC61  Store in Auxiliary buffer (FA56)
FC64  Compute running checksum
FC66  Increment offset - More to do?
FC67  Yes, then continue >>FC57
FC69  Reinitialize offset into data buffer
FC6B  Branch ways taken >>FC72
FC6D  Set carry flag indicating error
FC6E  Return to caller
FC6F  Store byte for later, no time now
FC72  Read a byte (C0EC)
FC77  Translate it and merge in (F900)
FC7A  bits from Auxiliary buffer (FA56)
FC80  Increment offset - done yet?
FC81  No, then do another >>FC6F
FC83  Save last two bits   XXXXXX00
FC84  Strip off last two bits   XXXXXX00
FC86  Reinitialize offset
FC88  Read a byte (C0EC)
FC8D  Translate it and merge in (F900)
FC90  bits from Auxiliary buffer (FA56)
FC96  Store byte in Primary buffer (top third) (1000)
FC99  Increment offset - done yet?
FC9A  No, then do another >>FC88
FC9C  Read a byte (C0EC)
FCA1  Strip off last two bits   XXXXXX00
FCA3  Reinitialize offset
FCA5  Translate it and merge in (F900)
FCA8  bits from Auxiliary buffer (FA54)
FCAE  Store byte in Primary buffer (middle third) (1000)
FCB1  Read a byte (C0EC)
FCB6  Increment offset
FCB7  No, then do another >>FCA5
FCB9  Strip off last two bits   XXXXXX00
FCBB  Is checksum valid? (F900)
FCBE  No, then exit with error >>FCCC
FCC0  Get slot number
FCC2  Read data register (C08C)
FCC5  Loop until data valid >>FCC2
FCC7  Is is last trailing mark ($DE)?
```



```
FCCA  Yes, then continue with carry clear >>FCCD
FCCC  Set Carry flag indicating error
FCCD  Get byte we stored away, we have time now
FCCE  Set proper offset
FCD0  Store byte in Primary buffer (offset $55)
FCD2  Return to caller

FCD3 ********** UPDATE DEVICE TRACK TABLE ****************************

FCD3  Get offset into Device Track Table <FCF1>
FCD6  Update Device Track Table (FB59)
FCD9  Return to caller

FCDA ********** DETERMINE IF DRIVE IS ON (DATA CHANGING)**************

FCDA  Get slot number
FCDC  Initialize counter
FCDE  Read data register (C08C)
FCE1  Delay 25 cycles <FCF0>
FCE6  Has data register changed? (C08C)
FCE9  Yes, then exit >>FCF0
FCEB  Just in case indicate No Device Connected Error
FCED  Decrement count - 256 tries yet?
FCEE  No, try again >>FCDE
FCF0  Return to caller

FCF1 ********** CONVERT SLOT/DRIVE TO TABLE OFFSET *          SKP  1***
FCF1  Preserve A-register
FCF2  Get Unit number       DSSS0000
FCF4  Divide by 16          0000DSSS
FCF8  Put Drive into Carry  0000DSSS  D
FCFA  Strip out Drive       00000SSS  D
FCFC  Roll left             0000SSSD
FCFD  Put result in X-register
FCFE  Restore A-register
FCFF  Return to caller

FD00 ********** WRITE DATA ROUTINE ***********************************

FD00  Set Carry flag (anticipate error)
FD04  Is diskette "write-protected"? (C08E)
FD07  No, then continue on >>FD0C
FD09  Go to error routine >>FDDF
FD0C  Put transition byte from secondary buffer (FB00)
FD0F  into zero page for timing
FD11  Use $FF for "sync" byte
FD13  Write first "sync" byte (C08F)
FD19  Set counter for four more
FD1C  Delay so that writes occur
FD1D  Exactly on 40 cycle loops
FD1E  ---
```

Disk II Device Driver -- V1.0.1 -- 1 JAN 84   NEXT OBJECT ADDR: FD20

ADDR	DESCRIPTION/CONTENTS
FD20	Write "sync" byte [illegible]
FD23	Decrement [illegible] counter, do another <FDE7>
FD24	No, then [illegible] done yet?
FD26	Write first data [illegible] >>FD1B
FD2B	Write second data mark ($D5)
FD30	Write third data mark ($AA)
FD35	Initialize index [illegible] mark ($AD)
FD36	Initialize [illegible] always taken
FD38	Branch [illegible] byte (Auxiliary buffer
FD3A	Get data [illegible] >>FD3D
FD3D	Exclusive [illegible] Auxiliary buffer) (FB00)
FD40	Put result in X-reg [illegible] previous data byte (FAFF)
FD41	Lookup "disk byte" [illegible] for table lookup
FD44	Get slot [illegible] in table (FA03)
FD46	Write "disk byte" [illegible] index
FD4C	Decrement [illegible] (C08D)
FD4D	No, then do another [illegible] Done with Auxiliary buffer?
FD4F	Get last byte of [illegible] >>FD3A
FD51	Initialize index [illegible] Auxiliary buffer
FD53	Exclusive [illegible] into Primary buffer
FD56	Strip out [illegible] next data byte (1000)
FD58	Put result in X-reg [illegible] bits XXXXXX00
FD59	Lookup "disk byte" [illegible] for table lookup
FD5C	Get slot [illegible] in table (FA03)
FD5E	Write "disk byte" [illegible]
FD64	Get data [illegible] offset, (C08D)
FD67	Increment [illegible] Primary buffer) (1000)
FD68	No, then continue [illegible] end of this page?
FD6A	Did buffer [illegible] start on >>FD53
FD6C	Yes, then go write [illegible] start on page boundary?
FD6E	Did buffer [illegible] go write checksum >>FDC0
FD70	Yes, then [illegible] indicates one past page boundary?
FD72	Carry indication [illegible] by last byte >>FDB3
FD73	Get transition (C08D) [illegible] odd or even buffer end
FD75	Write it [illegible] transition
FD7B	Get second [illegible] cycles for
FD7D	Delay 2 [illegible] offset, [illegible] transition byte
FD7E	Increment [illegible] if we [illegible] correct timing
FD7F	Yes, go [illegible] or with buffer end on odd byte?
FD81	Exclusive [illegible] last two [illegible] done then >>FD99
FD84	Strip out [illegible] in X-reg [illegible] next data byte (1100)
FD86	Put result [illegible] disk byte [illegible] bits XXXXXX00
FD87	Lookup "disk [illegible] for table lookup
FD8A	Get slot [illegible] byte" in table (FA03)
FD8C	Write "disk byte" (Pr[illegible]
FD92	Get data [illegible] offset (C08D)
FD95	Increment [illegible] or with Primary buffer - page 2) (1100)
FD96	Exclusive [illegible] buffer?
FD99	End of buffer [illegible] last two next data byte (1100)
FD9B	Strip out [illegible] in X-reg [illegible] result in carry
FD9D	Put result [illegible] bits XXXXXX00 [illegible] for table lookup

Disk II Device Driver -- V1.0.1 -- 1 JAN 84   NEXT OBJECT ADDR: FD9E

ADDR	DESCRIPTION/CONTENTS
FD9E	Lookup "disk byte" in table (FA03)
FDA1	Get slot
FDA3	Write "disk byte" (C08D)
FDA9	Get data byte (Primary buffer - page 2) (1100)
FDAC	Increment offset - Done yet?
FDAD	No, then do another >>FD81
FDAF	Yes, then go write checksum >>FDB1
FDB1	--- >>FDC0
FDB3	Get last byte (003B)
FDB6	Write it (C08D)
FDBC	Delay 14 cycles for correct timing
FDC0	Use last byte in Primary buffer as checksum
FDC2	Lookup "disk byte" (FA03)
FDC5	Get slot
FDC7	Write "disk byte" (C08D)
FDCD	Initialize offset into "epilog" table
FDCF	Delay 11 cycles for correct timing
FDD3	Load "epilog" from table ($DE,$AA,$EB,$FF) (F9C4)
FDD6	Go write it <FDE9>
FDD9	Increment offset
FDDA	Done all four yet?
FDDC	No, then do another >>FDD3
FDDE	Clear Carry flag (no error)
FDDF	Select read mode (C08E)
FDE5	Return to caller

FDE6 ********** WRITE A BYTE SUBROUTINE ******************************

ADDR	DESCRIPTION/CONTENTS
FDE6	Wait 9 cycles before write
FDE7	Wait 7 cycles before write
FDE9	Put A-register in data register (C08D)
FDEC	And write data register (C08C)
FDEF	Return to caller

FDF0 ********** PRENIBLIZE BLOCK ROUTINE *****************************

ADDR	DESCRIPTION/CONTENTS	
FDF0	Get buffer pointer	
FDF5	Add $2 to buffer address	
FDF7	To access top third of buffer >>FDFA	
FDFA	Store result in code below (FE30)	
FE01	Subtract $54 from buffer address	
FE03	To access middle third of buffer >>FE06	
FE06	Store result in code below (FE25)	
FE0D	Subtract $AA from buffer address	
FE0F	To access bottom third of buffer >>FE12	
FE12	Store result in code below (FE1B)	
FE18	Initialize offset	
FE1A	Get data byte (bottom third)	XXXXXXXX (1000)
FE1D	Get last two bits	000000AB
FE1F	Put in X-reg for table lookup	
FE20	Use lookup to reposition bits	0000BA00 (F9E0)

```
Disk II Device Driver -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: FE23
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  FE23  Save result on stack
  FE24  Get data byte (middle third)     XXXXXXXX (1056)
  FE27  Get last two bits                000000CD
  FE29  Put in X-reg for table lookup
  FE2A  Get current value from stack     0000BA00
  FE2B  Merge in new bits using table    00DCBA00 (F9C0)
  FE2E  Save result on stack
  FE2F  Get data byte (top third)        XXXXXXXX (10AC)
  FE32  Get last two bits                000000EF
  FE34  Put in X-reg for table lookup
  FE35  Get current value from stack     00DCBA00
  FE36  Merge in new bits using table    FEDCBA00 (F9A0)
  FE39  Save result on stack
  FE3A  Get offset into primary buffer
  FE3B  Compute offset into Auxiliary buffer
  FE3D  Put in X-reg
  FE3E  Get data byte just created       FEDCBA00
  FE3F  Store it in Auxiliary buffer (FB00)
  FE42  Increment offset primary buffer, done yet?
  FE43  No, then do another >>FE1A
  FE45  Get low order byte of buffer
  FE47  Subtract 1 (offset to last byte in buffer)
  FE48  Save it for later
  FE4A  Get low order byte of buffer
  FE4C  Modify code in Write Data Routine (offset) (FD52)
  FE4F  Buffer on page boundary? - Yes, skip ahead >>FE5F
  FE51  Else, compute offset to last byte
  FE53  Before page boundary
  FE54  Get byte (page boundary -1)
  FE56  Point at next byte (page boundary)
  FE57  Exclusive-or them together       XXXXXXXX
  FE59  Strip off last two bits          XXXXXX00
  FE5B  Put in X-reg for table lookup
  FE5C  Get "disk byte" from table (transition byte) (FA03)
  FE5F  Save result (0 indicates page boundary)
  FE61  Buffer on page boundary? - Yes skip ahead >>FE6F
  FE63  Get offset to last byte in buffer
  FE65  Carry indicates odd or even buffer start
  FE66  Get byte (page boundary)
  FE68  Did buffer start on odd byte? - Yes skip >>FE6D
  FE6A  Point at next byte (page boundary +1)
  FE6B  Exclusive-or them together
  FE6D  Save result
  FE6F  Point at last byte in buffer
  FE71  Get last byte in buffer          XXXXXXXX
  FE73  Strip off last two bits          XXXXXX00
  FE75  Save result ("checksum byte")
  FE77  Get high order byte of buffer
  FE79  Modify code in Write Data Routine (FD55)
  FE8C  Get slot number for this operation
  FE8E  Modify code in Write Data Routine (FD5D)
```

```
Disk II Device Driver -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: FE9A
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  FE9A   Return to caller

FE9B ********** DETERMINE IF SLOT/DRIVE HAS CHANGED ******************

  FE9B  Compair unit number with "current" unit number (FB59)
  FE9E  Put "current" drive in Carry
  FE9F  Has slot changed? - No, then exit >>FEBD
  FEA9  Get "current" slot
  FEAB  Put in X-register
  FEAC  Exit if Slot 0 >>FEBD
  FEAE  Is "current" motor is on? <FCDC>
  FEB1  No, then exit >>FEBD
  FEB8  Wait until "current" motor is off (FB70)
  FEBB  Or else timeout >>FEA6
  FEBD  Return to caller
  FEBE  Unused >>0042
003B
```

```
IRQ Handler -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: FF9B
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

FF9B    MODULE STARTING ADDRESS
            **********************************
            *                                *
            * Interrupt handler:             *
            *     Resides at $FF9B           *
            *                                *
            *                                *
            *                                *
            *                                *
            * Versions 1.0.1 -- 1 JAN 84     *
            **********************************

FF9B ********** GLOBAL PAGE EQUATES **********************************

BF56    Temporary storage 1
BF57    Temporary storage 2
BF88    A register savearea
BF8D    Bank ID byte
BFD3    IRQ exit code

FF9B ********** EXTERNAL EQUATES ***********************************

D000    RAM/ROM test byte
C082    ROM Select
C08B    Bankl Select

FF9B ********** IRQ CODE ********************************************

  FF9B  Put A-Register on stack
  FF9C  Get Accumulator value from $45
  FF9E  and save it (BF56)
  FFA1  Replace $45 with A-Register
  FFA2  since it may have been destroyed
  FFA4  Load Status register
  FFA5  Restore onto stack
  FFA6  Isolate B flag - Was it a BRK?
  FFA8  Yes, skip Interrupt stuff >>FFC2
  FFAA  Else, Check location $D000 (D000)
  FFAD  Do we have RAM active
  FFAF  Yes, indicate so >>FFB3
  FFB1  Else, indicate ROM
  FFB3  Update Bank ID byte (BF8D)
  FFB6  Also save temporarily (BF57)
  FFB9  Push ($BF50) address of
  FFBB  routine to bank in Ram and
  FFBC  call IRQ on the stack
  FFBF  Push a new P-Register on stack with
  FFC1  the Interrupt Disable flag set
  FFC2  Push ($FA41) address less 1 of
  FFC4  Monitor IRQ on the stack
  FFC8  Select ROM - execution continues in ROM (C082)
```

```
IRQ Handler -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: FFC8
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

            ******* RESET CODE ****************

  FFCB  Push ($FA61) address less 1 of (FFD7)
  FFCE  Hardware Reset routine on to stack
  FFD3  Exit via select ROM code above >>FFC8

  FFD6  Address (-1) of Hardware Reset routine

            ******* IRQ CODE ******************
          Called via $BF50 in System Global Page

  FFD8  Save Accumulator in Global page (BF88)
  FFDB  Restore $45 with original value (BF56)
  FFE0  Select RAM (read & write) (C08B)
  FFE3  use Bank 1 (C08B)
  FFE6  Get Bank ID byte (BF57)
  FFE9  Leave via Global Page IRQ exit code >>BFD3

FFEC ********** UNUSED ************************************************

  FFEC  --- >>000E

FFFA ********** VECTORS ***********************************************

  FFFA  NMI Vector
  FFFC  Reset Vector
  FFFE  IRQ Vector
```

```
BI Relocator -- V1.0.1 -- 1 JAN 84              NEXT OBJECT ADDR: 2000
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

2000    MODULE STARTING ADDRESS

          ****************************************
          *                                      *
          *  PRODOS BASIC INTERPRETOR RELOCATOR  *
          *       LOADED AS THE FIRST TWO BLOCKS *
          *       OF BASIC.SYSTEM AT $2000.      *
          *       THIS ROUTINE MOVES THE BASIC   *
          *       INTERPRETOR TO HIGH MEMORY.    *
          *                                      *
          *  VERSION 1.0.1 -- 1 JAN 84           *
          *                                      *
          ****************************************

          ******** ZERO PAGE ADDRESSES ************

0000    FROM POINTER FOR COPY
0001
0002    TO POINTER FOR COPY
0003
0036    CSWL VECTOR
0038    KSWL VECTOR
006F    APPLESOFT START OF STRINGS
0073    APPLESOFT HIMEM
00F2    APPLESOFT TRACE FLAG

          ******** EXTERNAL ADDRESSES *************

0200    PATHNAME BUFFER
0280    PREFIX BUFFER
0281    START OF PREFIX NAME

03D0    WARMSTART VECTOR
03D3    COLDSTART VECTOR
03F0    BRK HANDLER ADDRESS
03F1
03F2    RESET HANDLER ADDRESS
03F3
03F4    POWER-UP BYTE
03F5    APPLESOFT & VECTOR
03F8    CTL-Y VECTOR

          ******** SCREEN LINE ADDRESSES **********

0400    FIRST SCREEN BUFFER LINE
0480    SCREEN BUFFER LINE
0628    SCREEN BUFFER LINE
```

```
BI Relocator -- V1.0.1 -- 1 JAN 84              NEXT OBJECT ADDR: 2000
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

          ******** BASIC GLOBAL PAGE **************

BE00    BASIC INTERPRETOR ENTRY POINT
BE03    BI COMMAND SCANNER (SYNTAX)
BE10    COUT VECTORS FOR EACH SLOT
BE20    KSWL VECTORS FOR EACH SLOT
BE3C    DEFAULT SLOT NO.
BE3D    DEFAULT DRIVE NO.
BEFB    HIMEM

          ******** SYSTEM GLOBAL PAGE *************

BF00    MACHINE LANGUAGE INTERFACE ENTRY
BF30    LAST DEVICE USED
BF58    MEMORY MAP
BF98    MACHINE TYPE FLAGS
BF99    SLOTS WHICH CONTAINS CARDS WITH ROM
BF9A    IF 0, NO PREFIX ACTIVE

          ******** I/O PORT ADDRESSES *************

C00C    TURN OFF 80 COLUMN BOARD

          ******** ROM ADDRESSES ******************

E000    APPLESOFT ENTRY POINT
FA59    BRK HANDLER
FB2F    INIT SCREEN, MONITOR, ETC.
FC58    CLEAR SCREEN, HOME CURSOR
FDF0    CHARACTER OUTPUT TO SCREEN
FE84    SET NORMAL CHARACTER ATTRIBUTE

2000 ************ BASIC INTERP RELOCATOR ENTRY ************************

  2000  $00 --> $2400
  2004  $02 --> $9A00
  200E  COPY 35 PAGES
  2011  COPY INTERP TO HIGH MEMORY AT $9A00 <207B>
  2016  PAGE FOLLOWING INTERP IMAGE IS...
  2018  BASIC GLOBAL PAGE IMAGE
  201A  COPY THAT TO $BE00 <207B>
  201D  TURN 80 COLUMNS OFF (C00C)
  2020  SET NORMAL CHARACTER ATTRIBUTE <FE84>
  2023  INITIALIZE SCREEN/WINDOW <FB2F>
  2026  CLEAR SCREEN/HOME CURSOR <FC58>
  202D  SET BITMAP TO MARK LOWER 48K FREE (BF58)
  2033  EXCEPT PAGES 0 AND 1 AND
  2035   TEXT PAGES 4 THROUGH 7 (BF58)
  203D  MARK $9000-$BFFF IN USE..
  2048  EXCEPT FOR $BA00-$BDFF ARE FREE
```

```
    9  NO, THIS ONLY WORKS IN 64K >>2068
204D  SET MY CSWL/KSWL FOR INTERP INIT (21CB)
2053  COPY ALL 4 BYTES >>205D
2055  THEN GO TO BASIC COLDSTART >>E000
205    (WE WILL GET CONTROL AT 208B AGAIN)
205
205 *********** ERROR EXIT ****************************
206
2068  ---
   A  PRINT "UNABLE TO EXECUTE BASIC SYSTEM" (21F8)
   3  ALLOW REBOOT IF RESET PRESSED (03F4)
2068 9  GO TO SLEEP FOREVER >>2079

206 *********** COPY PAGES ($0/1-->$2/3) **************
206
207B  ---
207C  COPY FROM $0/1
   E  TO $2/3
207B 1  A PAGE AT A TIME >>207B
   7   COUNT PAGES
207A  RETURN
207
207 *********** CSWL INTERCEPT / CONTINUE *************
208
208B  "]" APPLESOFT PROMPT?
208D  NO...DON'T PRINT WHATEVER IT IS >>208A
   F  YES, APPLESOFT DONE SETTING UP (BE10)
208B 2  POINT CSWL TO STANDARD OUTPUT
   9  CHECK LAST DEVICE USED (BF30)
208C  SET ONLINE PARAMETER TO THIS (21F1)
2082  DRIVE ONE OR TWO? >>20A5
2085  STORE DEFAULT DRIVE (D) (BE3D)
2089  ISOLATE SLOT FROM DEVICE NO.
209E  AND STORE DEFAULT SLOT (S) (BE3C)
2095  GET SLOT BYTE SHOWING CARDS PRESENT (BF99)
20A9  PICK OFF ITS BITS ONE BY ONE
20AF  SET OUTVECS AND INVECS TO $CS00 (BE10)
20A2  FOR ALL SLOTS WITH ROMS IN THEM (BE20)
20A   ---
20B2  SET HIMEM TO $9600
20B4  IN VARIOUS PLACES
20B3  GOT A DEFAULT PREFIX? (BF9A)
20CE  NO >>2105
20C0  YES, MLI: GET PREFIX <BF00>
20D6  ERROR? >>2142
20D   BACKSCAN PREFIX FOR "/"'S (0280)
20D2  AND COUNT THEM IN $21EE (21F7)
```

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locator -- V1.0.1 -- 1 JAN 84   NEXT OBJ

Bene

```
DESCRIPTION/CONTENTS
-----------------------------------------------

BI Re   D  LOOK AT LANGUAGE IN ROM  (E000)
        0  IS IT APPLESOFT?
ADDR    2  NO, THEN CAN'T RUN INTERP >>2068
        7  GOT AT LEAST 64K?
        9  NO, THIS ONLY WORKS IN 64K >>2068
```

BI Re

```
locator -- V1.0.1 -- 1 JAN 84                NEXT OBJECT ADDR: 20F5
ADDR
-----------------------------------------------------------------------
        DESCRIPTION/CONTENTS
-----------------------------------------------------------------------
20F
20F5  ---
20F6  FOR A COUNT OF SUBLEVELS >>20ED
20FD  MORE THAN JUST VOLUME NAME? >>2126
210F  NO, MLI: SET PREFIX <BF00>
2105  MLI: ONLINE <BF00>
210B  ERROR? >>2142
211D  GET VOL NAME LENGTH (0281)
2112  NONE THERE? >>2142
2116  ADD ONE TO NAME LENGTH (0280)
211B  AND PREFIX IT WITH A "/" (0281)
212E  MLI: SET PREFIX <BF00>
   4  ERROR? >>2142

   ******** FIND STARTUP FILE **************
212
2126  MLI: GET_FILE_INFO <BF00>
2129  FIND "STARTUP" FILE
213C  ERROR? >>2142
2131  SAVE LENGTH OF STARTUP FILE NAME (21EF)
2134  COPY NAME TO $200 (21E5)
214D  FIRST COMMAND WILL BE "-STARTUP"
2142  CHECK NUMBER OF SUBLEVELS (21F7)
2147  MORE THAN JUST VOL? >>214F
2149  MLI: SET PREFIX <BF00>
215F  ANY STARTUP FILE NAME? (21EF)
2152  YES, SKIP MESSAGE >>2178
2154  SET TRUE KSWL <21BA>
2169  PRINT '         PRODOS BASIC 1.0' (2220)
2164  PRINT '        COPYRIGHT ... (223C)
   D  SKIP THREE LINES

   ******** FINISH UP AND GO TO BI *********
217
2178  ---
218A  COPY WARMSTART JMP TO 3PAGE (21B0)
2180  AND COLDSTART (03D3)
2183  AND CTL-Y (03F8)
2186  POINT & VECTOR (21B7)
2189  TO $BE03 (CMD SCANNER) (03F5)
219F  COPY BRK HANDLER JMP ALSO (21B3)
21AE  AND RESET JMP (03F2)
21A9  SET POWER-UP BYTE ACCORDINGLY (03F4)
21AE  SET APPLESOFT IN NON-TRACE MODE
   0  AND GO TO INTERPRETER >>BE00

   ******** VECTOR ADDRESSES ***************
```

```
BI Relocator -- V1.0.1 -- 1 JAN 84              NEXT OBJECT ADDR: 21B3
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  21B3  BREAK HANDLER ADDRESS FOR 3PAGE
  21B5  RESET HANDLER IS BASIC INTERP
  21B7  APPLESOFT & GOES TO BI CMD SCANNER >>BE03

21BA ********** FIRST KSWL INTERCEPT *********************************

  21BA  SET KSWL TO CURRENT DEVICE HANDLER (BE20)
  21C4  RETURN LENGTH OF FIRST COMMAND (21E5)
  21C8  FOLLOWED BY A RETURN
  21CA  RETURN

21CB ********** DATA ************************************************

  21CB  CSWL (208B) INTERCEPT ADDR
  21CD  KSWL (21B1) INTERCEPT ADDR

  21CF  GET FILE INFO PARMLIST
  21D0  FILE NAME IS AT $21DC

  21E2  SET PREFIX PARM LIST
  21E3  FOR PREFIX AT $21E4

  21E5  STARTUP FILE NAME LENGTH (07)
  21E6  'STARTUP'

  21ED  NULL PREFIX
  21EE  "/"

  21EF  SAVED LENGTH OF STARTUP FILE NAME

  21F0  ONLINE PARM LIST
  21F2  PUT VOLUME NAME AT $281

  21F4  SET PREFIX PARMLIST
  21F5  PREFIX IS AT $280

  21F7  NUMBER OF SUBLEVELS IN PREFIX +1

  21F8  '***           UNABLE TO EXECUTE BASIC SYSTEM  ***'
  2220  '                    PRODOS BASIC 1.0'
  223C  '                COPYRIGHT APPLE, 1983'

225A ********** NOT USED ********************************************

  225A  ---
```

```
BI Relocator -- V1.0.1 -- 1 JAN 84              NEXT OBJECT ADDR: 225C
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

2400 ********** START OF BI IMAGE ***********************************

2400    BASIC INTERP IMAGE
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9A00
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------

9A00    MODULE STARTING ADDRESS

        ********************************
        *                              *
        *  PRODOS                      *
        *    BASIC INTERPRETER (BI)    *
        *    THIS CODE STARTS IN THE THIRD *
        *    BLOCK OF THE FILE BASIC.SYSTEM. *
        *    IT PERFORMS COMMAND HANDLING *
        *    FOR ALL BUILT-IN PRODOS COM- *
        *    MANDS AND SUPPORTS BASIC'S FILE *
        *    HANDLING.                 *
        *  VERSION                     *
        *    VERSION 1.0.1 -- 1 JAN 84 *
        *                              *
        ********************************

        ******** ZERO PAGE ADDRESSES ************

0024    CURSOR HORIZONTAL
0028    SCREEN LINE BASE ADDR
0029
0033    MONITOR PROMPT CHARACTER
0036    CRT DISPLAY VECTOR (CSWL)
0037
0038    KEYBOARD INPUT VECTOR (KSWL)
0039
003A    SCRATCH POINTER AND LOOP COUNTER
003B
003C    SCRATCH POINTER AND LOOP COUNTER
003D
003E    POINTER TO APPLESOFT VARIABLES
003F
0050    APPLESOFT: LINE NUMBER
0051
0067    APPLESOFT: START OF PROGRAM PTR
0068
0069    APPLESOFT: LOMEM (START OF VARS)
006A
006B    APPLESOFT: START OF ARRAY VARS PTR
006C
006E    APPLESOFT: START OF FREEAREA PTR
006D
006F    APPLESOFT: START OF STRINGS PTR
0070
0073    APPLESOFT: HIMEM (END OF STRINGS)
0074
0075    APPLESOFT: CURRENT LINE BEING EXECUTED
0076
009B    APPLESOFT: ADDR OF LINE AFTER FINDLINE
009C
00AF    APPLESOFT: END OF PROGRAM PTR
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9A00
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------

00B0
00B8    APPLESOFT: START OF PROGRAM PTR
00B9
00D6    APPLESOFT: PROGRAM
00D8    APPLESOFT: ONERR LOCKED (PROTECTED)
00DE    APPLESOFT: ONERR ACTIVE FLAG
00F2    APPLESOFT: TRACE CODE
00F8    APPLESOFT: INTERACTIVE FLAG
                   AL STACK

          ******** EXTERNAL ADDRESSES *************

0100    START OF 6502 STACK
0200    KEYBOARD INPUT LINK
03F4    POWERON RESET FLAG E BUFFER

          ******** BI GLOBAL PAGE *****************

BE06    EXTERNAL COMMAND E
BE0C    PRINT ERROR MESSAGE NTRY TO BI
BE0F    PRODOS ERROR CODE E ENTRY TO BI
BE10    OUTPUT VECTORS FOR
BE30    CURRENT OUTPUT VEC ALL SLOTS
BE32    CURRENT INPUT VECTOR
BE34    PRODOS INTERCEPT OR
BE38    BI'S INTERNAL REC ECTORS (INPUT/OUTPUT)
BE3C    DEFAULT SLOT      IRECTION VECTORS
BE3D    DEFAULT DRIVE
BE3E    A REGISTER SAVE A
BE3F    X REGISTER SAVE AREA
BE40    Y REGISTER SAVE AREA
BE41    TRACE FLAG (APPLESEA
BE42    IMMEDIATE COMMANDS SOFT TRACE ON/OFF)
BE43    EXEC FILE ACTIVE=$ =0, DEFERRED=1
BE44    READ FILE ACTIVE=$80
BE45    WRITE FILE ACTIVE=80
BE46    READING PREFIX ACT $80
BE47    DIRECTORY FILE BEI IVE=$80
BE49    FREE STRING SPACE NG ACCESSED
BE4A    BUFFERED I/O BYTE DURING GARBAGE COLLECT
BE4B    INDEX INTO INPUT  COUNT
BE4C    LAST OUTPUT CHAR  OMMAND LINE
BE4D    NUMBER OF OPEN NO TO PREVENT RECURSION
BE4E    EXEC FILE BEING C -EXEC FILES
BE4F    READ FILE IS TRANS OSED FLAG
BE50    VECTOR TO EXTERNAL LATED DIRECTORY
BE52    LENGTH-1 OF EXTER  COMMAND HANDLER
BE53    COMMAND NUMBER     NAL COMMAND STRING
BE54    PARAMETERS ALLOWED
          (SEE BIT DEFINI  FOR THIS COMMAND
BE56    PARAMETERS FOUND  IONS IN TABLE LATER)
          (SAME BIT DEF  WITH THIS COMMAND
                         ITIONS AS FOR PBITS)
```

BASIC Interpr -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9A00

```
ADDR    DESCR   ENTS
--------------------------------------------------------------
BE58    A KEY   ET FILE
BE5A    B KEY   ET FILE
BE5D    E KEY   E/GET/SE
BE5F    L KEY   E/GET/SE
BE61    S KEY   SYSTEM
BE62    D KEY   REF NUM
BE63    F KEY   E: REF
BE65    R KEY   E: NEW
BE68    @ KEY   WRITE:
BE6A    T KEY   WRITE:
BE6B    SLOT    WRITE: L
BE70    ISSUE   WRITE: A
                FLUSH:
        MLI     HIMEM
BEA3    CREAT
BEA4    CREAT   ****** SY
BEA5    CREAT
BEA7    CREAT   VECTOR
BEB4    SET/C   DEVICE
BEB7    SET/C   RY UTILIZ
BEB8    SET/C   FILE LEV
BEB9    SET/C   X ACTIVE
BEBB    SET/C
BEBC    SET/C   ****** IM
BEBE    SET/C
BEC7    ONLIN
BEC8    ONLIN
BECE    OPEN
BED0    OPEN
BED2    NEWL
BED3    NEWL
BED6    READ
BED7    READ
BED9    READ
BEDB    READ
BEDE    CLOS
BEFB    BASI
        **
BF03    QUIT
BF30    LAST
BF58    MEMO
BF94    OPEN
BF9A    PREF
        **

        BUFFER
WORD VAL  RETURNED
WORD VAL
WORD VAL  E CHAR (ALWAYS CR)
WORD VAL  F NUM
NUMBER F  A ADDRESS
 MLI CAL  NGTH OF DATA
 PARM LI  UAL LENGTH TRANSMITTED
E: ACCES  REF NUM
E: FILE   ALUE
E: AUX I
E: FILE   STEM GLOBAL PAGE *************
          SED
          ATION BIT MAP
          FLAG (IF NONZERO)
          PUT/OUTPUT LOCATIONS *********

          ROM IN# OR PR#
          AND XLATE ERROR CODES
          FIELDS
          CODE

eter (BI)  KIND
IPTION/C  INFO: PARM COUNT
          INFO: ACCESS CODE
          INFO: FILE ID
WORD VAL  INFO: AUX ID
WORD VAL  INFO: FILE KIND
WORD VAL  INFO: BLOCKS USED
WORD VAL  INFO: MODIFY DATE/TIME
WORD VAL  MARK/EOF/BUF: REF NUM
WORD VAL  MARK/EOF/BUF: MARK/BUF
```

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```
        REMOVE KSWL/CSWL INTERCEPTS *************************
9A00    ---
9A01    REPLACE CSWL/KSWL WITH CURRENT (BE30)
9A04    ACTUAL DEVICE DRIVER VECTORS
9A16    RETURN

9A17 *********** RESET MODE/SET BI INTERCEPTS *********************

9A17    SET IMMEDIATE COMMAND MODE
9A19    AND GO
9A1C    KSWL/H SET... VECTORS <9FAD>
9A21    NO? THE ALREADY SET?
9A23    YES, CO CHECK CSWH >>9A26
9A26    CSWL/H  NTINUE >>9AA3
9A2B    YES, CO ALREADY SET?
9A2D    NO, SAV NTINUE >>9AA3
        E CURRENT INTERCEPTS FIRST >>9A8D

9A2F *********** OUTPUT INTERCEPT: MODE = 0 *************************
        (IMMEDIATE MODE)
```


BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9A00

```
ADDR    DESCRIPTION/CONTENTS
--------------------------------------------------------------
C000    KEYBOARD
C010    KEYBOARD STROBE
CFFF    RESET I/O STROBE CLEAR
        /O ROMS

        ****** APPLESOFT ROM LOCATIONS ********

D43F    APPLESOFT RESTART ENTRY
D61A    FIND LINE BY NUMBER IN APPLESOFT
D665    SET POINTERS IN APPLESOFT
D7D2    EXECUTE NEXT APPLESOFT STATEMENT
D820    APPLESOFT CMD EXECUTE
D865    APPLESOFT SIGNAL ERROR
ED24    APPLESOFT PRINT DECIMAL NUMBER
F273    APPLESOFT SET NORMAL CHARS

        ****** MONITOR ROM LOCATIONS **********

FC58    MONITOR CLEAR SCREEN/HOME CURSOR
FC9C    MONITOR CLEAR TO EOL
FD10    MONITOR READ KEY (NO CURSOR)
FDED    COUT VECTOR

9A00 *********** BASIC INTERPRETOR LOAD POINT **********************
        (ENTRY POINT IS AT $AC35, WARMDOS)

9A00 ***********
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84
ADDR    DESCRIPTION/CONTENTS
```

```
  9A2F  "#" CHARACTER? (9F98)
  9A32  NO... >>9A54
  9A34  ELSE, SAVE X REG (BE3F)
  9A38  CHECK STACK FOR $D812 AS RETURN ADDR
  9A3B  (APPLESOFT TRACE, PRINTING #LINENO)
  9A44  NOT TRACING? >>9A6E
  9A46  ELSE, SET DEFERED MODE=4
  9A4B  GET SET TO PRINT THE "#" (9F98)
  9A4E  RESTORE X REG (BE3F)
  9A51  AND GO TO OTHER OUTPUT HANDLER >>B84B (0103)

  9A54  NOT A #, SAME AS LAST OUTPUT THO? (BE4
  9A57  (SAVE FOR NEXT TIME THRU) (BE4C)
  9A5A  NO, ALL IS WELL >>9A74
  9A5C  TWO RETURNS IN A ROW?
  9A5E  NO, ALL IS WELL >>9A74
  9A60  HAS HORIZONTAL CURSOR POSN CHANGED?
  9A62  YES... >>9A69
  9A64  ELSE, ANYTHING IN PATHNAME BUFFER? (BC
  9A67  (MUST BE ALPHA)
  9A69  RESTORE A REG
  9A6B  PATHNAME IS THERE... >>9A74
  9A6D   ELSE, WE ARE RECURSING INFINITELY, EX
  9A6E  WE WERE'NT TRACING AFTER ALL, RESTORE
  9A71  AND A REGS, THEN FALL THRU TO EXIT (9F

9A74 *********** ECHO OUTPUT CHAR AND EXIT ***

  9A74  PUT BACK REAL CSWL/KSWL VECTORS <9A00>
  9A77  OUTPUT THE CHARACTER <FDED>
  9A7A  WAS IT A RETURN?
  9A7C  NO, EXIT NOW >>9A8D
  9A7E  ELSE, WAS APPLESOFT TRACING?
  9A82  YES >>9A8B
  9A84  NO, CLEAR MY TRACE FLAG (PSEUDO TRACE
  9A87  FORCE APPLESOFT TO TRACE FOR MY BENEFI
  9A8B  RESTORE A REG AND FALL THRU TO EXIT BI

9A8D *********** SAVE ACTUAL IN/OUT VECTORS **

  9A8D  ---
  9A8E  COPY KSWL/H TO VECIN
  9A98  AND CSWL/H TO VECOUT
  9A9A  IN BI GLOBAL PAGE (BE31)
```

```
                                NEXT OBJECT ADDR: 9A2F
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9AA3
ADDR    DESCRIPTION/CONTENTS
        CSWL/KSWL INTERCEPTS ****************************

9AA3 *********** SET
                ECTORS (BE34)
  9AA3  ---
  9AA4  COPY VDOSIO V
  9AA7  TO CSWL      ER
  9AB1  AND KSWL
  9AB9   EXIT TO CALL T INTERCEPT: MODE = 0 ***************************
                (MODE)
9ABA *********** INPU
        (IMMEDIATE) ACTIVE? (BE43)

  9ABA  IS EXEC FILE ISTERS <9F99>
  9ABD  NO >>9AC5    XEC FILE FOR INPUT COMMANDS >>9BDE
  9ABF  YES, SAVE REG
  9AC2  AND GO READ F RESTORE REAL CSWL/KSWL <9A00>
                ID?
  9AC5  NO EXEC FILE; T HIM INTO IMMEDIATE MODE >>9AFA
  9AC8  PROGRAM LOCKED Y FROM KEYBOARD <FD10>
  9ACA  YES, DON'T EC
  9ACC  NO, READ A KE AEF
  9ACF  RETURN?      ISTERS <9F99>
  9AD1  NO, EXIT  >>9 INE BUFFER (0200)
  9AD3  YES, SAVE REG TRY CALLED BY EXEC TO PROCESS
  9AD6  STORE IT IN ND STRING STORED AT $200
          --> THIS EXE COMMAND STRING <A6B4>
              A COMMA NUMBER RETURNED FROM PARSE (BE53)
  9AD9  GO PROCESS T NOW? >>9AEC
  9ADC  CHECK COMMAND ETURNED WITH ERROR CODE? >>9B22
  9ADF  EXIT BI RIGHT REG (BE40)
  9AE1  NO, COMMAND SPACE TO CALLER OF KEYBOARD
  9AE3  NO, RESTORE DEX OF ZERO
  9AE6  RETURN A BAC >9AEF
  9AE8  AND A LINE IN
  9AEA  EXIT THE BI  R'S REGISTERS <9FA3>
                Y INSTALLING INTERCEPTS >>9A8D
  9AEC  RESTORE CALLE
  9AEF  AND EXIT BI HIAL ABORT EXIT ***********************************

9AF2 *********** SPE H NOT FOUND"
                0C>
  9AF2  ERROR=6, "PA CSWL/KSWL VECTORS <9A8D>
  9AF4  GO SAY SO <BE
  9AFA  SAVE CALLER'S PRESS SPACE BAR" (BB9A)
  9AFD  ---          ON RESET (03F4)
  9AFF  PRINT "PLEASE D (C000)
  9B0B  FORCE REBOOT ?
  9B0E  CHECK KEYBOAR
  9B13  IS IT A SPACE YBOARD STROBE (C010)
  9B15  NO >>9B0E    EEN <FC58>
  9B17  YES, CLEAR KE
  9B1A  CLEAR THE SCR
```

```
BASIC Interpreter (BI) -- V1.Ø.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9B1D
------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
------------------------------------------------------------------------

  9B1D  AND CLOSE FILES AND QUIT SY

9B2Ø *********** ERROR HANDLER ****************************************

  9B2Ø  ERROR=3, "NO DEVICE CONNECT
  9B22  MAIN ENTRY: STORE ERROR CODSTEM >>9F8F
  9B25  AND IN APPLESOFT ONERR
  9B27  CHECK BI STATE (BE42)
  9B2A  MEMORIZE WHETHER IT'S IMMED
  9B2F  SET A HIGH FILE LEVEL FOR N
  9B34  NO ACTIVE READ/WRITE FILES  (BEØF)
  9B3D  CLOSE ALL OPEN FILES AT OR
  9B4Ø  FILE LEVEL = $ØF
  9B42  MLI: CLOSE (ALL) <BE7Ø>    IATE MODE
  9B45  ERROR? >>9B59              N-EXEC FILES (BF94)
  9B47  WRITE ANY DATA I HAVE BUFFER PREFIX READ (BE44)
  9B4A  ERROR? >>9B59              ABOVE (BEDE)
  9B4C  PUT FILE LEVEL BACK TO ZERO
  9B54  NOW FLUSH ALL OPEN FILES
  9B56  MLI: FLUSH (ALL) <BE7Ø>
  9B59  ---                        RED <AØ37>
  9B5A  ASSUME MODE WILL BE 4 (DEFE
  9B5C  MEMORIZE WHETHER BASIC ONER
  9B5E  DEFERRED MODE CURRENTLY? >>
  9B6Ø  NO, STILL IMMEDIATE MODE (M
  9B62  ---
  9B63  SET MODE AS DEFINED ABOVE <RRED)
  9B66  RESTORE BI'S CSWL/KSWL INTER ACTIVE
  9B69  GET ERROR CODE (BEØF)       9B62
  9B6D  BASIC ONERR ACTIVE? THEN GODE=Ø)
  9B7Ø  NO, JUST PRINT ERROR MESSAC
  9B73  CLOSE EXEC FILE IF ONE IS (9FAD>
  9B77  DEFERRED MODE? >>9B85       RCEPTS <9AA3>
  9B79  IMMED. MODE, PRINT RETURN A
  9B7C  WARMSTART APPLESOFT >>D43F  HANDLE IT >>9B7F
                                    E <BEØC>
  9B7F  RESTORE STACK FOR BASIC     PEN <B355>
  9B84   PASS ERROR CODE TO BASIC
  9B85  ---                         ND    <9FE2>
  9B87  JUMP INTO APPLESOFT ERROR

9B8A *********** RETURN TO IMMED.

  9B8A  CLEAR APPLESOFT ERRNUM
  9B8E  WILL LOOK FOR "#" FROM APPHANDLER >>D865
  9B93  SET NORMAL VIDEO IN APPLES
  9B96  RESTORE TRUE CSWL/KSWL <9AMODE ********************************
  9B99  TRY TO WRITE BUFFERED DATA
  9B9C  RESET MODE/SET UP BI'S INT
  9B9F  RESTORE REGISTERS <9FA3>    ESOFT
  9BA2  GO TO PROCESS IMMED. INPUT  <F273>
                                    ØØ>
                                    <AØ2B>
                                    RCEPTS <9A17>

                                    REQUEST >>9ABA
```

```
BASIC Interpreter (BI) -- V1.Ø.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9BA2
------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
------------------------------------------------------------------------

9BA5 *********** INPUT INTERCEPT: MODE=4 OR 8 ***********************

  9BA5  SAVE REGISTERS <9F99>
  9BA8  PREFIX INPUT ACTIVE? (BE46)
  9BAB  NO >>9BBØ
  9BAD  YES, GO DO SPECIAL HANDLING >>9D96
  9BBØ  ELSE, IS READ FILE ACTIVE? (BE44)
  9BB3  NO >>9BB8
  9BB5  YES, GO DO SPECIAL HANDLING FOR THAT >>9C45
  9BB8  ELSE, IS EXEC FILE ACTIVE? (BE43)
  9BBB  NO >>9BDE
  9BBD  YES, GET PROMPT CHARACTER
  9BBF  IT BETTER NOT BE A "]"
  9BC1  IT IS, RETURN TO IMMEDIATE MODE >>9B8A
  9BC3  ELSE, SET TRUE CSWL/KSWL <9AØØ>
  9BC6  AND PASS CALLER'S AREG TO REMOVE CURSOR (BE3E)
  9BC9  REMOVE CURSOR AND GET A KEYPRESS <FD1Ø>
  9BCC  BACKSPACE?
  9BCE  NO, EXIT BI >>9BDB
  9BDØ  YES, CHECK PROMPT
  9BD2  IF ITS A ">"...
  9BD4  THEN EXIT WITH THE BACKSPACE >>9BD9
  9BD7  ELSE, IF AT START OF LINE, REPROMPT >>9BC6
  9BD9  MIDDLE OF LINE, RETURN A BACKSPACE
  9BDB  EXIT BI TO CALLER >>9A8D

9BDE *********** READ EXEC FILE **************************************

  9BDE  REMOVE CURSOR FROM SCREEN
  9BEØ  CHECK PROMPT CHARACTER
  9BE2  IF ITS A ">"...
  9BE4  DO THINGS DIFFERENTLY >>9C21
  9BE6  CHECK KEYBOARD (CØØØ)
  9BE9  NO KEY READY? >>9BFC
  9BEB  GOT A KEY, IS IT CONTROL-C?
  9BED  NO, IGNORE IT >>9BFC
  9BEF  YES, CLOSE EXEC FILE <B355>
  9BF2  IMMEDIATE MODE? (BE42)
  9BF5  NO >>9C3Ø
  9BF7  YES, CLEAR KEYBOARD STROBE (CØ1Ø)
  9BFA  AND GO START NEW LINE >>9C3Ø
  9BFC  SET UP FOR EXEC LINE READ <9DB9>
  9BFF  READ A LINE TO $2ØØ <9C9B>
  9CØ2  ERROR? >>9C29
  9CØ4  SAVE REGISTERS <9F99>
  9CØ7  HOP INTO LOOP >>9CØD
  9CØ9  ---
  9CØA  BACKSCANNING $2ØØ BUFFER (Ø2ØØ)
  9CØD  FORCING THE MSB ON
  9C15  RESTORE TRUE CSWL/KSWL <9AØØ>
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: 9C18
-------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  9C18  GO PROCESS COMMAND LINE <9AD9>
  9C1B  CHECK COMMAND NUMBER (BE53)
  9C1E  IMMEDIATE EXIT? IF NOT, GET NEXT LINE >>9BFC
  9C20  RETURN

        ******** HANDLE EXEC PROMPT > ***********

  9C21  GET SET TO READ EXEC LINE <9DB9>
  9C24  READ SINGLE CHARACTER PER CALL <9C77>
  9C27  NO ERRORS, EXIT TO CALLER NOW >>9C20

        ******** EXEC ERROR RECOVERY ************

  9C29  CLOSE EXEC FILE <B29F>
  9C2C  WAS ERROR "END OF DATA"?
  9C2E  NO, REAL ERROR THEN >>9C42
  9C30  ELSE, OK -- JUST STOP EXECING
  9C32  GET CURSOR HORIZONTAL POSITION
  9C34  IF IN MID LINE, PASS SCREEN CHAR BACK >>9C3D
  9C36  ELSE, CHANGE PROMPT TO "]"
  9C3A  AND RETURN WITH A BACKSPACE
  9C3C  RETURN
  9C3D  GET SCREEN CHARACTER UNDER CURSOR
  9C3F  AND EXIT THRU KSWL TO GET REAL KEYPRESS >>0038
  9C42  REAL ERROR, GO TO BI'S MAIN ERROR HANDLER >>9B22

9C45 *********** INPUT FILE ACTIVE ***********************************

  9C45  GET PROMPT
  9C47  IF ITS A "]"...
  9C4B  THEN RESET TO IMMEDIATE MODE >>9B8A
  9C4E  ELSE, REMOVE CURSOR FROM SCREEN (BE3E)
  9C53  CHECK KEYBOARD (C000)
  9C56  NO KEYPRESS? >>9C60
  9C58  GOT A KEY, IS IT CONTROL-C?
  9C5A  NO, IGNORE IT >>9C60
  9C5C  CLEAR STROBE AND EXIT TO CALLER (C010)
  9C5F  RETURN

  9C60  GET PROMPT AGAIN
  9C62  IS THIS A DIRECTORY FILE? (BE47)
  9C65  YES >>9CC4
  9C67  NO, IS PROMPT = ">"?
  9C69  YES, READ A SINGLE BYTE AT A TIME >>9C71
  9C6B  ELSE, READ ENTIRE LINE <9C96>
  9C6E  ERROR? >>9C42
  9C70  RETURN
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: 9C70
-------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  9C71  READ SINGLE BYTE FROM INPUT FILE <9C77>
  9C74  ERROR? >>9C42
  9C76  RETURN

9C77 *********** READ NEXT BYTE OF FILE ******************************

  9C77  SAVE CURRENT READ/WRITE COUNT (BED9)
  9C7A  IN L KEYWORD VALUE (BE5F)
  9C7F  SET UP TO READ ONE BYTE (BED9)
  9C84  MLI: READ <BE70>
  9C87  ERROR? >>9C95
  9C89  PUT COUNT BACK TO MAXIMUM AGAIN (BE5F)
  9C8F  GET FIRST CHARACTER ON $200 LINE (BED7)
  9C92  AND RETURN THAT TO CALLER (0200)
  9C95  RETURN

9C96 *********** READ NEXT LINE OF FILE ******************************

  9C96  REMOVE CURSOR FROM SCREEN (BE3E)
  9C9B  ---
  9C9D  MLI: READ <BE70>
  9CA0  ERROR? >>9C95
  9CA2  GET LENGTH ACTUALLY TRANSMITTED (BEDB)
  9CA5  NOTHING? >>9CBD
  9CA8  GOT SOMETHING, FIND END OF DATA (BED7)
  9CAC  FETCH LAST BYTE OF LINE (01FF)
  9CB1  IS IT A RETURN CHARACTER?
  9CB3  NO, LEAVE LINE ALONE >>9CBD
  9CB5  YES, WAS L KEYWORD GIVEN? (BE57)
  9CBA  YES, LEAVE IT BE >>9CBD
  9CBC   ELSE, CHOP OFF THE RETURN ITSELF
  9CBD  AND EXIT WITH A RETURN
  9CBF  RESTORING Y REG AS YOU GO (BE40)
  9CC3  RETURN

9CC4 *********** READING DIR FILE ***********************************

  9CC4  ">" PROMPT?
  9CC6  YES, EXIT RIGHT NOW >>9CBD
  9CC8  ELSE, REMOVE CURSOR FROM SCREEN (BE3E)
  9CCD  SET 80 COLUMNS
  9CD4  MLI: GET MARK <BE70>
  9CD7  ERROR? >>9D4E
  9CD9  ARE WE AT BEGINNING OF THIS FILE? (BEC8)
  9CDF  NO, CONTINUE >>9D0E
  9CE1  YES, CAT FLAG = 2
  9CE6  READ DIRECTORY HEADER <B1B7>
  9CE9  ERROR? >>9D4E
  9CEB  REF NUM TIMES 32 (BED6)
  9CF6  SET THE L VALUE OF THIS DIR FILE IN (BCFF)
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9CF9
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  9CF9  THE OPEN FILE LIST TO THE ENTRY LENGTH (BCB8)
  9CFC  AND THE NUMBER OF ENTRIES PER BLOCK (BD00)

        ******** FORMAT DIRECTORY NAME **********

  9CFF  GO FORMAT NAME OF DIRECTORY <B112>
  9D02  STORE THE LENGTH OF LINE AT $200
  9D07  PUT A RETURN CHAR AT END OF LINE
  9D0C   AND EXIT TO CALLER
  9D0D  RETURN

  9D0E  GET CAT FLAG (BE4F)
  9D11  IF ZERO, GO PROCESS INDIVIDUAL ENTRIES >>9D51
  9D13  IF MINUS, GO DO SUMMARY LINE OR EXIT >>9D28
  9D15  POSITIVE, ASSUME NULL LINE WANTED
  9D17  DROP CAT FLAG BY ONE (BE4F)
  9D1A  IF ZERO, JUST GO PRINT A BLANK LINE >>9D02

        ******** FORMAT TITLE LINE **************

  9D1C  ELSE, BLANK OUT $200 AND  <A6A9>
  9D21  UNPACK "NAME TYPE BLOCKS ETC... <9FE7>

  9D24  LINE LENGTH IS 80
  9D26  GO RETURN IT TO CALLER >>9D02

        ******** FORMAT SUMMARY LINE ************

  9D28  DO SUMMARY LINE?
  9D2A  NO, JUST EXIT (ALL DONE) >>9D4B
  9D2C  YES, DROP CAT FLAG SO EXIT NEXT TIME (BE4F)
  9D31  CLEAR READ/WRITE COUNT (BED9)
  9D39  MLI: READ <BE70>
  9D3C  FORMAT BLOCKS FREE AND INUSE SUMMARY LINE <B141>
  9D40  GET REF NUM (BED6)
  9D43  AND COPY TO GET/SET LIST (BEC7)
  9D47  NO ERRORS, EXIT >>9D24
  9D49  ERROR, JUMP TO BI ERROR EXIT >>9D4E
  9D4B  "END OF DATA" ERROR
  9D4E  GO TO BI ERROR EXIT >>9B22

        ******** FORMAT FILE/DIR ENTRIES ********

  9D51  SET DIR ENTRY NUM COUNTER TO -1
  9D56  GET REF NUM (BED6)
  9D59  *32
  9D5E  USE AS INDEX TO GET ENTRY LENGTH (BCFF)
  9D64  AND ENTRIES PER BLOCK FROM OPEN FILE LIST (BD00)
  9D6A  POSITION ON EVEN BLOCK BOUNDARY (BEC9)
  9D70  AND GET SECTOR OFFSET (BEC8)
  9D74  SKIP FILE/DIR ENTRIES UNTIL POSITIONED TO (BCBB)
```



```
BASIC Interpreter (BI) -- V1.0.1 --
-------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------

  9D77  CURRENT POSITION IN THIS BLO
  9D7F  READ NEXT DIR ENTRY FROM FIL
  9D82  NO ERROR? >>9D90
  9D84  ERROR, IF RANGE ERROR...
  9D86  NO, TRUE ERROR >>9D4E
  9D88  RANGE ERROR, READY FOR SUMMA
  9D8D  RETURN A BLANK LINE THIS TIM

  9D90  FORMAT FILE/DIR ENTRY INTO $
  9D93  AND RETURN IT TO CALLER >>9D

9D96 *********** PREFIX INPUT ACTIVE

  9D96  PROMPT = "]"?
  9D98  NO, ALL IS WELL >>9D9D
  9D9A  YES, RETURN TO IMMEDIATE MO
  9D9D  REMOVE CURSOR FROM SCREEN (B
  9DA4  PREFIX NO LONGER ACTIVE AFT
  9DAA  COPY PATHNAME BUFFER (PREFI
  9DAD  TO $200 (01FF)
  9DB3  RETURN WITH IT TO BASIC (BC
  9DB8  RETURN

9DB9 *********** SETUP TO READ LINE

  9DB9  SET READ REF NUM FOR EXEC F
  9DBF  READ TO $200
  9DC4  FOR $EF BYTES OF LENGTH
  9DC9  (OR UNTIL A RETURN CHAR)
  9DD1  RETURN

9DD2 *********** OUTPUT INTERCEPT:
          (LOOK FOR CONTROL-D)

  9DD2  SAVE REGISTERS <9F99>
  9DD5  PRINTING A CONTROL-D?
  9DD7  NO >>9DF0
  9DD9  YES, WRITE OUT ANY BUFFERED
  9DDC  NOTHING IN COMMAND LINE (BE
  9DDF  READ FILE INACTIVE (BE44)
  9DE2  WRITE FILE INACTIVE (BE45)
  9DE5  PREFIX READ INACTIVE (BE46)
  9DEA  SET MODE = 8 FROM NOW ON <9
  9DED  RESTORE REGS AND EXIT >>9FA

  9DF0  GOT A CONTROL-D...
  9DF2  SET MODE = 4 FROM NOW ON <9
  9DF5  RESTORE REGISTERS <9FA3>
  9DF8  OUTPUT CHARACTER AND EXIT >
```

```
CK (BCB7)
E <B22B>

RY LINE NEXT (BE4F)
 >>9D02
201  <A501>
24
*********************************

NOW >>9B8A
23E)
R THIS (BE46)
 (BCBC)
3C)

FROM EXEC ************************
LE (BCA3)

ODE = C ***************************

DATA <A02B>
4B)

EAD>
3

EAD>

>B84B
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9DF8
---------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
---------------------------------------------------------------------

        ****** OUTPUT INTERCEPT: MODE = 8 *************************
9DFB    (ASSEMBLE COMMAND LINE)
        VE REGISTERS <9F99>
  9DFB  SAVE CHAR IN COMMAND LINE (0200)
  9E01  SAVE IT A RETURN?
  9E04  WAS, READY TO ROLL >>9E16
  9E06  YES, BUMP CHARACTER COUNTER (BE4B)
  9E08  NOW EXIT TO CALLER >>9E12
  9E0B  ANDS! LINE TOO LONG
  9E0D  O"SYNTAX ERROR" >>9B22
  9E0F  "SAVE, RESTORE X REG AND EXIT (BE3F)
  9E12  RETURN
  9E15  RE
  9E16  +-AL LINE? >>9E25
  9E18  NUL PUT BACK TRUE CSWL/KSWL <9A00>
  9E1A  NOVTAX SCAN CMD LINE <A6B4>
  9E1D  SYNTOR? >>9E0F
  9E20  ERR PUT BACK BI'S INTERCEPTS <9A8D>
  9E22  NO
  9E25  ■■■E = 4 NOW <9FAD>
  9E27  MOSTORE REGS AND EXIT >>9FA3
  9E2A  RES
        ***** WRITE BUFFERED CHARACTER ***************************
9E2D    E Y REG (BE40)
  9E2D  SAVCK PROMPT
  9E30  CHECK TO SEE IF WE ARE IN "IF", >>9E40
  9E32  CHEINT", "LIST", OR "CALL" STATEMENTS >>9E40
  9E35  "RAN APPLESOFT PROGRAM >>9E40
  9E38  OF NOT, EXIT TO CALLER... (BE40)
  9E3A  IS H CHARACTER ECHOED TO SCREEN >>9A74
  9E3D  WIT
        INDEX TO TEMPORARILY BUFFERED CHARS (BE4A)
  9E40  GESORE INTO BUFFER JUST ABOVE HIMEM
  9E45  STOP INDEX (BE4A)
  9E4A  BU >>9E5A
  9E4D  OVFFER FULL, SAVE REGISTERS <9F99>
  9E4F  BUFTE BUFFER OUT TO DISK <A025>
  9E52  WRTOR? >>9E0F
  9E55  ERESTORE REGISTERS <9FA3>
  9E57  RESD EXIT ANYWAY
  9E5A  AN
        ***** OUTPUT INTERCEPT: MODE = 4 *************************
9E5B    INITIAL ENTRY FOR A RUNNING PROGRAM)
        (FLUSH OUT NON COMMAND LINES)
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9E5B
---------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
---------------------------------------------------------------------

  9E5B  PRINTING A "#"? (9F98)
  9E5E  NO >>9E78
  9E60  YES, SAVE X REGISTER (BE3F)
  9E64  RETURN ADDR IS IN APPLESOFT... (0103)
  9E67  TRACE ROUTINE...
  9E6B  AT $D812? (0104)
  9E70  YES >>9EE5
  9E72  NO, RESTORE REGISTERS (9F98)
  9E78  IS WRITE FILE ACTIVE?  (BE45)
  9E7B  NOPE >>9E9B
  9E7D  YES, PRINTING A "]"?
  9E7F  NO >>9E85
  9E81  YES, SAME AS PROMPT CHARACTER?
  9E83  YES >>9EB5
  9E85  NO, PRINTING A RETURN CHAR?
  9E87  NO >>9E2D
  9E89  YES, GET PROMPT
  9E8F  DOES IT INDICATE RECURSION? >>9E2D
  9E91  YES, WRITE BUFFER OUT <A02B>
  9E94  OUTPUT FILE INACTIVE NOW (BE45)
  9E99  EXIT WITH RETURN CHAR >>9ECE

  9E9B  ---
  9E9C  INPUT FILE ACTIVE? (BE44)
  9EA2  NO >>9EAC
  9EA4  YES, CHECK PROMPT
  9EA6  OR IN $04
  9EA8  CONTROL-D?
  9EAA  YES >>9ED1
  9EAC  ---
  9EAD  NO, HOW BOUT "]"?
  9EAF  NO, EXIT WITH ECHO THEN >>9ECE
  9EB1  YES, IS THIS THE PROMPT CHAR?
  9EB3  NO, EXIT WITH ECHO >>9ECE
  9EB5  YES, SAVE REGISTERS <9F99>
  9EB8  CHECK OPEN FILE COUNT (BE4D)
  9EBB  NONE OPEN? >>9ECB
  9EBD  SOME OPEN, WRITE BUFFER OUT <A02B>
  9EC0  INDICATE WRITE FILE INACTIVE NOW (BE45)
  9EC3  SET TRUE CSWL/KSWL <9A00>
  9EC8  PRINT "FILE(S) STILL OPEN" <BE0C>
  9ECB  RESTORE REGS <9FA3>
  9ECE  AND ECHO EXIT >>9A74

  9ED1  ---
  9ED2  CHAR IS A RETURN?
  9ED4  NO >>9ED9
  9ED6  YES, SAME AS LAST CHAR OUTPUT? (BE4C)
  9ED9  (SAVE IT FOR THIS TEST NEXT TIME) (BE4C)
  9EDC  NOT SAME, NO PROBLEM THEN >>9EE0
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9EDE
---------------------------------------------------------------------
ADDR   DESCRIPTION/CONTENTS
---------------------------------------------------------------------

 9EDE  SAME, MARK
 9EE0  RETURN

9EE1 ********* PROMPT FOR RECURSION
        (CONT...
        (EXECUTED ... APPLESOFT TRACE INTERCEPT ****************************
        ... PASSES HERE FOR EVERY STATEMENT)
        ... APPLESOFT WHILE PRODOS IS ACTIVE)

 9EE1  BUMP A...
 9EE5  ---
 9EE9  MARK ...
 9EEB  JUST ... PROMPT ... LINE POINTER
 9EED  RESTORE ... IN CASE
 9EF0  DOES ... FOR RECURSION
 9EF3  YES, ... KNOW WE DIE IN HERE
       ... APPLESOFT'S STACK
 9EF5  ELSE, ... WE ARE TRACING? (BE41)
 9EF9  IS IT ... PICK ... HAVE TRACE THEN >>9F68
 9EFB  OR END ... A TOK...
 9EFD  NEITHER ... OF ... NEXT TOKEN ON LINE
 9F00  OK >> ... DEN? >>9F20
 9F02  COMPU... ... NE? >>9F1D
 9F06  AT LE... DECREMENT STRING SPACE CTR (BE49)
 9F08  YES >... AST 3 ...
 9F0A  NO, W... 9F... OF FREESPACE IN PAGES
 9F0D  AND T... PAGES AVAILABLE?
 9F12  COMPU...
 9F14  AND SA... PREFERRED DATA <A02B>
 9F19  GET N... GARBAGE COLLECT <A07B>
 9F1B  ---  EXT ... SPACE NOW
 9F1D  JUMP ... STRING SPACE CTR (BE49)
 9F20  STORE ... BACK ... TOKEN
 9F23  LOOK ... TOKEN
 9F26  ITS N... INTO APPLESOFT TO EXECUTE IT >>D820
 9F28  IT IS ... IN PROMPT
 9F2B  AND JUMP ... IN BI'S TOKEN TABLE (B7F3)
       ... BI IS INTERESTED IN >>9F1D
       ... STING, CHANGE BRANCH (9F2C)
 9F2D  IF OR ... ONE OF THE FOLLOWING: >>9F2D
 9F2F  CLEAR ... PRINT
 9F32  GO TO ... OUT
 9F35  (BEGIN ... MODE ... PROMPT = 0
 9F3E  NOW ON ... LAST CHAR SAVE AREA (BE4C)
       ... PRO... C NEXT TIME THRU (B85D)
       ... SING FOR COMMANDS) (BE38)
 9F40  LIST: ... PROCESS THE IF OR PRINT >>9F5D
 9F42  (DON'T ... LOOK ...
 9F44  GO DO ... IT >... = 1
       ... FOR COMMANDS NOW)
 9F46  CALL: ... PROMPT 9F5D
 9F48  (DON'T LOO...
 9F4A  GO DO IT >... = 2
       ... FOR COMMANDS NOW)
       >>9F5D
```

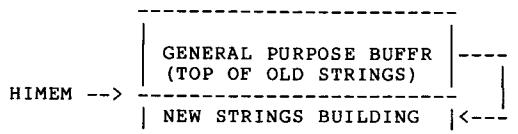
```
       CHARACTER (ASOFT TRACE CHAR)

******* SAVE CALLERS REGISTERS *****************************

       SAVE A,X AND Y REGS (BE3E)
       RETURN

******* RESTORE CALLERS REGISTERS **************************

       RESTORE A,X AND Y REGS (BE3E)
       RETURN
```



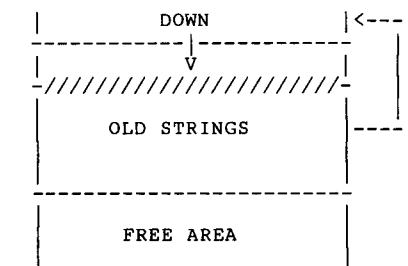
```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9F4A
---------------------------------------------------------------------
ADDR   DESCRIPTION/CONTENTS
---------------------------------------------------------------------

 9F4C  I...
 9F4D  AN...

 9F50  TH...
 9F53  TH...

 9F55  NO...
 9F58  (...
 9F59  FO...
 9F5D  --...
 9F5E  GO...

 9F61  R...
 9F66  GO...

 9F68  R...
 9F6D  P...
 9F74  U...
 9F79  PLET: DECREMENT STRING CTR
 9F7C  POD GO BACK FOR NEXT TOKEN >>9EFD
 9F80  T...
       TRACE: TURN TRACE ON (BE41)
 9F83  THEN CONTINUE BELOW >>9F59
 9F87  L...
 9F89  STRACE: DROP INTO BACKGROUND TRACE (BE41)
 9F8D  CHANGE TOKEN TO "TRACE"
       FORCE ON APPLESOFT TRACE

9F8F ****
       BACK TO APPLESOFT TO PERFORM IT >>D820
 9F8F  C...
 9F94  RESUME: CLEAR ONERR CODE
       GO TO APPLESOFT TO PROCESS IT >>9F1B
 9F98  "...

9F99 ********* REAL TRACE ACTIVE ***********************************

       RESTORE TRUE CSWL/KSWL <9A00>
 9F99  PRINT "#" <FDED>
 9FA2  USE APPLESOFT TO PRINT CURRENT LINE NO <ED24>
       PRINT A BLANK SPACE <FDED>
9FA3 **** PUT BI'S CSWL/KSWL INTERCEPTS BACK <9A..>
       THEN GO BACK AND HANDLE AS USUAL >>9EF5
 9FA3  F...
 9FAC  LOOKING FOR A LOWER CASE "c"
       LOOKING FOR A "#"
       STORE CHAR TO SEARCH FOR (9F98)
       BRANCH BACK INTO APPLESOFT >>9F1B

******* EXIT SYSTEM VECTOR **************************************

       CLOSE ALL OPEN FILES <B54C>
       BI: QUIT <BE70>

       CHARACTER (ASOFT TRACE CHAR)
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: 9FAC
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

9FAD ********** SET MODE AND CSWL/KSWL ******************************

  9FAD' STORE "STATE" MODE FROM X REGISTER (BE42)
  9FB2  COPY PROPER CSWL/KSWL VALUES TO REDIRECT... (B851)
  9FB5  VECTOR DEPENDING ON CURRENT MODE (BE38)
  9FBE  RETURN

9FBF ********** PRINTERR: PRINT ERROR MSG ***************************

  9FBF  ---
  9FC0  GET INDEX INTO PACKED MESSAGE TEXTS (BA65)
  9FC3  UNPACK MESSAGE INTO $201 <9FE7>
  9FC9  SAVE THE LENGTH (BCB6)
  9FCC  SKIP A LINE <9FE2>
  9FD1  PRINT A BELL <9FE4>
  9FD4  ---
  9FD6  PRINT CONTENTS OF $201 MSG BUFFER (0201)
  9FE2  PRINT A RETURN CHARACTER
  9FE4  AND EXIT >>FDED

9FE7 ********** UNPACK ERROR MESSAGE ********************************

  9FE7  NOTHING IN BUFFER AT FIRST
  9FED  GET A NIBBLE FROM PACKED MSG <A009>
  9FF0  NON-ZERO, COMMON CHARACTER >>9FF7
  9FF2  IF ZERO, GET NEXT NIBBLE <A009>
  9FF5  AND CONVERT TO UNCOMMON CHAR INDEX
  9FF7  ---
  9FF8  GET THE LETTER THIS NIBBLE REPRESENTS (BA7A)
  9FFB  ZERO? THEN END OF MESSAGE >>A008
  9FFD  GET INDEX INTO OUTPUT BUFFER (BE4B)
  A000  AND STORE THE CHARACTER THERE (0201)
  A003  BUMP INDEX (BE4B)
  A006  AND CONTINUE >>9FED
  A008  RETURN

A009 ********** UNPACK MESSAGE BYTE *********************************

  A009  GET NEXT MSG BYTE (BA9A)
  A00C  WORKING ON SECOND NIBBLE? >>A020
  A00E  NO, TAB INDICATOR? >>A016
  A010  NO, ISOLATE HIGH NIBBLE
  A014   NEXT TIME GET LOW NIBBLE
  A015  RETURN

  A016  ---
  A017  GET TAB POSITION (BA9A)
  A01A  AND BUMP OUTPUT PTR ACCORDINGLY (BE4B)
  A01E  THEN GO BACK FOR NEXT NIBBLE >>A009
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A01E
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  A020   BUMP BYTE PTR FOR NEXT TIME
  A021  ISOLATE LOW NIBBLE
  A023   NEXT TIME GET HIGH NIBBLE
  A024  RETURN

A025 ********** WRITE ONE BUFFERED BYTE ******************************

  A025  SET UP COUNT OF 0001
  A029  AND JUMP INTO ROUTINE BELOW >>A03E

A02B ********** WRITE BUFFERED DATA/TEST ERROR ***********************

  A02B  WRITE BUFFERED DATA <A037>
  A02E  OK? THEN EXIT >>A053
  A031   ERROR, POP OUT OF THIS SUBROUTINE
  A034  AND GO TO ERROR HANDLER >>9B22

A037 ********** WRITE ALL BUFFERED DATA ******************************

  A037  ---
  A039  GET BUFFERED DATA COUNT (BE4A)
  A03C  NONE BUFFERED? >>A052
  A03E  STORE BUFFERED DATA COUNT IN RW PARMS (BED9)
  A046  MLI: WRITE <BE70>
  A04C  NOTHING BUFFERED NOW, COUNT=0 (BE4A)
  A050  ERROR? >>A053
  A052   NO, EXIT
  A053  RETURN

A054 ********** SPECIAL GARBAGE COLLECT ******************************
          (PULL OUT STRING CONSTANTS ALSO)

  A054  DO GARBAGE COLLECTION NORMALLY FIRST <A07B>
  A057  ERROR? >>A07A
  A05B  START OF STRING AREA = PROGRAM START PTR (BC84)
  A063  USE GENERAL PURPOSE BUFFER (ABOVE HIMEM)
  A065  FOR A GARBAGE COLLECT WORKAREA (BC7D)
  A06A  IT IS 3+1 PAGES IN LENGTH (BC7E)
  A06F  END OF STRING AREA IS AT END OF FREEAREA (BC86)
  A077  GO COLLECT CONSTANT STRINGS NOW <A0C2>
  A07A   THEN EXIT

A07B ********** "FRE" COMMAND ****************************************
          (FAST APPLESOFT STRING GARBAGE COLLECTION)
```



```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A07B
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------
```




```
        TOP PART OF OLD STRINGS IS SAVED IN THE
        GENERAL PURPOSE BUFFER OR IN THE FREE
        AREA (WHICHEVER IS LARGER) AND A NEW
        COPY OF THE STRINGS IS BUILT JUST BELOW
        HIMEM.

  A07B  STRING AREA START IS ON PAGE BOUNDARY
  A082  ASSUME 4 PAGE WORKAREA (BC7E)
  A087  IN GENERAL PURPOSE BUFFER ABOVE HIMEM (BC7D)
  A08C  STRING START PTR IS START OF STRING AREA (BC84)
  A090  COMPUTE NUMBER OF FREE PAGES
  A092  AT LEAST 7?
  A094  IF NOT, USE G.P. WORKAREA INSTEAD >>A0B0
  A096  DON'T USE ALL OF FREE AREA (LEAVE $300)
  A098  NEW WORKAREA SIZE IS FREE AREA SIZE-$300 (BC7E)
  A09D  SET PTR TO WORKAREA AT FIRST FREE PAGE
  A0A4  COMPUTE NUMBER OF STRING PAGES
  A0A8  USE SMALLER OF STRING PAGES OR WORKAREA SIZE (BC7E)
  A0AD  AS NEW WORKAREA SIZE (BC7E)
  A0B0  END OF STRING AREA IS HIMEM
  A0BA  JUMP TO NEXT INSTRUCTION >>A0BD
  A0BD  STRING START LSB IS HIMEM INITIALLY (BC85)
  A0C2   RECORD WHETHER LAST PAGE IS PARTIAL
  A0C6  STRING START MSB IS HIMEM INITIALLY (BC86)
  A0CB  ADJUST LORANGE AND HIRANGE MSB'S
  A0CD  FOR PARTIAL PAGES AT EITHER END, (BC7F)
  A0D0  SETTING THEM AT HIMEM FOR NOW.
  A0D9  SET UP ARRAY END MSB +1 FOR COMPARES (BC82)
  A0DC  $3E/$3F --> FIRST VARIABLE (LESS 7 BYTES)
  A0DE  (EACH VARIABLE IS 7 BYTES)
  A0E8  SET UP ARRAY START LSB FOR COMPARES
  A0ED  GET LORANGE VALUE (BC7F)
  A0F0  PRIOR TO STRING AREA? (BC84)
  A0F3  YES, THEN DONE! >>A133
  A0F5  ELSE, DROP LORANGE BY WORKAREA SIZE (BC7E)
  A0F8  AND SAVE THIS VALUE (BC7C)
  A0FB  NOW DROP IT ALSO BY THE DISTANCE BETWEEN
  A0FD  ...THE OLD LORANGE AND THE STRING START PTR (BC7F)
  A107  USE THE LOWER OF THE TWO VALUES (BC7C)
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A10C
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------
  A10C
  A10F          PRODUCE THE MAXIMUM SIZED RANGE (BC7C)
  A112          IS BELOW THE BOTTOM OF THE STRINGS? (BC84)
  A114          >>A119
  A117          USE THE BOTTOM POINTER INSTEAD (BC84)
  A119          STRING FOR PARTIAL PAGE)
  A11C          FINAL LORANGE VALUE (BC7F)
  A11F          SOME PAGES BELOW HIRANGE TO WORKAREA <A1D2>
  A121          MAKE ROOM FOR NEW STRINGS)
  A124          SELECT SIMPLE STRING VARS FOR THIS RANGE <A134>
  A126          >>A131
  A129          COLLECT STRING ARRAYS <A16A>
  A12F          HIRANGE = OLD LORANGE (BC7F)
                CONTINUE LOOPING >>A0DC
  A131
  A133          ERROR, "RAM TOO LARGE"
                EXIT TO CALLER
A134 ***********************************************************************
                *** COLLECT SIMPLE STRINGS ******************************
  A134
  A135
  A13F          BYTES TO $3E/$3F PTR FOR NEXT VAR
  A145          AT ARRAYS NOW?
  A147          SO, WE ARE DONE >>A168
  A14E          THIS A STRING VARIABLE?
  A150          >>A134
  A154          BE ABSOLUTELY SURE
  A158          MSB OF STRING POINTER
  A15B          IT WITHIN MY RANGE? (BC7F)
  A160          >>A135
  A162          >>A134
  A165          S, PULL IT OUT AND TACK IT TO HIMEM <A1F5>
  A167          WENT WELL, GET NEXT VARIABLE >>A135
                ERROR, EXIT NOW
  A168
  A169          NORMAL EXIT TO CALLER
A16A ***********************************************************************
                *** COLLECT STRING ARRAYS ******************************
  A16A
  A16D          TO THE NEXT ARRAY <A199>
  A16F          MORE? >>A168
  A173          ONE, GET MSB OF ITS STRING PTR
  A176          IN MY RANGE? (BC7F)
  A17B          >>A183
  A17D          >>A183
  A180          S, PULL IT OUT AND TACK IT TO HIMEM <A1F5>
  A182          AND CONTINUE WITH NEXT ARRAY ELEMENT >>A184
                ERROR EXIT
```

```
ADDR    DESCRIPTION/CONTENTS
--------------------------------------------------------------------------------


  A183  ---
  A184  BUMP POINTER TO NEXT ARRAY MEMBER
  A18E  POINTER NOW AT NEXT ARRAY? (BC81)
  A191  NO, DO THIS ELEMENT >>A16F
  A195  NO >>A16F
  A197  YES, SET UP TO PROCESS THAT ONE THEN >>A16A

A199 *********** FIND NEXT STRING ARRAY ******************************

  A199  ---
  A19A  $3E --> ARRAY VARIABLES (BC81)
  A1A1  AT END OF ARRAY VARS
  A1A3  NO, CONTINUE >>A1A9
  A1A7  YES, OUT (CARRY SET, NO MORE ARRAYS) >>A1D1

  A1A9  POINT TO ARRAY FOLLOWING THIS (LSB AND...)
  A1B3  MSB TO X REGISTER
  A1BA  CHECK TYPE OF VARIABLE
  A1BF  SKIP INTEGER AND REAL ARRAYS >>A199
  A1C3  GET NUMBER OF DIMENSIONS
  A1C5  *2 TO SKIP SIZES
  A1C6  +5 TO SKIP FIXED STUFF AT BEGINNING
  A1CA  POINT TO FIRST ARRAY MEMBER
  A1CE  READY TO ROLL, $3E POINTS TO IT
  A1D1  RETURN

A1D2 *********** COPY PAGES TO WORKAREA ******************************
          TO MAKE ROOM FOR NEW STRINGS BEING MOVED
          TO HIMEM, COPY SOME STRING PAGES FROM OLD
          STRING AREA TO THE WORKAREA TO PROTECT THEM.

  A1D2  $3A/$3B --> FIRST PAGE TO SAVE (BC7C)
  A1D7  $3C/$3D --> WORKAREA (BC7D)
  A1E2  COPY N+1 PAGES (SIZE OF WORKAREA) (BC7E)
  A1E6  ---
  A1F4   EXIT WHEN FINISHED

A1F5 *********** PULL STRING OUT ***************************************
          TACK STRING JUST UNDER HIMEM AT CURRENT
          STRING START POINTER.

  A1F5  IS STRING BELOW SAVED AREA? (BC7C)
  A1F8  YES, ITS STILL THERE THEN >>A201
  A1FA  ELSE, POINT TO SAVED STRING IN WORKAREA (BC7C)
  A201  $3A/$3B --> STRING
  A20C  DROP STRING START PTR BY LEN OF THIS STRING
  A211  UPDATE STRING'S LSB IN VARIABLE PTR
  A215  FIX UP MSB OF STRING START PTR ALSO
  A21A  AND OF VARIABLE PTR
  A21E  IS THIS A NULL LENGTH STRING?
```



```
ADDR    DESCRIPTION/CONTENTS
--------------------------------------------------------------------------------


  A220  YES, NO MOVE TO DO
  A223  ---
  A224  ELSE, COPY STRING
  A22B  ---
  A22C  OUT OF FREESPACE?
  A231  RETURN TO CALLER

A232 *********** ALLOCATE

  A232  NEED 4 PAGES  ""
                        >>A22B
        ******** GENERAL
                        OUT
  A234  STORE THAT (BBB6)
  A237  GO GARBAGE COLLECT (BC82)
  A23A  ERROR? >>A287     WITH INDICATION
  A23E  HOW MANY FREE PAGE
  A240  ARE THERE ENOUGH?  BUFFER ***************************************
  A243  IF NOT, "RAM TOO F
  A245  TOO FEW... >>A287
  A247  GOT ENOUGH, $3A-->
  A24E  AND $3C-->NEW TOP   PURPOSE ALLOCATE *******
  A258  COMPUTE LENGTH OF
  A266  COPY STRINGS DOWN
  A26C  SUBTRACT "N" FROM   TO GET SPACE <A07B>
  A272  ADJUST ALL POINTER
  A277  OLD HIMEM BECOMES   S ARE THERE?
  A27E  NEW HIMEM IS "N" B  (BBB6)
  A283  FIND PAGE JUST BEL  ARGE" MSG
  A286  RETURN
  A287  ---                 TOP OF FREESPACE
  A288  RETURN              AFTER ALLOCATION
                            STRINGS FOR COPY
A289 *********** FREE BUFF  "N" PAGES IN MEMORY <A396>
                            STRING ADDRESS MSB'S (BBB6)
  A289  GARBAGE COLLECT S   S IN SIMPLE & ARRAY VARS <A3DA>
  A28C  ERROR? >>A2D4       BUFF ADDR HIGH WATER MARK (BBB8)
  A292  PUT HIMEM-$100 IN   AGES LOWER
  A296  AND HIMEM+$400 IN   OND A FILE BUFFER (BC88)
  A29C  (COPY LSB'S)
  A2A3  BC92 = LENGTH OF S
  A2AD  COPY STRINGS UP 4
  A2B2  PREPARE TO ADJUST   ER ***************************************
  A2B8  NEW HIMEM+$400
  A2BA  ADJUST ALL STRING   RINGS <A07B>
  A2C0  ARE WE FREEING BO
  A2C2  YES, DONE! >>A2EE   O $3A/3B
  A2C5  CHECK OPEN FILE C   O $3C/3D
  A2C8  NONE OPEN? (HOW CA
  A2CA  WHICH FILE'S BUFFE
  A2CF  SEARCH UNTIL IT I   TRINGS (BC92)
                            PAGES <A3BA>
                            THEM BY $400 (BC87)

                            ADDRS UP BY $400 <A3DA>
                            TOM-MOST BUFFER?

                            UNT (BE4D)
                            N THAT BE?) >>A2D4
                            R IS NEXT TO HIMEM?
                             FOUND... >>A2D5
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A2D4
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  A2D4   RETURN IF NO FILE IS USING THIS BUFFER
  A2D5   ---
  A2D6   GIVE THAT FILE THE BUFFER PASSED TO US (BEC9)
  A2D9   (SURE HOPE THAT FILE WAS FLUSHED!) (BC93)
  A2E4   PASS FILE REF NUM TO MLI (BEC7)
  A2E9   MLI: SET NEW BUFFER <BE70>
  A2EC   ERROR? >>A2D4
  A2EE   ---
  A2EF   RETURN

A2F0 ********** GETBUFR: GET A BUFFER *********************************
          THIS ROUTINE IS CALLED THROUGH AN EXTERNAL
          ENTRY POINT IN THE GLOBAL PAGE.  IT ALLO-
          CATES A FIXED LOCATION BUFFER BETWEEN THE
          BI AND ITS BUFFERS.

  A2F0   ALLOCATE A BUFFER OF ANY SIZE (A=PAGES) <A234>
  A2F3   ERROR? >>A33A
  A2F8   FIND FIRST PAGE OF BUFFER (BBB9)
  A2FF   GET FILE OPEN COUNT (BE4D)
  A302   NONE OPEN? >>A325
  A304   BUMP BUFFER PAGE PTR BY $400 (BBB8)
  A308   TO POINT TO PREVIOUSLY ALLOCATED
  A30A   BUFFER. (BBB8)
  A30D   FIND OPEN FILE WITH THIS BUFFER (BC93)
  A312   GOT IT, (BEC9)
  A315   SET FILE BUFFER REAL LOW IN MEMORY <A38D>
  A318   THEN SET IT TO NEW BUFFER LOCATION <A2D6>
  A31B   BELOW ALL OTHERS (BEC9)
  A322    DO THIS FOR EACH OPEN FILE...
  A323   THEREBY INSERTING A BLANK BUFFER >>A30D
  A328   IS EXEC FILE ACTIVE? (BE43)
  A32B   NO, DONE >>A33A
  A32D   YES,
  A32F   MOVE EXEC BUFFER DOWN ALSO <A38D>
  A338   AND BUMP UP ABOVE IT
  A33A    EXIT TO CALLER
  A33B   RETURN

A33C ********** FREEBUFR: FREE BUFFER *********************************
          THIS ROUTINE IS CALLED THROUGH AN EXTERNAL
          ENTRY POINT IN THE GLOBAL PAGE.  IT FREES
          A FIXED LOCATION BUFFER PREVIOUSLY ALLO-
          CATED BY GETBUFR.

  A33C   GET COUNT OF OPEN FILES (BE4D)
  A340   INDEX THIS BY 4 PAGES PER FILE
  A341   ADD TO HIMEM MSB
  A343   SAVE THIS AS TOP OF BUFFERS (BBB8)
  A348   THEN SET UP BOTTOM AS HIMEM MSB (BBB9)
  A34B   GET OLD ORIGINAL HIMEM (BEFORE ANY BUFFERS) (BEFB)
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A34E
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  A34E   SAME AS THIS ONE?
  A350   THEN NOTHING ELSE TO DO >>A38B
  A352   ASSUME NO BUFFERS BY REPLACING OLD HIMEM
  A354   ANY EXEC FILE OPEN? (BE43)
  A357   NO, CONTINUE >>A35E
  A359   YES, MOVE EXEC BUFFER TO OLD HIMEM <A32D>
  A35C   AND GO MOVE HIMEM DOWN BY $400 >>A37C
  A35E   ELSE, START WITH TOP BUFFER  (BBB8)
  A361   ANY OPEN FILES? (BE4D)
  A364   IF NOT, WE ARE DONE >>A388
  A366   SEARCH FOR OPEN FILE WITH THIS BUFFER (BC93)
  A369   NOT IT? >>A385
  A36B   GOT IT, GIVE IT NEW HOME AT HIMEM
  A36D   AND SET BUFFER LOW <A38D>
  A370   THEN TO NEW LOC <A2D6>
  A374   DROP TOP BUFFER PTR BY $400 (BBB8)
  A37C   AND DROP HIMEM BY $400
  A383   AND GO DO NEXT BUFFER >>A35E
  A385   ---
  A386   (LOOP TO SEARCH FOR OPEN FILES) >>A366
  A388   WHEN FINISHED, GARBAGE COLLECT <A07B>
  A38B   ---
  A38C    THEN EXIT NORMALLY TO CALLER

          ******** SET BUFFER BELOW ALL OTHERS ***

  A38D   ---
  A38E   USE BOTTOM BUFFER PTR (BBB9)
  A391   SET FILE BUFFER <A2D6>
  A395    AND EXIT

A396 ********** COPY BLOCK DOWN IN MEMORY ****************************

  A396   COPY ALL FULL PAGES DOWN TO THEIR NEW HOME
  A39D   COPYING $3A-->$3C
  A3A4   BUMP BOTH MSB'S
  A3A8   DROP PAGE COUNTER (BC93)
  A3AB   AND CONTINUE >>A39D
  A3AD   NO SHORT LAST PAGE? (BC92)
  A3B0   THEN EXIT NOW >>A3B9
  A3B2   ELSE, COPY PARTIAL PAGE
  A3B9    THEN EXIT

A3BA ********** COPY BLOCK UP IN MEMORY ******************************

  A3BA   PARTIAL PAGE? (BC92)
  A3BD   NO, JUST COPY FULL PAGES NOW >>A3C6
  A3BF   YES, COPY SHORT PAGE FIRST <A3D1>
  A3C2   DROP BOTH MSB'S
  A3C6   PAGE COUNT GONE TO ZERO? (BC93)
  A3C9   YES, DONE  >>A3D9
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A3CB
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  A3CB  ELSE, DROP PAGE COUNT (BC93)
  A3CE  AND GO COPY A FULL PAGE UP >>A3BF

  A3D1  ---
  A3D2  COPY REMAINDER OF PAGE UP (BACKWARDS)
  A3D9  RETURN

A3DA ********** ADJUST ALL STRING ADDRS ****************************
         (BC87 HAS ADDITIVE ADJUSTMENT FACTOR)

  A3DA  USE LOMEM PAGE AS MSB FOR $3E/3F
  A3DE  GET LOMEM LSB
  A3E0  AND END OF SIMPLE VARS PAGE
  A3E3  JUMP INTO THE LOOP >>A3EA
  A3E5  ---
  A3E6  SKIP ONE SIMPLE VARIABLE
  A3EA  ---
  A3EC  OVERFLOW? >>A3F0
  A3EE  YES, BUMP MSB
  A3F0  FINISHED WITH SIMPLE VARS?
  A3F4  (CHECK BOTH MSB AND LSB OF PTR)
  A3F6  ---
  A3F7  YES... >>A40D
  A3F9  NO,
  A3FB  LOOK AT A SIMPLE VARIABLE
  A400  SKIP INTEGER AND REAL VARS >>A3E5
  A402  (DOUBLE CHECK MSB)
  A406   ITS A STRING, POINT TO ITS LEN/ADDR
  A407  ADJUST IT IF NECESSARY <A435>
  A40A  THEN SKIP OVER IT >>A3E5

  A40D  COPY ARRAYS STARTING LSB
  A40F  (MSB IS IN X REGISTER NOW) (BC81)
  A412  ---
  A413  FIND A STRING ARRAY <A199>
  A416  NO MORE? THEN DONE... >>A434
  A418  ---
  A41B  ADJUST ITS ADDRESS IF NEED BE <A435>
  A421  SKIP TO NEXT STRING ELEMENT OF ARRAY
  A429  AT END OF THIS ARRAY YET? (BC81)
  A42C  NO... >>A418
  A42E  (CHECK MSB ALSO)
  A432  YES..., GO GET NEXT ARRAY  >>A412
  A434  RETURN

A435 ********** ADJUST A STRING ADDRESS ****************************
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A435
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  A435  GET STRING LENGTH
  A437  IGNORE NULL STRINGS >>A448
  A439   POINT TO MSB OF ADDRESS
  A43B  IS STRING STORED OUTSIDE OF PROGRAM?
  A43F  NO, LEAVE IT ALONE >>A448
  A441  STORE ABOVE LOMEM, ADD FACTOR TO MSB
  A448   THEN EXIT

A449 ********** COMPRESS ALL ASOFT VARS ****************************
         THIS ROUTINE SQUASHES ALL APPLESOFT VARS
         UP AGAINST THE BOTTOM OF THE STRINGS
         HIMEM --> -------------------------
                   |                       |
                   |       STRINGS         |
                   |                       |
                   -------------------------
                   |                       |
                   |       ARRAY VARS      |
                   |                       |
                   -------------------------
                   |                       |
                   |       SIMPLE VARS     |
                   |                       |
                   -------------------------

  A449  GARBAGE COLLECT FIRST <A054>
  A44C  ERROR? >>A4AE
  A44E  COMPUTE LENGTH OF SIMPLE AND ARRAY VARS
  A453  AND SAVE IT (BC89)
  A463  NEXT, COMPUTE LENGTH OF SIMPLE VARS ONLY
  A467  AND SAVE IT (BC8B)
  A471  SUBTRACT VAR LENGTH FROM STRING START
  A473  TO FIND A PLACE TO PUT THE VARS UNDER (BC92)
  A476  THE STRINGS (START ON AN EVEN PAGE BOUND)
  A47C  $3C/$3D --> PLACE TO PUT VARS
  A483  $3A/$3B --> START OF VARS (ROUNDED TO EVEN
  A485                PAGE ALIGNEMENT)
  A48B  COPY VARS UP AGAINST STRINGS <A3BA>
  A490  STORE START OF VARS PTR (BC8E)
  A496  BUMPING PAGE NUMBER BY ONE
  A4A0  SUBTRACT THIS PTR FROM HIMEM TO COMPUTE (BC90)
  A4A3  TOTAL LENGTH OF COMBINED VARS/STRINGS
  A4A5  AND SAVE THIS TOO (BC8D)
  A4A8  ALSO, SAVE HIMEM MSB IN CASE THEY ARE MOVED
  A4AE   DONE, EXIT
```

```
A4AF  SAV
A4B6  ADD
A4B8  TO
A4C4  $3C
A4CB  $6B
A4D6  $3A
A4E0  COP
A4E7  COM
A4E9  LEN
A4F2  DID
A4F7  NO.
A4F9  YES
A4FC  GO
A4FF  TH
A500  RET

...PRESSED VARS ****************************
...SIMPLE AND ARRAY VARS

A501  PUT
A504  DOU    REEXPAN
A509  GET  IS ROUTINE M
A50F  COP  CK DOWN TO L
A51A  ZER  MEM
A51D  GET
A520  I K
A522  ---

                STRINGS
                FREE SPACE
                ARRAY VARS
                SIMPLE VARS

...E AND ARRAY VARS (BC89)
...COMPRESSED VARS PTR
...LENGTH OF S...INGS ($6D/$6E)
...TO START...HERE TO PUT SIMPLE VARS)
...GIVE START OF...PUT ARRAY VARS
...($3...> LOMEM OF COMPRESSED VARS (BC8E)
...$6C --> WHERE VA...S DOWN TO LOMEM <A396>
...$3B --> STAR STRI...GS BY ADDING VARS
...SIMPLE/ARRA...
...UTE START OF...VARS WERE COMPRESSED?
...GTH TO VARS O...
...HIMEM MOVE S...RENCE IN HIMEM'S (BC87)
... >>A4FF   ...RING POINTERS <A3DA>
... ADJUST BY D
...ADJUST ALL ST
...EN EXIT

...CATALOG ENTRY LINE **************************
...** FORMAT LINE <A6A9>
          $200
...OUT A BLANK ...(0259)
...LE QUOTE TO ...(0259)
...LENGTH OF NA... FOR LATER (BCB1)
... NAME TO LIN...269)
... ACCUMULATOR
... FILE TYPE (0
...NOW OF ONLY 1...
```

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84   NEXT OBJECT ADDR: A524

ADDR	DESCRIPTION/CONTENTS
A524	LOOK UP FILE TYPE IN TABLE (B9DB)
A527	FOUND IT? >>A534
A52D	FILE TYPE NOT IN MY TABLE
A52F	PRINT IT IN HEXADECIMAL <A64F>
A532	AND CONTINUE BELOW >>A578
A534	ELSE, FOR KNOWN TYPES
A537	COPY NAME OF TYPE TO THE LINE (B9E9)
A542	80 COLUMNS PER LINE? (BCB6)
A545	YES... >>A590
A547	NO,
A549	BIN FILE?
A54B	YES... >>A562
A54D	TXT FILE?
A54F	NO... >>A578
A551	YES, R VALUE GIVEN AS SUBTYPE
A55C	CONVERT R VALUE TO DECIMAL <A66C>
A55F	SKIP OVER BIN CODE >>A573
A562	BIN FILE, USE AD VALUE AS SUBTYPE
A56A	CONVERT IT TO TWO HEX DIGITS <A64F>
A573	ADD AN "=" SIGN
A578	COPY MSB OF END OF FILE MARK (0270)
A586	CONVERT LOW TWO BYTES OF EOF <A66C>
A58D	DO CREATION DATE/TIME <A5AD>
A590	---
A598	CONVERT BLOCKS USED <A66C>
A5A0	CHECK FOR WRITE ACCESS
A5A2	UNLOCKED? >>A5A9
A5A4	NO, ADD A "*"
A5A9	FALL THRU TO DO LAST MODIFIED DATE/TIME
A5AB	AND THEN EXIT TO CALLER

A5AD *********** FORMAT A DATE/TIME ***********************************
X = OFFSET FROM $259 TO FIELD
Y = $201 OFFSET TO DATE/TIME VALUE

ADDR	DESCRIPTION/CONTENTS
A5AD	ISOLATE YEAR (025A)
A5B1	AND STORE IT (BCB5)
A5B8	ISOLATE DAY
A5BA	AND STORE IT (BCB4)
A5BE	ISOLATE MONTH
A5C4	(MONTH = 0 IS NO GOOD) >>A5E0
A5C8	(MONTH > 12 IS ALSO BAD) >>A5E0
A5CA	STORE MONTH (BCB3)
A5CE	MULTIPLY MONTH INDEX BY 3 (BCB3)
A5D1	AND SAVE IT INSTEAD (BCB3)
A5D7	(DAY = 0 IS NO GOOD) >>A5E0
A5DE	(YEAR MUST BE < 99) >>A5F2

```
A626    POINT TO LAST CHARACTER
A629  COPY MONTH NAME FROM TABLE (BA0F)
A62C  TO LINE (0201)
A634  BACKWARDS... >>A629
A638  PUT A "-" IN (0201)
A63B  TWO PLACES (0205)
A644  EXIT BY CONVERTING DAY >>A66C

A647 *********** CONVERT 2 DIGIT NUMBER ******************************
        (FORCE LEFT ZERO FILL)

A647  ---
A648  ADD 100 TO FORCE SIGNIFICANCE IN TENS
A64A  CONVERT IT <A66C>
A64D   IGNORE 100'S PLACE
A64E  RETURN

A64F *********** CONVERT TO HEX ***************************************

A64F  ---
A650  ISOLATE LOW NIBBLE
A652  AND GO CONVERT IT FIRST <A65A>
A656  NOW ISOLATE HIGH NIBBLE
A659  AND FALL THRU TO CONVERT IT ALSO
```



```
A68A  24 BIT SHIFT (3 BYTES)
A68E  CLEAR SUM (BCB2)
A691  GO ROL ACCUMULATOR LEFT ONE BIT
A694  ALSO ROL 4TH BYTE OF ACCUM (BCB2)
A698  IF MSB > 10... (BCB2)
A6A2  THEN ADD ONE TO ACCUMULATIVE SUM
A6A5  ---
A6A6  SHIFT 24 TIMES >>A691
A6A8  RETURN
A6A9  ---
A6B3  RETURN

A6B4 *********** SYNTAX: PARSE COMMAND LI
        (ALSO EXTERNAL ENTRY FOR COMMANI

A6B4  INIT COMMAND NUMBER TO -1
A6BB  A BLANK ENDS EACH STRING (BCA9)
A6C0  AT MOST 8 CHARACTERS IN A COMMAND
A6C3  PARSE COMMAND ITSELF <AA5B>
A6C6  GET FIRST LETTER (BCBD)
A6C9  MUST BE ALPHABETIC
A6CB  IT IS... >>A6D4
A6CD  IT'S NOT, IS IT A "-"?
A6CF  YES, OK THEN... >>A6D4
A6D1  ELSE, ITS BAD - SYNTAX ERROR >>A8
A6D4  SCAN FOR COMMAND IN TABLES <AB21>
A6D7  BAD COMMAND? >>A6D1
```

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A5DE

```
A5E0   OTHERWISE, BAD DATE!
A5E2  BACK UP 6 CHARACTERS ON LINE
A5E7  AND PRINT "<NO DATE>" (BA37)
A5F1   THEN EXIT RIGHT AWAY

A5F2  DATE OK, GET HOUR (025C)
A5F6  AND MINUTES (025B)
A5FB  MINUTES > 60?
A5FD  NO.. >>A600
A5FF   YES, USE ZERO MINUTES
A600  CONVERT MINUTES (LEFT ZERO FILL) <A647>
A605  THEN PRINT A ":" (0201)
A609   GET HOUR AGAIN
A60C  GREATER THAN 24 HOURS?
A60E  NOPE >>A611
A610   YES, USE ZERO
A611  10 OR MORE HOURS (TWO DIGITS?)
A614  IN ANY CASE, CONVERT HOURS <A66C>
A618  IF TWO DIGITS... >>A61B
A61A   IF ONE, ADJUST LINE PTR
A61B  ---
A61F  CONVERT YEAR (LEFT ZERO FILL) <A647>
A623  GET MONTH INDEX (*3) (BCB3)
```

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN

```
A65A  CONVERT NIBBLE TO NUMERIC ASCII
A65C  >9?
A65E  NO >>A662
A660  YES, CONVERT $BA-$BF TO $C1-$C6
A662  AND STORE THE RESULT (0201)
A665   BUMP LINE INDEX BACK
A666  PRECEED WITH A $ SIGN
A66B  RETURN

A66C *********** CONVERT TO DECIMAL ******

A66C  A,X = NUMBER    Y=INDEX TO LAST F
A66F  STORE NUMBER IN ACCUMULATOR (BCAF)
A672  DIVIDE BY 10 <A68A>
A675  GET DIGIT AND CONVERT IT (BCB2)
A67A  STORE IN LINE (0201)
A67D   AND DROP LINE INDEX BY ONE
A67E  IS QUOTIENT NOW ZERO? (BCAF)
A687  NO, CONTINUE UNTIL IT IS >>A672
A689   ELSE, EXIT

        ******** DIVIDE ACCUMULATOR BY
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A6D9
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  A6D9  NO, IMMEDIATE COMMAND MODE? (BE42)
  A6DC  NO, DEFERRED... >>A6E9
  A6DE  IMMEDIATE, EXEC ACTIVE? (BE43)
  A6E1  YES, NEVER MIND >>A6E9
  A6E3  ERASE TO END OF LINE <FC9C>
  A6E6  AND GO TO A NEW LINE ON SCREEN <9FE2>
  A6E9  ASSUME NO PARMS AT ALL
  A6F1  NO PATH NAME YET (BCBD)
  A6F4  NO SECONDARY PATH NAME EITHER (0280)
  A6FA  CURRENT SLOT = DEFAULT SLOT (BE61)
  A700  CURRENT DRIVE = DEFAULT DRIVE (BE62)
  A705  BUFFER ALLOCATION = HIMEM (BC88)
  A708  GET LENGTH OF COMMAND NAME (BE52)
  A70D  ALLOW 2 MORE CHARACTERS FOR NOW (BCAA)
  A710  ARE ANY PARAMETERS PERMITTED? (BE54)
  A713  NO...MUST BE MON OR NOMON >>A776
  A715  YES, IN# OR PR#?
  A716  YES...  >>A779
  A718  ELSE, REPARSE THE COMMAND <AA5B>
  A71D  FOR THIS COMMAND... (BE54)
  A720  DOES THE PREFIX NEED FETCHING? >>A727
  A722  YES,
  A724  MLI: GET PREFIX FROM DEFAULT DRIVE <BE70>
  A727  ---
  A729  END OF LINE? >>A776
  A72B  NO, COMMA?
  A72D  NO >>A732
  A72F  YES, NO FILENAME, LOOK FOR KEYWORDS >>A7C7
  A732  "/"?
  A734  YES >>A73A
  A736  NO, ALPHABETIC?
  A738  NO...FILE NAMES MUST BEGIN THAT WAY >>A76F
  A73A  ---
  A73B  DON'T FLUSH ANY BLANKS OUT OF PATHNAME
  A740  ALLOW 64 CHARACTERS NEXT PARSE
  A746  PARSE NEXT OPERAND ON LINE <AA5F>
  A74A  SAVE ITS LENGTH (BCBC)
  A74F  FOUND A PATHNAME#1 (BE56)
  A755  COPY PARM KEYWORD TO $280 (BCBC)
  A758  (ASSUMING PATHNAME1=PATHNAME2) (0280)
  A75F  CHECK NEXT CHAR (OTHER THAN A BLANK) <AA7A>
  A762  NOT COMMA OR RETURN, BAD! >>A76C
  A764  RETURN? >>A7D8
  A766  NO, PATHNAME EXPECTED NOW? (BE54)
  A76A  YES, ALL IS WELL >>A7A2
  A76C  NO, "SYNTAX ERROR" >>A879
  A76F  NON ALPHA FILE NAME, CHECK COMMAND NUMBER (BE53)
  A772  IS IT "RUN"
  A774  NO, ERROR >>A76C
  A776  YES, ITS OK THEN (MIGHT BE "RUN 100") >>A7D8
  A779  IN#S/PR#S, REPARSE COMMAND <AA5B>
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A77C
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

        FOUND - ERROR >>A76C
  A77C  RETURN (ADDRESS KEYWORD)
  A77E  "A"?   GO PARSE THAT KEYWORD ONLY >>A7CC
  A780  IF SO, ZERO ACCUMULATOR <AB77>
  A782  ELSE,  ING ONE BYTE'S WORTH (BCAD)
  A785  CONVER IN PR#/IN# SLOT VALUE AREA (BCAE)
  A78A  PUT IT SLOT FOR PR#/IN# (BE56)
  A78F  FOUND  SLOT # <A9A0>
  A792  CONVER >>A7A1
  A795  ERROR? NVERTED VALUE (BE6B)
  A797  GET CO
  A79A  >8?    S OK  >>A7D1
  A79C  NO, IT RANGE ERROR"
  A79E  YES, "
  A7A1  RETURN PATHNAME EXPECTED?
  A7A2  SECOND?C7
  A7A3  NO >>A USH TO NON-BLANK <AA7A>
  A7A5  YES, F G ELSE ON LINE???? >>A76C
  A7A8  NOTHIN FLUSH ANY BLANKS OUT OF PATHNAME
  A7AB  DON'T  COND PATHNAME TO $281 <AA40>
  A7B2  COPY S 'S LENGTH (LESS 1) (0280)
  A7B7  SAVE I PATHNAME1 AND PATHNAME2 (BE56)
  A7BC  FOUND ST CHARACTER AGAIN <AA7A>
  A7C0  GET LA COMMA OR RETURN, "SYNTAX ERROR" >>A76C
  A7C3  IF NOT? >>A7D8
  A7C5  RETURN MA, FLUSH TO NON-BLANK <AA7A>
  A7C7  NO, CO ERROR IF TWO COMMAS IN A ROW >>A76C
  A7CA  SYNTAX KEYWORD CHAR AND PARSE ITS VALUE <A928>
  A7CC  LOOKUP W? >>A7A1
  A7CF  EXIT N Sn TO NON-BLANK <AA7A>
  A7D1  NO, FL ERROR IF COMMA OR RETURN NOT FOUND >>A76C
  A7D4  SYNTAX YES, GO GET NEXT KEYWORD >>A7C7
  A7D6  COMMA?
        RSED SLOT (BE61)
  A7D8  GET PA NON-ZERO >>A79E
  A7DB  MUST B S THAN 8
  A7DD  AND LE - "RANGE ERROR" >>A79E
  A7DF  OR ELS RIVE TOO (BE62)
  A7E1  CHECK E EITHER 1 OR 2
  A7E6  MUST BE A DEFERRED COMMAND?
  A7ED  IS THI >>A7FB
  A7F0  NO...  A PROGRAM RUNNING? (BE42)
  A7F2  YES, I A7FB
  A7F5  YES >> T DIRECT COMMAND"
  A7F7  NO, "N
  A7FA  RETURN ING NO PATHNAMES? >>A83D
  A7FB  EXPECT BE55)
  A7FD  NO...  AND D VALID FOR THIS CMD?
  A800  ARE S 83D
  A802  NO >>A AVE WE GOT PATHNAME1? (BE56)
  A804  YES, A813
  A808  YES >>
```

```
A80D  IS PATHNAME REQUIRED?
A80F  YES, "SYNTAX ERROR" >>A879
A811  NO, OPTIONAL - NO PREFIX FETCH
A816  DOES PATHNAME1 START WITH A "/
A818  YES, FULLY QUALIFIED  >>A81F
A81A  NO, IS THERE A PREFIX ACTIVE?
A81D  NO >>A838
A81F  YES, (BE57)
A822  SLOT/DRIVE GIVEN WITH THIS COM
A824  NO, FORGET IT >>A83D
A826  YES, DO WE HAVE PATHNAME ALSO?
A828  NO,
A82A  NULL OUT PATHNAME1 (BCBC)
A832  MARK THAT WE WILL HAVE ONE SO
A838  ADD PREFIX TO FILENAMES <A87D>
A83B  ERROR? >>A87B
A83D  GET COMMAND NUMBER (BE53)
A840  *2 AS INDEX INTO TABLE
A842  GET ADDRESS OF COMMAND HANDLIN
A84B  AND STORE IT FOR INDIRECT JMP
A850  EXTERNAL COMMAND? IF SO GO NOW
A852  MY OWN COMMAND, "PREFIX"?
A854  YES, GO NOW >>A876
A859  S OR D VALID KEYWORDS FOR THIS
A85B  NO, GO NOW >>A876
A860  PATHNAME1 GIVEN WITH THIS COMM
A861  NO, GO NOW >>A876
A863  YES, GET FILE INFO FOR PATHNAM
A866  NO ERRORS I HOPE >>A876
A868  ERROR WAS PATH NOT FOUND?
A86A  NO, REAL ERROR - SAY SO >>A87B
A86F  CAN WE CREATE PATHNAME1?
A871  YES, OK THEN >>A876
A873  ELSE, "PATH NOT FOUND"
A875  RETURN
A876  GO TO COMMAND HANDLING ROUTINE

A879 ********** SYNTAX ERROR ********

A879  LOAD BI CODE FOR "SYNTAX ERROR
A87B   AND RETURN WITH ERROR CONDIT
A87C  RETURN

A87D ********** ADD PREFIX TO PATHNAM

A87D  GET SLOT NUMBER (BE61)
A884  PUT SLOT IN HIGH 3 BITS
A886  ADD DRIVE TO TOP BIT AND SHIFT
A88E  ...TO FORM THE UNIT NUMBER (BE
A893  READ THE PATHNAME PREFIX TO $2
A89D  MLI: ONLINE <BE70>
```



```
ADDR  DESCRIPTION/CONTENTS
```

```
                                THEN >>A83D
                               "?
                                (BF9A)
                               MAND?
                                >>A838
                                N (BE56)
                               G ROUTINE (B93F)
                               (BCAC)
                               ! >>A876
                                CMD?
                               AND?
                               E1 <B82A>
                               ON
                               ES ********************************
                                SLOT DOWN (BE62)
                               C7)
                               01 (BEC8)
```



```
ADDR  DESCRIPTION/CONTENTS

A8A0  ERROR? >>A87B
A8A5  DEFAULT DRIVE = PARSED DRIVE (BE3D)
A8AB  DEFAULT SLOT = PARSED SLOT (BE3C)
A8B1  PATHNAME1 STARTS WITH "/"?
A8B3  THEN ITS ALREADY GOT A PREFIX >>A926
A8B8  ELSE, GET LENGTH OF PATHNAME
A8BA  BUMP IT BY 2 (TO ALLOW FOR /'S)
A8C2  WITH PREFIX WILL IT EXCEED 64 CHARS?
A8C7  YES, "SYNTAX ERROR" >>A927
A8C9  NO, UPDATE LENGTH TO INCLUDE PREFIX (BCBC)
A8CF  ---
A8D3  AND COPY PATHNAME1 FORWARD TO MAKE ROOM (BCBD)
A8DC  PUT A "/" AT THE BEGINNING
A8E1  AND AT THE END (BCBD)
A8E4  COPY PREFIX JUST READ TO START OF PATHNAME1 (0200)
A8EA  GET COMMAND NUMBER (BE53)
A8ED  "OPEN"?
A8EF  YES, DONE NOW! >>A926
A8F1  "APPEND"?
A8F3  YES, DONE NOW! >>A926
A8F5  "EXEC"?
A8F7  YES, DONE NOW! >>A926
A8F9  ELSE, GET LENGTH OF PATHNAME2 (0280)
A8FE  COMBINE THIS WITH PREFIX LENGTH (0201)
A901  MORE THAN 64 CHARS?
A906  IF SO, "SYNTAX ERROR" >>A927
A908  UPDATE LENGTH (0280)
A90B  ---
A90F  COPY PATHNAME2 FORWARD TO MAKE ROOM (0281)
A918  PUT A "/" IN FIRST
A91D  THEN THE PREFIX AND ANOTHER SLASH (0281)
A926  ---
A927   DONE!

A928 ********** KEYWORD LOOKUP **************************************

A928  ZERO THE ACCUMULATOR <AB77>
A92B  NINE POSSIBLE KEYWORDS IN TABLE
A92D  COMPARE AGAINST EACH (B9BD)
A930  FOUND IT? >>A967
A935  NO, IS IT "T"? (FILE TYPE)
A937  YES, OK THEN >>A93C
A939  ELSE, BAD KEYWORD >>A879
A93C  IT'S "T", IS IT PERMITTED ON THIS CMD?
A941  NO, ERROR >>A963
A946  ELSE, MARK WE HAVE "T" (BE56)
A94B  START WITH TYPE INDEX OF 0 (BCAD)
A950  INDICATE WHERE T VALUE IS TO GO (BCAE)
A953  AND GO PARSE ONE CHAR <AA7A>
A956  NOTHING THERE??? >>A939
A958  IS IT A $?
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A95A
-----------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

 A95A    YES, H  GAVE TYPE IN HEX >>A9B6
 A95C    IS IT   LPHABETIC?
 A95E    NO, CO  VERT DECIMAL TYPE >>A9A0
 A960    ELSE,   GO LOOKUP TYPE NAME IN TABL

 A963    ---
 A964    "INVAL  D PARAMETER"
 A966    RETURN

                 POSITION OF THIS KEYWORD
                 V" >>A987
                 KEYWORD PERMITTED? (BE55)
                 WITH THIS COMMAND ANYWAY

 A967    GET BI
 A96A    IGNORE
 A96C    IS THI  READY FOUND IT ON THIS LIN
 A96F    NO, NOT CHANGE DRIVE DEFAULT >
 A971    S OR D  SSUME DRIVE = 1
 A973    NO >>A  SAVE SLOT/DRIVE (BE57)        >>A9F6
 A975    YES, A  -1 IN BYTES OF VALUE  (B9
 A978    YES, D  SET TO VALUE IN STORAGE AR
 A97A    ELSE, A NON-BLANK <AA7A>
 A981    MARK WH ELSE THERE? >>A9F0
 A987    GET SI  CHAR A "$"?
 A994    AND OFF CONVERT HEX - ELSE, FALL  (B9C7)
 A997    FLUSH T
 A99A    NOTHING CONVERT DECIMAL NUMBER *
 A99C    IS NEXT                               >>A963
 A99E    YES, GO E INDEX (BE4B)

A9A0 *********  ADD ONE DECIMAL DIGIT TO
                A9AC                          ? (BE57)
 A9A0    SAVE LI ? THEN "RANGE ERROR" >>A9    A987
 A9A3    CONVERT ? THEN "SYNTAX ERROR" >>
 A9A6    OK.. >> LINE INDEX (BE4B)
 A9A8    OVERFLO NEXT NON-BLANK <AA7A>
 A9AA    BAD DIG BACK TO CONVERT NEXT DIGIT    (BCAE)
 A9AC    RESTORE END OF LINE OR COMMA >>
 A9AF    FLUSH T
 A9B2    AND GO  CONVERT HEX NUMBER ******
 A9B4    ALL DON                               HRU >>A9B6
         NEXT NON-BLANK (SKIP "$")
A9B6 *********  LEFT? >>A9F0  ***************************
                 INDEX (BE4B)
 A9B6    FLUSH T HEX DIGIT <AAEE>
 A9B9    NOTHING A9C7                          CCUM <AA9C>
 A9BB    SAVE LI ? THEN "RANGE ERROR" >>A9
 A9BE    CONVERT ? THEN "SYNTAX ERROR" >>
 A9C1    OK.. >> LINE INDEX (BE4B)             9F0
 A9C3    OVERFLO NEXT NON-BLANK <AA7A>
 A9C5    BAD DIG CONVERT NEXT DIGIT >>A9BB
 A9C7    RESTORE                               >>A9A0
 A9CA    FLUSH T                               9CF
 A9CD    AND GO
                 *************************************
                                               <AA7A>

                                               9F0
```

```
 AA4F    RETURN
 AA51    YES, C

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: A9CD
-----------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

                 ** STORE KEYWORD VALUE *

                 BYTES TO CHECK?
                 BEEN CHECKED? >>A9DE
                 SURE MSB'S OF ACCUM ARE
                 IS A SHORT INTEGER >
                 ACCUM TO PROPER PARM STOR
                 LINE INDEX (BE4B)
                 XIT
A9CF *********
                 ERROR" JUMP >>A879
                 ERROR" JUMP >>A79E   ****************************
 A9CF    HOW M
 A9D4    ALL H   * STORE KEYWORD VALUE *
 A9D6    NO, I
 A9D9    IF NU                        ZERO (BCAF)
 A9E1    COPY    CHARACTER TYPE TO ACCUM >A9F3
 A9EB    RESTO   ALL 3?) >>AA07        AGE CELL (BCAF)
 A9EF     AND    NEXT CHAR IGNORING BLANKS
                 HAVE 3 CHARACTERS! >>A9F0
 A9F0    "SYNT   NE INDEX (BE4B)
 A9F3    "RANG   ZE NAME INDEX TO ZERO
                 13 BEEN CHECKED?
A9F6 *********   MATCH >>A9F0
                 INDEX*3 (BCAD)       ****************************
 A9F6    ---     E TYPE GIVEN (BCAF)
 A9F8    COPY    ES IN TABLE (B9E9)
 A9FE    (COPI   E MSB'S)             (BCAF)
 AA00    (GET    ALREADY... >>AA29
 AA05    MUST                         ) <AA7A>
 AA07    SAVE    ALL THREE CHARS >>AA18
 AA0A    INITI   MATCH! WE FOUND IT >>
 AA0F    HAVE    RIGHT ONE, (BCAD)
 AA11    YES,    THE NEXT ONE >>AA0A
 AA14    ELSE,   NAME INDEX
 AA18    COMPA   TYPE VALUE FROM TABLE
 AA1B    TO TY   IN TYPE VALUE STORAGE
 AA1E    (IGNO   LINE INDEX (BE4B)
 AA1F    NO MA   XIT
 AA23    ELSE,
 AA25    CHECK   ** COPY PATHNAME2 ******
 AA27    THEY A
 AA29    NOT TH  CHARACTER <AA8A>      AA2E
 AA2C    GO TRY  ORE IT INDEXED OFF $280
 AA2E    REVERS
 AA35    AND GE  ONE >>AA77
 AA38    STORE                         (B9DB)
 AA3B    RESTOR  ONE >>AA77            AREA (BE6A)
 AA3F     AND E
                 NOW >>AA88
AA40 *********                         ****************************

 AA40    GET NE
 AA43    AND ST
 AA47    COMMA?                        (0280)
 AA49    YES, D
 AA4B    BLANK?
 AA4D    YES, D
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: AA53
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  AA53  PATHNAME TOO LONG? (BCAA)
  AA56  NO, CONTINUE COPYING >>AA40
  AA58  ELSE, SET NOT-EQUAL CONDITION
  AA5A   AND EXIT

AA5B ********** COPY COMMAND NAME INTO TXTBUF **********************

  AA5B  SET INDICIES
  AA5F  GET NEXT NON-BLANK <AA8A>
  AA62  COPY TO TXTBUF (BCBD)
  AA66  COMMA?
  AA68  YES, DONE >>AA77
  AA6A  BLANK?
  AA6C  YES, DONE >>AA77
  AA6E  RETURN?
  AA70  YES, DONE >>AA88
  AA72  AT MAX LENGTH (8)? (BCAA)
  AA75  NO, CONTINUE >>AA5F
  AA77  ELSE, SET NOT-EQUAL CONDITION
  AA79   AND EXIT

AA7A ********** FLUSH TO NON-BLANK **********************************
          Z-FLAG SET IF COMMA OR RETURN FOUND
          C-FLAG SET IF COMMA

  AA7A  IGNORE BLANKS
  AA7F  GET NEXT NON-BLANK <AA8A>
  AA82  COMMA?
  AA84  YES, OUT >>AA89
  AA86  RETURN?
  AA88   EXIT INDICATING WHAT WE FOUND
  AA89  RETURN

AA8A ********** GET NEXT CHARACTER **********************************

  AA8A  GET NEXT CHAR IN INPUT LINE (0200)
  AA8D  FORCE OFF MSB
  AA8F  LOWER CASE?
  AA91  NO >>AA95
  AA93  YES, FORCE UPPER CASE
  AA95   BUMP LINE INDEX
  AA96  IS THIS A FLUSH CHARACTER (LIKE BLANK)? (BCA9)
  AA99  YES, GO GET NEXT ONE >>AA8A
  AA9B   ELSE, RETURN WITH IT

AA9C ********** CONVERT DIGIT AND ADD TO ACCUM **********************
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: AA9C
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  AA9C  NUMERIC?
  AA9E  NO >>AAA4
  AAA2  YES >>AAA8
  AAA4   NOT NUMERIC, EXIT WITH CARRY SET
  AAA5  AND Z-FLAG RESET
  AAA7  RETURN
  AAA8  ISOLATE DECIMAL PORTION OF DIGIT
  AAAB  CURRENT VALUE OF ACCUM... (BCB1)
  AAAE  >1,703,936?
  AAB0  YES, OVERFLOW >>AAD4
  AAB4  PUSH ENTIRE ACCUM ONTO STACK (BCAF)
  AABB  ACCUM*2 (ROL IT ONCE) <AB17>
  AABE  ACCUM*4 (AND AGAIN) <AB17>
  AAC4  ---
  AAC5  ACCUM*4+ACCUM --> ACCUM*5 (BCAF)
  AAD1  FINALLY, ACCUM*5*2 --> ACCUM*10 <AB17>
  AAD4  ---
  AAD5  ACCUM OVERFLOW? >>AAEA
  AAD7  NO, ADD NEW DIGIT TO ACCUM (BCAF)
  AADA  AND STORE IT (BCAF)
  AADD  NO CARRY? >>AAED
  AAE0  GOT CARRY, PROPAGATE IT THRU ACCUM (BCB0)
  AAEA  OVERFLOW ERROR
  AAED   NORMAL EXIT

AAEE ********** CONVERT HEX DIGIT AND ADD ***************************

  AAEE  NUMERIC?
  AAF0  NO >>AAFE
  AAF4  YES >>AB04
  AAF6  NON-NUMERIC, HOW BOUT "A" THRU
  AAFA  "F"
  AAFC  YES! >>AB02
  AAFE  ---
  AAFF  NO, GET OUT NOW
  AB01  RETURN
  AB02  "A" THRU "F", CONVERT TO $BA-$BF
  AB04  ISOLATE DIGIT
  AB08  SHIFT ACCUM 4 BITS LEFT TO MAKE ROOM <AB17>
  AB0B  (WATCH OUT FOR OVERFLOW) >>AAEA
  AB10  OR IN NEW NIBBLE (BCAF)
  AB13  AND REPLACE IN ACCUM LSB (BCAF)
  AB16   DONE

AB17 ********** SHIFT 3 BYTE ACCUM LEFT A BIT ***********************
```

```
BASIC Inte
----------
ADDR    DE
----------

  AB17  SH
  AB20  RE

AB21 *****

  AB21  ST
  AB26  IS
  AB2B  NO
  AB2D  YE
  AB30  ZE
  AB33  CO
  AB35  FI
  AB3A  GE
  AB3D  SA
  AB3F  NO
  AB42  NA
  AB45  --
  AB46  CO
  AB4C  NO
  AB50  CO

  AB52  FO
  AB55  *2
  AB57  PI
  AB63    E
  AB64  RE

  AB65  NO
  AB6E  IF
  AB70  EL
  AB74  XR

AB77 *****

  AB77  ZE
  AB79  --
  AB82  RE

AB83 *****

  AB83  CH
  AB86  AF
  AB88  YE
  AB8A  BI
  AB8C  YE
  AB8E  TE
  AB90  NO
  AB92  YE
  AB95  SY
  AB97  YE

ONE,
ARI SKIP TO NEXT (BE52)
NO SUG ANY MORE >>AB3A
THRU H COMMAND (BE53)
$BE06 VECTOR >>BE06
* ZE
THREE BYTE ACCUM ****************************
THE I
MULA E BYTE WORK
OR (BCAF)
* "_"
COMMAND *****************************************
ILE, T
OFT PI PE (BEB8)
RUN" OGRAM?
FILE T >>ABF2
"BRUN"?
LE? T >>ABCD
AB95
"EXEC"
E? T >>B27B
RUN
T >>AB9D
```

```
ABF2 *********** "RUN" COMMAND ***************************************

  ABF2  NO INPUT FILE ACTIVE NOW
  ABF7  NO APPLESOFT ERROR NUMBER
  ABFC  GOT PATHNAME1?
  ABFD  NO, ERROR >>AC19
  ABFF  YES, LOAD PROGRAM <AC42>
  AC02  ERROR? >>AC58
  AC04  NO, CLEAR VARIABLES <D665>

  AC07  CLEAR ERROR FLAG
  AC09  POSITION TO LINE NUMBER IF GIVEN <ACDC>
  AC0C  RESTORE MY INTERCEPTS <9A8D>
  AC0F  CLEAR COMMAND NUMBER ETC., MODE = 4 <AC19>
  AC16  JUMP INTO APPLESOFT TO RUN PROGRAM >>D7D2

AC19 *********** CLEAR COMMAND NUMBER ETC. ***************************

  AC19  SET NORMAL (NON-INVERSE OR FLASH) <F273>
  AC1E  SEARCH CHARACTER FOR TRACE IS "#" (9F98)
  AC23  NO COMMAND NUMBER NOW (BE53)
  AC26  NO PROMPT
  AC2A  SET MODE=4 (DEFERRED) <9FAD>
  AC2D  "SYNTAX ERROR" IF THINGS GO WRONG >>A879
```



```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: AB17
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  AB77  ZE        REE BYTE WORK ACCUM (BCAF)
  AB79  --
  AB82  RE    SCA

AB83 *****  N CMD TABLE FOR COMMAND ***************************

  AB83  CHS   WITH L
              "-" ST COMMAND IN TABLE
  AB86  AF    SPECIAL
  AB88  YE    LENGTH, COMMAND NUMBER  (BE53)
  AB8A  BI    >> COMMAND STRING (BE52)
  AB8C  YE    COMMAND
  AB8E  TE    DEX TO DS IN TABLE ARE 8 CHARS
  AB90  NO    NGTH) EXT NAME (B8B2)
  AB92  YE      AS LAST NAME? >>AB45
  AB95  SY    ARE ON
  AB97  YE      E BYTE SHORTER FROM NOW ON (BE52)
              RE HIS
              >> ME TO MY TABLE (BCBD)
              ENT AB65
              RE NAME >>AB46
              GE
              MOST COMMAND INDEX (BE53)
              PERM HINGS
              HAPPIN TED PARMS BITS (B97F)
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: AB99
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  AB99  ELSE, "FILE TYPE MISMATCH"
  AB9C  RETURN

        ******** RUN "SYS" FILE *****************

  AB9D  CLOSE ALL OPEN FILES <B54C>
  ABA0  CLOSE EXEC <B355>
  ABA5  LSB OF A$ IS 00 (BE58)
  ABA8  FREE UP ALL OF BI'S MEMORY (BF6B)
  ABBB  A$2000 IS WHERE IT WILL LOAD (BE59)
  ABC0  TYPE IS "SYS" (BE6A)
  ABCA  FORCE, T, PATHNAME1, AD PARMS (BE56)
  ABCD  GO DO A STANDARD BRUN >>AE5B

ABD0 *********** "CHAIN" COMMAND ***************************************

  ABD0  SQUASH VARIABLES UP AGAINST HIMEM <A449>
  ABD5  SAVE HIMEM (BC7B)
  ABDC  SET NEW HIMEM BELOW COMBINED VARS
  ABDE  LOAD FILE (LEAVE OTHERS OPEN) <AC47>
  ABE4  RESTORE OLD HIMEM
  ABE6  ERROR? >>AC58
  ABE8  NO, CLEAR VARIABLES <D665>
  ABEB  REEXPAND VARIABLES DOWN AGAINST LOMEM <A4AF>
  ABF0  THEN GO "RUN" PROGRAM >>AC07
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: AC2D
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

AC30 *********** "LOAD" COMMAND ***************************************

  AC30  LOAD PROGRAM <AC42>
  AC33  ERROR? IF NOT, FALL THRU TO WARMSTART >>AC58

AC35 *********** WARMDOS: WARMSTART BI ********************************

  AC35  CLEAR APPLESOFT, RESET POINTERS <D665>
  AC38  RESET MODE/SET INTERCEPTS <9A17>
  AC3D  CURSOR HORIZ. = 0 (START OF LINE)
  AC3F  GO WARMSTART APPLESOFT >>D43F

AC42 *********** LOAD A PROGRAM ***************************************

  AC42  CLOSE ALL OPEN FILES <B54C>
  AC45  ERROR? >>AC58
  AC47  GO LOAD FILE <AC59>
  AC4A  ERROR? >>AC58
  AC4C  SET LOMEM = ARRAYS = FREESTART
  AC4E  ALL TO END OF PROGRAM LOADED
  AC58  RETURN

AC59 *********** READ A PROGRAM FROM A FILE ***************************

  AC59  READ REQUESTED
  AC5B  TYPE = BAS ASSUMED
  AC5D  OPEN THE FILE <B1EE>
  AC60  ERROR? >>AC58
  AC64  MLI: GET EOF <BE70>
  AC67  ERROR? >>AC58
  AC6B  APPLESOFT PROGRAM START --> READ DATA (BED7)
  AC6E  ADD TO THAT THE EOF MARK TO ... (BEC8)
  AC71  SET AD PARM --> END OF PROGRAM IMAGE (BE58)
  AC7F  OVERFLOW? >>AC83
  AC81  NO, WOULD PROGRAM EXCEED HIMEM?
  AC83  IF SO...
  AC85  "PROGRAM TOO LARGE"  >>AC58
  AC87  ELSE, PICK UP LENGTH AGAIN (BEC8)
  AC8D  AND GO READ IT IN <B000>
  AC90  ERROR? >>AC58
  AC92  CLOSE FILE <AFFC>
  AC95  ERROR? >>AC58
  AC97  RELOCATE PROGRAM IF NECESSARY <ACA5>
  ACA0  COPY AD PARM TO APPLESOFT PGM END PTR
  ACA4  RETURN
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: ACA4
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

ACA5 *********** RELOCATE APPLESOFT PROGRAM ***************************

  ACA5  ---
  ACA6  WAS APPLESOFT PROGRAM SAVED FROM SAME
  ACA8  MEMORY LOCATION? (BEB9)
  ACB7  YES, NOTHING TO DO THEN >>ACDB
  ACBD  ELSE, LOOP THROUGH PROGRAM
  ACBF  ADJUSTING ALL ADDRESSES TO
  ACC1  THE NEW LOAD LOCATION
  ACDB  RETURN

ACDC *********** POSITION TO LINE NUMBER ******************************

  ACDC  WAS A LINE NUMBER PARM GIVEN? (BE57)
  ACE2  NO, NEVER MIND >>ACDB
  ACE4  COPY L KEYWORD VALUE TO APPLESOFT'S LINE # (BE68)
  ACEE  THEN CALL APPLESOFT TO FIND THE LINE <D61A>
  ACF4  SUBTRACT ONE FROM THE ADDRESS
  ACF6  AND POINT APPLESOFT'S GETCHR SUBROUTINE
  ACF8  AT IT (SO NEXT CHAR READ WILL BE FIRST
  ACFA  CHARACTER ON THE LINE).
  ACFF  RETURN

AD00 *********** "SAVE" COMMAND ***************************************

  AD00  DOES FILE EXIST ALREADY? >>AD24
  AD02  NO, TYPE = BAS
  AD04  IN T KEYWORD VALUE (BE6A)
  AD07  AND MLI LIST (BEB8)
  AD0C  ALLOW ALL ACCESSES (READ/WRITE/ETC.) (BEB7)
  AD11  SAVE PROGRAM START ADDRESS IN (BEA5)
  AD14  AUXID'S (BEB9)
  AD1F  GO CREATE A NEW FILE <AD8B>
  AD22  ERROR? >>AD6D

  AD24  WRITE ACCESS REQUESTED
  AD26  BAS TYPE FILE
  AD28  OPEN IT <B1EE>
  AD2B  ERROR? >>AD6D
  AD30  SUBTRACT APPLESOFT PTRS TO COMPUTE
  AD32   LENGTH OF PROGRAM.
  AD33  STORE THIS IN EOF MARK LIST (BEC8)
  AD40  MSB OF EOF MARK IS 00 (<64K PGM) (BECA)
  AD45  POINT LIST TO PROGRAM AS DATA TO WRITE (BED7)
  AD4D  WRITE A RANGE TO DISK FILE <B004>
  AD50  ERROR? >>AD6D
  AD54  MLI: SET EOF (TO TRUNCATE OLD LONGER FILE) <BE70>
  AD57  ERROR? >>AD6D
  AD59  CLOSE THE FILE <AFFC>
  AD5C  ERROR? >>AD6D
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: AD60
-------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  AD60  DOES PROGRAM START MATCH AUXID IN FILE INFO?
  AD65  NO, CHANGE IT >>AD6E
  AD6D   ELSE, EXIT

  AD6E  TO CHANGE IT,  (BEB9)
  AD74  EXIT THRU SET FILE INFO ROUTINE >>B833

AD77 *********** "CREATE" COMMAND ***************************************

  AD77  AUXID = 0 (A$ OR RECLN)
  AD82  TYPE KEYWORD GIVEN?
  AD84  YES >>AD8B
  AD88  NO, ASSUME TYPE = DIR (BE6A)

  AD8B  *** CREATE FILE ENTRY *** (BE43)
  AD8E  EXEC FILE ACTIVE?
  AD91  HOW MANY FILES ARE OPEN INCLUDING EXEC? (BE4D)
  AD94  8 OR MORE?
  AD96  YES, ERROR >>ADB3
  AD9B  ELSE, SET TYPE IN MLI LIST (BEA4)
  AD9E  FULL ACCESS (READ/WRITE/ETC.)
  ADA0  KIND = STANDARD FILE
  ADA2  DIR FILE WANTED?
  ADA4  NO >>ADA8
  ADA6  YES, KIND = DIR FILE
  ADA8  SET ACCESS (BEA3)
  ADAB  AND KIND (BEA7)
  ADB0  MLI: CREATE (DON'T COME BACK HERE) >>BE70

  ADB3  "RAM TOO LARGE" ERROR
  ADB5  RETURN

ADB6 *********** "RENAME" COMMAND ***************************************

  ADB6  ---
  ADBA  SECOND PATHNAME GIVEN?
  ADBD  IF SO, GO MLI: RENAME >>ADC4
  ADBF  "SYNTAX ERROR" OTHERWISE >>A879

ADC2 *********** "DELETE" COMMAND ***************************************

  ADC2  SETUP MLI: DELETE CALL TYPE
  ADC4  EXIT THRU MLI CALL >>BE70

ADC7 *********** "LOCK" COMMAND *****************************************

  ADC7  GET FILE INFO FOR PATHNAME1 <B82A>
  ADCA  GET ACCESS CODES (BEB7)
  ADCD  TURN OFF ALL...
  ADCF  BUT READ
  ADD4  THEN GO SET UPDATED FILE INFO >>B841
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: ADD4
-------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

ADD7 *********** "UNLOCK" COMMAND ***************************************

  ADD7  GET FILE INFO FOR PATHNAME1 <B82A>
  ADDA  TURN ON ALL FILE ACCESSES
  ADE2  THEN GO SET UPDATED FILE INFO >>B841

ADE5 *********** "PREFIX" COMMAND ***************************************

  ADE5  SLOT/DRIVE GIVEN ON COMMAND? (BE57)
  ADEB  IF SO, GOT OPERAND ALREADY >>ADF1
  ADED  ELSE, (BE56)
  ADF0  CHECK FOR PATHNAME1
  ADF1  AND GO DO MLI: SET PREFIX ...
  ADF3  IF IT'S THERE >>ADC4
  ADF5  ELSE, IS BASIC PROGRAM RUNNING?
  ADF7  IF SO, SET PREFIX ACTIVE FLAG >>AE16
  ADF9  NO, NEW LINE <9FE2>
  AE01  END OF NAME YET? >>AE0E
  AE03  NO, COPY NAME IN PATHNAME1 BUFFER (BCBD)
  AE08  TO OUTPUT DEVICE <9FE4>
  AE0E  AND SKIP A BLANK LINE <9FE2>
  AE15   DONE

  AE16  SET PREFIX ACTIVE FLAG
  AE18  SO BASIC CAN READ THE PREFIX (BE46)
  AE1C  RETURN

AE1D *********** "BSAVE" COMMAND ***************************************

  AE1D  PATHNAME1 FOUND? >>AE53
  AE1F  NO, NEW FILE (BE57)
  AE22  AD, L, AND E POSSIBLE
  AE24  AD AND EITHER L OR E REQUIRED
  AE26  OR ELSE ERROR >>AE57
  AE2B  PUT AD IN CREATE PARAMETER LIST (BEA5)
  AE2E  AND IN GET FILE INFO LIST (BEB9)
  AE3C  TYPE = BIN ASSUMED (BE6A)
  AE45  T KEYWORD GIVEN?
  AE47  IF SO, ERROR >>AE57
  AE49  GO CREATE THE FILE <AD8B>
  AE4C  ERROR? >>AE59
  AE4E  GET FILE INFO <B82A>
  AE51  ERROR?  >>AE59
  AE53  WRITING...
  AE55  GO PROCESS LIKE A BLOAD OTHERWISE >>AE6A
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: AE55
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  AE57  "PATH NOT FOUND" ERROR
  AE59  ---
  AE5A  RETURN

AE5B ********** "BRUN" COMMAND ***************************************
          (DOES NOT SET MODE=4 SO DOS COMMANDS MAY
          NOT BE ISSUED AS WITH A BASIC PROGRAM)

  AE5B  BLOAD IT FIRST <AE68>
  AE5E  ERROR? >>AE59
  AE60  THEN CALL IT <AE65>
  AE63   THEN EXIT
  AE64  RETURN
  AE65  INDIRECT JMP TO BINARY PROGRAM >>BED7

AE68 ********** "BLOAD" COMMAND **************************************

  AE68  READING...
  AE6A  TYPE = BIN
  AE6C  OPEN THE FILE <B1EE>
  AE6F  ERROR? >>AE59
  AE71  ASSUME USER SPECIFIED AD KEYWORD (BE58)
  AE7A  IF SO, USE HIS ADDRESS >>AE8C
  AE7C  ELSE, USE AD IN FILE INFO AUXID (BEB9)
  AE85  WAS T KEYWORD GIVEN?
  AE87  YES, INVALID PARM (ONLY BIN IS LEGAL) >>AEC3
  AE8C  POINT READ/WRITE PARMS TO DATA (BED7)
  AE92  AND SAVE THIS ADDRESS IN AUXID (BEB9)
  AE98  PICK UP LENGTH FROM L KEYWORD VALUE (BE5F)
  AE9E  WAS L OR E GIVEN?
  AEA0  NEITHER >>AEC7
  AEA2  BOTH?
  AEA4  YES...NAUGHTY! >>AEC3
  AEA6  E GIVEN?
  AEA8  NO, MUST BE L >>AEDD
  AEAA  YES... (BE5D)
  AEAE  COMPUTE L = (E - AD) (BE58)
  AEBA  PLUS ONE FOR INCLUSIVE RANGE >>AEBD
  AEBD  MAKE SURE NO BORROW OCCURED >>AEDD

  AEBF  OR ELSE, "RANGE ERROR"
  AEC2  RETURN

  AEC3  "INVALID PARM" ERROR
  AEC6  RETURN
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: AEC6
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  AEC7  ---
  AEC9  MLI: GET EOF <BE70>
  AECC  ERROR? >>AEDB
  AECE  GET L (EOF MARK) (BEC8)
  AED4  BETTER NOT EXCEED 64K (BECA)
  AED7  NO.. >>AEDD

  AED9  YES, "PROGRAM TOO LARGE"
  AEDB  ---
  AEDC  RETURN

  AEDD  STORE LENGTH TO READ OR WRITE (BED9)
  AEE6  B KEYWORD GIVEN?
  AEE8  NO >>AF0F
  AEEC  YES, COPY B VALUE TO SET MARK LIST (BE5A)
  AEF5  ---
  AEF7  MLI: SET MARK <BE70>
  AEFD  NO ERROR? >>AF0F
  AEFF  ERROR, RANGE ERROR?
  AF01  NO >>AEDB
  AF03  BSAVING (NOT BLOAD/BRUNING)?
  AF05  NO >>AEDB
  AF09  MLI: FORCE EOF FORWARD TO MARK <BE70>
  AF0C  AND TRY SET MARK AGAIN >>AEF5
  AF0E  RETURN
  AF0F  GET COMMAND NUMBER (BE53)
  AF12  ASSUME READ
  AF14  BSAVE?
  AF16  NO, READ IS CORRECT >>AF32
  AF18  ELSE, BSAVING... (BE57)
  AF1B  L OR E GIVEN?
  AF1D  NO, RESAVING, GO RIGHT NOW >>AF30
  AF22  MUST UPDATE EOF TO NEW PLACE (BEC8)
  AF2D  MLI: SET EOF <BE70>
  AF30  WRITING
  AF32  MLI: READ OR WRITE <BE70>
  AF35  ERROR? >>AEDB
  AF37  NO, BSAVE?
  AF39  NO >>AF3E
  AF3B  YES, SET FILE INFO WITH AD AND L VALUES <B833>
  AF3E  THEN EXIT THRU CLOSE  >>AFFC

AF41 ********** "STORE" COMMAND **************************************

  AF41  PATHNAME1 EXISTS? >>AF55
  AF43  NO, T = VAR BY DEFAULT
  AF4B  FULL ACCESS (READ/WRITE/ETC.)
  AF50  CREATE THE FILE <AD8B>
  AF53  ERROR? >>AFA1
  AF55  COMPRESS APPLESOFT VARS AGAINST HIMEM <A449>
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: AF5C
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  AF5C  OPEN "VAR" FILE FOR WRITE <B1EE>
  AF5F  ERROR? >>AF9A
  AF61  POINT TO INTERNAL 5 BYTE HEADER BUFFER <AFA2>
  AF64  AND WRITE OUT LENGTHS OF VARS <B004>
  AF67  ERROR? >>AF9A
  AF69  STORE ADDRESS OF VARS (BC8E)
  AF6C  IN READ/WRITE PARM LIST (BED7)
  AF6F  AND FILE INFO AUXID (BEB9)
  AF7B  GET LENGTH OF VARS (BC91)
  AF81  AND WRITE THEM OUT <B004>
  AF84  ERROR? >>AF9A
  AF88  MLI: GET MARK <BE70>
  AF8D  MLI: SET NEW EOF (TRUNCATE IF NECESSARY) <BE70>
  AF90  ERROR? >>AF9A
  AF92  SET FILE INFO WITH AD OF VARS <B833>
  AF95  ERROR? >>AF9A
  AF97  CLOSE FILE <AFFC>
  AF9A  ---
  AF9C  REEXPAND VARS BACK AGAIN <A4AF>
  AFA1  RETURN

AFA2 *********** SETUP TO READ/WRITE VAR HDR *************************
          APPLESOFT VARIABLES HEADER CONSISTS OF:
          2 BYTE LENGTH OF SIMPLE+ARRAY VARIABLES
          2 BYTE LENGTH OF SIMPLE VARIABLES ONLY
          1 BYTE MSB OF HIMEM FOR THESE VARIABLES

  AFA2  STORE ADDRESS OF 5 BYTE INFO
  AFA4  IN READ/WRITE PARM LIST (BED7)
  AFAE  LENGTH = 5
  AFB0  RETURN

AFB1 *********** "RESTORE" COMMAND ************************************

  AFB1  TYPE = VAR
  AFB3  READING
  AFB5  OPEN THE FILE <B1EE>
  AFB8  ERROR? >>AFA1
  AFBA  SET UP TO READ THE HEADER <AFA2>
  AFBD  READ 5 BYTE HEADER <B000>
  AFC0  ERROR? >>AFA1
  AFC2  PICK UP WHERE TO READ IN COMPRESSED VARS (BEB9)
  AFC5  FROM AUXID (BC8E)
  AFCB  ADJUST MSB OF THIS BY THE DIFFERENCE
  AFCE  BETWEEN HIMEM'S (NOW AND WHEN STORED) (BC8D)
  AFDB  MAKE SURE VARS WON'T OVERLAY PROGRAM
  AFDD  IF SO, ERROR >>AFF8
  AFE7  COMPUTE LENGTH OF ALL VARS/STRINGS
  AFE9  (HIMEM-START) (BC8F)
  AFED  GO READ COMBINED VARS INTO MEMORY <B000>
  AFF0  ERROR? >>AFA1
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: AFF2
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  AFF2  CLOSE THE FILE <AFFC>
  AFF5  EXIT BY RESETTING INVEC OR OUTVEC (BE59)
  AFF8  "PROGRAM TOO LARGE" ERROR
  AFFB  RETURN

AFFC *********** CLOSE FILE ***************************************

  AFFC  SET MLI CLOSE OPCODE
  AFFE  AND GO TO MLI <BF00>

B000 *********** READ/WRITE ***************************************

  B000  READ MLI OPCODE
  B002  JUMP IN >>BF00
  B004  WRITE MLI OPCODE
  B006  STORE LENGTH
  B00C  EXIT THRU OPCODE
        WITH (BEDA)

B00F *********** "SLOT" COMMAND ***********************************

  B00F  USE CSWL AS "SLOT#" COMMAND
  B014  JUMP TO COMMON CODE

B016 *********** "IN#" COMMAND ************************************

  B016  USE KSWL AS "IN#" COMMAND
  B01B  AND INVEC
  B01D  OR IN SLOT
  B020  *2 FOR USE AS INDEX
  B025  WAS SLOT PARAMETER GIVEN BY THE VARS DOWN >>AF9A
  B027  NO... >>B03A AS INDEX
  B029  YES, (BE57) PARAMETER ERROR
  B02C  AD GIVEN? >>B04F
  B02E  NO, GET IN
  B031  AND STORE >>B04F ***************************************
  B03A  VALIDITY CHECK OR OUT
  B03D  NO GOOD? >>B04E AD KEYW
  B03F  GET INDEX BACK I/O D
  B045  AND REPLACE >>B04E
  B048  HIS ADDRESS TO CSWL OR  RANGE ***************************
  B04E  RETURN      S ONE OR TH
                    S (BE59)
  B04F  VALIDITY C
  B052  NO GOOD? >>
  B054  GOOD, COPY ECK AD KE
  B060   EXIT BUT  >>B060
                   R WRITE >>BE70
                   VALUE TO
                   DON'T REDIRECT ***********************************
                   >>B01D
                   AD ***********************************************
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B060
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------


B061 ********** VALIDITY CHECK I/O DRIVER **************************

  B061  $3A/3B --> NEW HANDLER (FROM AD PARM) (BE58)
  B06D  IS DRIVER IN MAIN RAM (BELOW $C000)?
  B06F  YES >>B086
  B071  NO, RESET I/O CARD ROMS (CFFF)
  B074  USE $3C TO COUNT ITERATIONS
  B076  TEST ROM AT USER'S ADDRESS
  B07C  FOR STABILITY
  B080  256 TIMES
  B084   MUST BE OK
  B085  RETURN
  B086  MAIN RAM I/O DRIVER
  B088  MUST START WITH A "CLD" INSTRUCTION
  B08A  OK... >>B084

  B08C  ELSE, "NO DEVICE CONNECTED"
  B08F  RETURN

B090 ********** "CAT" COMMAND ***************************************

  B090  39 CHARACTERS PER LINE
  B092  THEN PROCESS LIKE "CATALOG" >>B096

B094 ********** "CATALOG" COMMAND ***********************************

  B094  79 CHARACTERS PER LINE
  B096  STORE LINE LENGTH (BCB6)
  B09C  TEST FOR T AND
  B09E  ....PATHNAME1 GIVEN
  B09F  GOT T >>B0A4
  B0A1  NO T, T=0 (ANY TYPE WILL DO) (BE6A)
  B0A4  GOT PATHNAME1 >>B0AB
  B0A6  NO PATHNAME1, GET FILE INFO FOR PREFIX <B82A>
  B0A9  ERROR? >>B111
  B0AB  OPEN/READ DIRECTORY HEADER <B1A4>
  B0AE  ERROR? >>B111
  B0B0  SKIP TO A NEW LINE <9FE2>
  B0B3  FORMAT DIRECTORY'S NAME TO $201 <B112>
  B0B6  PRINT $201 <9FD4>
  B0B9  SKIP TO A NEW LINE <9FE2>
  B0BC  BLANK $201 BUFFER <A6A9>
  B0C1  UNPACK HEADING MESSAGE LINE <9FE7>
  B0C4  PRINT IT (40 OR 80 COLUMNS) <9FD4>
  B0C7  SKIP TO A NEW LINE <9FE2>
  B0CD  ANY FILES IN THIS DIRECTORY? (BCBA)
  B0D0  NO >>B0FD
  B0D2  YES, READ NEXT ENTRY <B22B>
  B0D5  ERROR? >>B111
  B0D7  GET TYPE REQUESTED FOR SEARCH (BE6A)
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B0DA
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  B0DA  ANY TYPE WILL DO? >>B0E1
  B0DC  YES, CHECK TYPE AGAINST THIS ENTRY (0269)
  B0DF  NOT IT, SKIP IT >>B0E7
  B0E1  ELSE, FORMAT ENTRY TO $201 <A501>
  B0E4  AND PRINT $201 <9FD4>
  B0E7  CHECK KEYBOARD (C000)
  B0EA  CHR A CONTROL-C
  B0EC  IGNORE ANYTHING ELSE >>B0F8

  B0EE  CONTROL-C, WHAT STATE ARE WE IN? (BE42)
  B0F1  DEFERRED >>B0FD
  B0F3  OK, IMMEDIATE, RESET KEYBOARD STROBE (C010)
  B0F6  AND EXIT RIGHT NOW >>B0FD

  B0F8  ELSE, ANY FILES LEFT IN COUNT? (BCBA)
  B0FB  YES, CONTINUE >>B0D2
  B0FD  CLOSE, CLOSE DIRECTORY <AFFC>
  B100  ERROR? >>B111
  B102  SKIP TO A NEW LINE <9FE2>
  B105  FORMAT BLOCKS FREE AND IN USE TO $201 <B141>
  B108  ERROR? >>B111
  B10A  PRINT $201 <9FD4>
  B10D  SKIP A LINE <9FE2>
  B111  DONE

B112 ********** FORMAT NAME OF DIRECTORY ***************************

  B112  BLANK $201 BUFFER <A6A9>
  B115  FILE NAME IS AT +1 INTO DIR ENTRY
  B117  GET NAME LENGTH/TYPE (025D)
  B11C  VOLUME DIRECTORY HEADER?
  B11E  NO >>B124
  B120  YES, START NAME WITH "/" (0200)
  B124  AE-
  B125  ISOLATE NAME LENGTH FROM TYPE
  B127  AND SET UP LENGTH TO COPY (0200)
  B12C  COPY DIRECTORY NAME TO (0259)
  B131  ADD.LINE (0200)
  B13B  SET $200 TO MAXIMUM LENGTH
  B140  RETURN

B141 ********** FORMAT BLOCKS FREE/INUSE ***************************

  B141  PRINT MLI:ONLINE PARMLIST
  B143  TO TXTBUF (PATHNAME1) (BEC8)
  B14B  COPY DEVICE NUMBER (UNIT) (BF30)
  B153  MLI: ONLINE <BE70>
  B156  ERROR? >>B111
  B15B  ISOLATE NAME LENGTH FROM BUFFER
  B15E  BUMP BY ONE TO INCLUDE "/"
  B15F  AND STORE IT AS A PREFIX (BCBC)
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: B164
-------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  B164   STORE "/" AS FIRST CHAR IN PATHNAME BUFFER (BE7D)
  B167   GET FILE_ENTRY_LENGTH (BED9)
  B16A   ERROR? >>B1EE
  B16C   BLANK $27 BYTES AFTER PATHNAME (BE7E)
  B171   UNPACK "/" INTO PATHNAME BUFFER (BE7D)
  B174   ZERO THE REST OF PATHNAME BUFFER (BE7D)
  B17F   CONVERT BLOCKS FREE TO ASCII (BCBD)
  B18A   CONVERT THREE BYTE BLOCKS USED TO ASCII (BCBD)
  B191   BLOCKS FREE = TOTAL BLOCKS - BLOCKS USED <A6A9>
  B198   ... - BLOCKS USED <A6A9>
  B19F   CONVERT BLOCKS USED.. TO ASCII (BCBD)
  B1A3    DONE!

B1A4 ************ OPEN/READ/CLOSE DIRECTORY FILE ************************

  B1A4   READ ONLY ACCESS <B23D>
  B1A8   CHECK FILE_TYPE = DIR <A66C>
  B1AB   VOLUME DIRECTORY HEADER KEY_POINTER (BEBC)
  B1AD   NO >>B1B7
  B1AF   YES, TYPICAL VOLUME DIRECTORY <B23D>
  B1B2   OPEN THE DIRECTORY FILE <A66C>
  B1B5   ERROR? IF <> DIR FILE <B3BB>

B1B7 ************ NOT, FREE DIRECTORY HDR ************************************

  B1B7   BUFFER IS READ DIR (B3B8)
  B1C3   LENGTH IS $27 <B23D>
  B1CD   MLI: READ $259 ALL THRU >>B1ED
  B1D0   ERROR? >> $2B (OPEN)
  B1D4   COPY ENTRY <B370> DIRECTORY HDR ***************************
  B1D7   AND FILE_ENTRY_LENGTH (BED9)
  B1DD   STORE ENTRY LENGTH
  B1E2   SET COUNT FOR ENTRY) (BED9)
  B1E7   MARK = 0 ENTRY LENGTH
  B1ED   RETURN  POINTER TO FIRST ENTRIES PER BLOCK, (027C)
                 (START OF DIR HDR (BCB7)
                 IN READ LENGTH NOW (BED9)

B1EE ************ OPEN FILE ENTRY IN BLOCK (BCBB)
          A REGISTER = ACCESS FILE) (BEC9)
          X REGISTER = DEVICE ***************************

  B1EE   ---
  B1F2   T KEYWORD GIVEN? ESS BITS
  B1F4   NO >>B1F9 EFAULT TYPE
  B1F6   YES, USE
  B1F9   ---
  B1FA   EXISTING KEYWORD
  B1FD   NO, ERROR
  B1FF   CHECK ACCESS FILE OF
  B202   REQUESTED >>B227 VALUE INSTEAD (BE6A)
  B204   SET SYSTEM ACCESS REQ
  B20C   LEVEL = ACCESS THIS TYPE? (BEB8)
                 BUFFER
                 $0F (B29)
                 SSTED (BEB7)
                 OT PERMITTED >>B227
                 N OPEN PARM LIST (BC88)
                 4)
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: B211
-------------------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  B211   MLI: OPEN <BE70>
  B214   ERROR? >>B222
  B219   SAVE REFNUM IN READ/WRITE PARMLIST (BED6)
  B21C   AND CLOSE PARMLIST (BEDE)
  B21F   AND GET/SET EOF/MARK LIST (BEC7)
  B222    AND EXIT

  B223   "FILE TYPE MISMATCH"
  B226   RETURN
  B227   "FILE LOCKED"
  B22A   RETURN

B22B ************ READ NEXT DIRECTORY ENTRY ****************************

  B22B   FORCE MARK TO START OF THIS BLOCK (BEC9)
  B233   CHECK ENTRY NUMBER (BCBB)
  B238   LAST ENTRY IN THIS BLOCK? (BCB8)
  B23B   NO >>B247
  B23E   YES, ENTRY 0 NEXT TIME (BCBB)
  B241   BUMP MARK TO NEXT BLOCK (BEC9)
  B247   ---
  B249   MARK POSITIONED TO PROPER ENTRY YET? >>B252
  B24B   NO, BUMP POINTER TO NEXT ENTRY (BCB7)
  B24E   AND CONTINUE IF STILL FIRST PAGE >>B247
  B250   JUST ENTERED SECOND PAGE >>B244
  B252   ADD 4 TO PTR TO ADJUST FOR BLOCK PREFIX
  B259   MLI: SET MARK <BE70>
  B25C   ERROR? >>B277
  B260   MLI: READ <BE70>
  B263   ERROR? >>B277
  B265   BUMP ENTRY COUNTER (BCBB)
  B26B   IS THIS ENTRY VALID?
  B26D   NO, SKIP OVER IT >>B22B
  B26F   DECREMENT FILE COUNT (BCB9)
  B277    AND RETURN TO CALLER

B278 ************ EXTERNAL COMMAND HANDLER ******************************

  B278   INDIRECT JMP TO XTRNAD VECTOR >>BE50

B27B ************ "EXEC" COMMAND ****************************************

  B27B   IS THIS FILE OPEN ALREADY? <B479>
  B27E   NO >>B2AA
  B280   YES, EXEC CLOSING? (BE4E)
  B283   NO >>B2A6
  B285   SAVE REFNUM (BEC7)
  B28A   RESET MARK TO ZERO (BEC8)
  B295   MLI: SET MARK <BE70>
  B298   ERROR? >>B29F
  B29A   GET REFNUM AGAIN (BEC7)
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B29D
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

 B29D  GO RESTART THIS EXEC FILE FROM ITS START >>B31D

        ******** CLOSE EXEC FILE ****************

 B29F   PRESERVE CALLER'S AREG
 B2A0  AND CLOSE THE FILE <B355>
 B2A5   THEN RETURN WITH ERROR

 B2A6  "FILE BUSY" ERROR
 B2A9  RETURN

        ******** CONTINUE EXEC SETUP ************

 B2AA  EXEC ACTIVE? (BE43)
 B2AD  NO >>B2B4
 B2AF  YES, CLOSE IT <B355>
 B2B2  ERROR? >>B2BD
 B2B4  GET FILE TYPE (BEB8)
 B2B7  SHOULD BE TXT
 B2B9  IT IS >>B2BF

 B2BB  ELSE, "FILE TYPE MISMATCH"
 B2BD   RETURN WITH ERROR
 B2BE  RETURN

 B2BF  MOVE STRINGS TO MAKE ROOM FOR A BUFFER <A232>
 B2C2  NO ROOM? >>B2BD
 B2C6  STORE NEW BUFFER ADDRESS IN PARM LIST (BEC8)
 B2CF  GET COUNT OF OPEN FILES (BE4D)
 B2D2  NO OTHERS CURRENTLY OPEN? >>B2F8

        ******** MAKE EXEC TOPMOST BUFFER *******

 B2D4   OTHERS ARE OPEN...
 B2D6  OPENCOUNT*4 (4 PAGES PER BUFFER)
 B2D8  ADD THIS TO MY BUFFER TO FIND TOP BUFFER (BC88)
 B2DC  SEARCH OPEN FILES TO FIND THE FILE WHICH (BC93)
 B2DF  IS USING THIS BUFFER... >>B2E5
 B2E4   IF IT IS NOT FOUND, BREAK!
 B2E5  ---
 B2E6  MOVE THAT FILE TO THE NEW BUFFER INSTEAD (BC93)
 B2E9  GET THAT FILE'S REFNUM ALSO (BC9B)
 B2F1  MLI: SET BUFF <BE70>
 B2F4  NO ERRORS? >>B2F7
 B2F6   IF ERROR, BREAK!
 B2F7  ---
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B2F7
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

        ******** OPEN NEW EXEC FILE *************

 B2F8  SET NEW BUFFER ALLOCATION PAGE (BC88)
 B2FB  SET UP OPEN LIST FOR EXEC TOO (BECF)
 B300  LEVEL = 0 (BF94)
 B305  MLI: OPEN (EXEC FILE) <BE70>
 B308  NO ERROR? >>B311

 B30A  ---
 B30B  IF ERROR, FREE BUFFER FIRST <A289>
 B310   THEN EXIT WITH ERROR

 B311  SAVE BUFFNO FOR EXEC (BECF)
 B317  AND REFNUM TOO (BED0)

        ******** COMPLETE EXEC COMMAND **********

 B31D  SAVE READ REFNUM (BED6)
 B320  AND GET/SET REFNUM (BEC7)
 B323  AND NEWLINE REFNUM (BED2)
 B329  SET "L" VALUE FROM AUXID (BE5F)
 B332  SAVE PATHNAME/AUXID IN OPEN FILE TABLE <B445>
 B337  IGNORE MSB FOR END OF LINE CHARS (BED3)
 B33C  MLI: SET NEWLINE <BE70>
 B342  WAS "F" OR "R" GIVEN ON COMMAND LINE?
 B344  NO >>B34E
 B346  YES, POSITION TO SPECIFIED STARTING PT <B57C>
 B349  NO ERRORS? >>B34E
 B34B  IF ERROR, GO CLOSE EXEC >>B29F
 B34E  MARK EXEC ACTIVE
 B354   AND RETURN TO CALLER

B355 *********** CLOSE EXEC FILE ************************************

 B355  EXEC ACTIVE? (BE43)
 B358  NO, SKIP IT >>B365
 B35A  INDICATE EXEC FILE CLOSING (BE4E)
 B35F  PICK UP REFNUM FOR EXEC (BC9B)
 B362  AND GO CLOSE IT <B4FF>
 B365  RETURN

B366 *********** "VERIFY" COMMAND ************************************

 B366  FILE NOT FOUND? >>B3A1
 B36B  FILE FOUND, WAS A PATHNAME1 GIVEN?
 B36D  YES >>B377
 B36F  NO,
 B371  PRINT "(C) APPLE COMPUTER..." <9FC3>
 B374  AND A NEW LINE <9FE2>
 B377   THEN EXIT
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B378
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  B378  RETURN

B379 ********** FLUSH ALL OPEN FILES *******************************

  B379  REFNUM = 0 (ALL FILES)
  B37B  JUMP INTO FLUSH >>B389

B37D ********** "FLUSH" COMMAND ************************************

  B37D  ---
  B380  WAS PATHNAME1 GIVEN?
  B382  NO, FLUSH ALL FILES >>B389
  B384  ELSE, LOOK UP NAME IN OPEN FILE LISTS <B479>
  B387  NOT AN OPEN FILE >>B391
  B389  SAVE REFNUM IN PARM LIST (BEDE)
  B38E  MLI: FLUSH <BE70>
  B391   EXIT

B392 ********** "OPEN" COMMAND *************************************

  B392  ---
  B393  LOOK UP NAME IN OPEN FILE LIST <B479>
  B396  NOT CURRENTLY OPEN? >>B3A5

  B398  ---
  B399  IT IS OPEN, "FILE BUSY" ERROR
  B39C  RETURN

  B39D  "FILE TYPE MISMATCH" ERROR
  B3A0  RETURN

  B3A1  "PATH NOT FOUND" ERROR
  B3A3  ---
  B3A4  RETURN

  B3A5  ---
  B3A6  ASSUME "L" IS ZERO
  B3AD  WAS "L" KEYWORD GIVEN?
  B3AF  YES, USE HIS VALUE >>B3B7
  B3B1  NO, SET "L" TO ZERO (BE60)
  B3BA  WAS "T" GIVEN?
  B3BE  YES, USE HIS TYPE >>B3C5
  B3C0  ELSE, DEFAULT TO "TXT"
  B3C5  DOES THE FILE ALREADY EXIST? >>B3E8
  B3C7  NO, "T" GIVEN? IF SO, ERROR >>B3A1
  B3C9  FORCE TYPE = "TXT" (BEB8)
  B3CE  FULL ACCESS (BEB7)
  B3D4  COPY "L" KEYWORD VALUE (BE5F)
  B3D7  TO CREATE (BEA6)
  B3DA  AND SET FILE INFO LISTS (BEBA)
  B3E3  GO CREATE THE FILE <AD8B>
```

```
BASIC Interpreter (BI) --
-------------------------
ADDR    DESCRIPTION/CONTE
-------------------------

  B3E6  ERROR? >>B3A3
  B3E8  CHECK FILE TYPE (I
  B3EB  AGAINST HIS "T" V
  B3EE  MISMATCH? >>B39D
  B3F0  NO, TYPE = TXT?
  B3F2  NO >>B407
  B3F4  YES, GET RECORD L
  B3FD  WAS "L" KEYWORD V
  B3FF  YES, USE THAT INS
  B401  OTHERWISE, SAVE A
  B407  ALLOCATE A NEW FI
  B40A  ERROR? >>B3A3
  B40C  GET BUFFER PAGE N
  B40F  AND STORE IN OPEN
  B414  LEVEL = 7 (BF94)
  B419  MLI: OPEN <BE70>
  B41C  NO ERRORS? >>B425

  B41E  ---
  B41F  ERROR, FREE BUFFE
  B424   THEN EXIT WITH E

  B425  CHECK FILE TYPE A
  B428  "DIR" FILE?
  B42A  YES >>B42D
  B42C   NO
  B42D  ---
  B430  SET DIR FLAG ACCO
  B433  USING OPEN COUNT
  B439  STORE BUFFER LOCA
  B43F  ALSO, THE REFNUM
  B442  AND BUMP OPEN FIL

B445 ********** SAVE FIL

  B445  MAKE INDEX FROM R
  B44B  GET NAME LENGTH (
  B44E  OR IN DIR FLAG (B
  B451  AND STORE IN OPEN
  B457  NAME > OR = TO 30
  B459  NO... >>B45D
  B45B  YES, USE 29
  B45D  STORE THAT AS A L
  B462  COPY "L" KEYWORD
  B46B  ---
  B46C  COPY FILE NAME TO
  B475  COPY ALL OF NAME,
```

```
(BE7)
FILE NAME LIST (BCFE)
BYTES?

OO? COUNTER
VALUE TO NAME LIST TOO (BCFF)

NAME LIST (0280)
THEN FALL THRU TO EXIT >>B46B
```

```
**********

V1.0.1 -- 1 JAN 84    NEXT OBJ
-------------------------------
S
-------------------------------

EB8)
UE (B36A)

NGTH FROM AUXID (BEBA)
UE GIVEN?
AD >>B407
ID RECORD LEN (BE60)
BUFFER <A232>

(BC88)
ST (BECF)

FIRST <A289>
ROR CODE

AIN (BEB8)
```



```
DINGLY (BE47)
AS AN INDEX (BE4D)
ION IN OPEN FILE LIST (BC94)
(BC9C)
S COUNT AND FALL THRU (BE4D)

E NAME/RECLEN IN TABLE *******

EFNUM*32 BYTES
0280)
```

```
ECT ADDR: B3E6
```

```
B484  ANY FILES CL
B487  NO, CAN'T E
B489  YES, CLEAR EX
B48C  STORE FILE CO
B48E  GET NEXT REF
B491  COMPARE FILE
B494  NOT THE OWNE
B496  ELSE, WE'VE C
B498  PICK UP APPRO
B49B  ---
B49C   AND RETURN W
B49D  ELSE, NOT IT
B4A0  AND CONTINUE

B4A2  CAN'T FIND IT
B4A5  NO, THEN WE M
B4AA  IS HE LOOKING
B4AD  NO, GIVE UP >
B4B1  YES, EXEC FI
B4B6  AND RETURN WI

B4B8  "FILE NOT OPE
B4BB   RETURN WI

B4BC ********** COM

B4BC  REFNUM*32 SOR
B4C2  PICK UP DIR F
B4CA  SAME LENGTH?
B4CD  NO, CAN'T BE
B4D0  MAKE SURE LEN
B4D4  IF IT DOESN'T
B4D6  USE $3A AS C
B4DB  COPY "E" OF
B4E4  ---

                    ) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B475
                    ----------------------------------------------------
                    CONTENTS
                    ----------------------------------------------------

                     COMMANDS AND
                    LLER

                    " AND "NOMON" COMMANDS **************************
                    UP OPEN FILENAME *********************************
                    FNUM OF OPEN FILE)

                     GIVEN?

                    RROR"
                    ROR

                    RENTLY OPEN? (BE4D)
                    D IT THEN >>B4A2
                    EC FILE CLOSING FLAG (BE4E)
                    UNT AS LOOP COUNTER
                    UM (BC9B)
                    AMES  <B4BC>
                    >>B49D
                    OT IT!
                    PRIATE REFNUM (BC9B)

                    ITH IT
                     TRY NEXT ONE
                    LOOPING >>B48C

                    , IS EXEC ACTIVE? (BE43)
                    UST GIVE UP >>B4B8
                     FOR EXEC FILE? <B4BC>
                    >B4B8
                    E CLOSING (BE4E)
                    TH EXEC'S REFNUM >>B498

                    N" ERROR
                    ERROR CODE

                    ARE FILENAMES ************************************
```



```
                     FILENAME INDEX
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B4E5
                    LAG FROM THIS ENTRY (BCFE)
ADDR    DESCRIPTION/C  S HIS FILENAME? (0280)
                    IT THEN >>B4F2
                    GTH DOES NOT EXCEED 29
                    NLY LOOK AT FIRST 29
                    OP COUNTER
B477 ********** "MO HIS FILE TO KEYWORD (BCA4)

B477  IGNORE THIS?
B478   RETURN TO CA

B479 ********** LOOK
       (RETURNS RF

B479  ---
B47C  WAS PATHNAME1
B47E  YES >>B484

B480  NO, "SYNTAX E
```



```
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

B4E5  COMPARE NAMES (0280)
B4EB  NO MATCH? EXIT WITH Z FLAG CLEAR >>B4F2
B4F2   MATCH, EXIT WITH Z FLAG SET

B4F3 ********** "CLOSE" COMMAND ************************************

B4F3  ---
B4F6  PATHNAME1 GIVEN?
B4F8  NO, CLOSE ALL FILES >>B54C
B4FA  YES, LOOK IT UP IN OPEN FILE TABLES  <B479>
B4FD  NOT FOUND? >>B49B
B4FF  FOUND IT, STORE REFNUM IN CLOSE LIST (BEDE)
B505  MARK BUFFER PAGE FREE (BC88)
B508  EXEC CLOSING? (BE4E)
B50B  YES...NO NEED TO COMPRESS LISTS >>B529
B50D  GET OPEN COUNT (LAST OPENED FILE NO.) (BE4D)
B511  SWAP BUFFERS (BC93)
B51F  AND REFNUMS WITH THE LAST OPENED FILE (BC9B)
B529  ---
B52B  LEVEL = 0 (BF94)
B530  MLI: CLOSE <BE70>
B533  ERROR? >>B55C
B535  RELEASE THE BUFFER <A289>
B538  EXEC FILE CLOSING? (BE4E)
B53B  NO >>B548
B540  YES, EXEC NO LONGER ACTIVE (BE43)
B543  AND NO LONGER CLOSING (BE4E)
B547   RETURN TO CALLER

B548  DROP OPEN FILE COUNT (BE4D)
B54B   AND EXIT

B54C ********** CLOSE ALL OPEN FILES ********************************

B54C  ANY FILES OPEN? (BE4D)
B54F  NO >>B55D
B551  YES, EXEC NOT CLOSING (BE4E)
B557  CLOSE LAST FILE OPENED <B4FF>
B55A  IF THAT WORKS, START ALL OVER AGAIN >>B54C
B55C   EXIT WHEN ALL ARE CLOSED

B55D  ---
B55F  SET CLOSE REFNUM TO ZERO (ALL FILES) (BEDE)
B564  LEVEL = 7 (LEVEL 0 FILES ALREADY CLOSED) (BF94)
B569  EXIT THRU  MLI: CLOSE >>BE70
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B56C
ADDR    DESCRIPTION/CONTENTS
----------------------------------------------------------------------
B56C ********** "POSITION" COMMAND **********************************
B56C   LOOKUP NAME OF FILE <B479>
B56F   NOT OPEN? >>B5D9
B571   SET OPEN? >>B5D9
B574   AND REFNUM IN READ/WRITE PARMLIST (BED6)
B577   DIR? SET NEWLINE LIST (BED2)
B57A   YES, FILE? (BE47)
         S, GET OUT RIGHT NOW! >>B5DA
B57C   "F"
B581   NO# OR "R" GIVEN? (BE57)
B583   BO   INVALID PARM >>B5D7
B585   YE  H GIVEN?
B587   JU , INVALID PARM >>B5D7
B589   NO  T "R" GIVEN?
B58B   JU  JUST "F" >>B597
B58E   ("S  "R", COPY "R" VALUE TO "F" (BE65)
B597   SE  " AND "F" ARE ALIASES) (BE63)
B5A6   BU  COUNT TO 239. (MAXIMUM LINE LEN)
B5A9   --  FER IS AT $200 (BED8)
B5AB   NE
B5B0   ML  LINE CHAR IS EITHER $0D OR $8D (BED3)
B5B3   ER  SET NEWLINE <BE70>
         OR? >>B5D9

         ******** SKIP LINES BY READING THEM *****
B5B5   --
B5B8   "F
B5BC   YE  =0? (BE64)
B5BE   EL  , DONE >>B5DA
B5C0   ML  E...
B5C3   ER  READ NEXT FIELD (LINE) <BE70>
B5C8   DE  OR? >>B5D9
B5D5   AN  CREMENT "F" VALUE BY ONE
         O GO CHECK IT AGAIN >>B5B5
B5D7   "I
B5D9   --  VALID PARAMETER" ERROR
B5DA   EX
         XIT TO CALLER
B5DB **********
         ****** COMPUTE NEW FILE POSITION ***************************
         (COMPUTES ABSOLUTE FILE POSITION MARK)
B5DB   AC
B5EF   MA  UM = CURRENT RECORD LENGTH (BCA4)
         RK = 0 (BEC8)

         ******** MARK = "R" * RECLEN ************
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B5F8
ADDR    DESCRIPTION/CONTENTS
----------------------------------------------------------------------
B5F8   SHIFT "R" VALUE RIGHT (BE66)
B600   IF LOW BIT OFF, NO ADD >>B619
B603   ADD ONE INSTANCE OF RECLEN TO MARK (BC  AE)
B612   OVERFLOW? >>B62C
B617   ACCUM OVERFLOW? >>B62C
B619   SCALE ACCUM (MULTIPLIER) UP BY 2 (BCAF)
B622   IF "R" NON ZERO... (BE65)
B624   CONTINUE LOOPING >>B5F8
B62B   ELSE, EXIT TO CALLER

B62C   "RANGE ERROR"
B62F   RETURN

B630 ********** "READ" COMMAND **********************************
B630   LOOK UP FILE NAME <B479>
B633   NOT OPEN? >>B685
B635   ITS OPEN, STORE REFNUM IN READ/WRITE..  (BED6)
B638   GET/SET... (BEC7)
B63B   AND SET NEWLINE PARMLISTS (BED2)
B63E   DIR FILE? (BE47)
B641   YES, SPECIAL HANDLING REQUIRED >>B686 <B6C0>
B643   NO, PRE-POSITION FOR "B", "F", OR "R"
B646   ERROR POSITIONING? >>B685
B648   ASSUME "L" = 239.
B64F   "L" GIVEN?
B651   NO >>B666
B653   YES, USE HIS "L" VALUE (BE5F)
B659   UNLESS ITS >256 >>B6BB
B65D   OR >239. >>B6BB
B661   DOUBLE QOUTE IT SO COMMAS COME THRU (0200)
B664   READ INTO $201
B666   IF NO "L", READ TO $200 (BED7)
B66C   NL CHAR = $0D/$8D (OR NONE IF "L")  (BED3)
B67B   MLI: SET NEWLINE <BE70>
B67E   ERROR? >>B685
B680   ---
B682   MARK INPUT "READ" FILE ACTIVE (BE44)
B685   AND RETURN

       ******** READ DIR FILE ************
B696   SET READ/WRITE LIST REFNUM (BED6)
B699   AND GET/SET LIST REFNUM (BEC7)
B69E   READING TO $259 (BED7)
B698   INIT CAT FLAG TO FIRST LINE VALUE (BE  F)
B69E   "R" GIVEN?
B6A1   NO, DONE >>B680
B6A5   YES, ZERO OUT MARK (BEC8)
B6B0   MLI: REWIND FILE <BE70>
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B6B3
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------

  B6B3  ERROR? >>B6BA
  B6B7  MARK INPUT FILE ACTIVE (BE44)
  B6BA   AND EXIT

B6BB ********** "RANGE ERROR" ***************************************

  B6BB  "RANGE ERROR" CODE
  B6BF   EXIT TO CALLER

B6C0 ********** PRE-POSITION FOR I/O ********************************

  B6C0  ---
  B6C3  "B", "F", OR "R" GIVEN?
  B6C5  NO, EXIT >>B709
  B6C7  "R"?
  B6C9  NO >>B6D5
  B6CB  YES, COMPUTE ABSOLUTE POSITION <B5DB>
  B6CE  ERROR? >>B6BB
  B6D0  NO, SET MARK TO NEW POSITION <B702>
  B6D3  ERROR? >>B70A
  B6D5  "F" GIVEN? (BE57)
  B6DA  NO >>B6E1
  B6DC  SKIP LINES UNTIL "F" = 0 <B5A9>
  B6DF  ERROR? >>B70A
  B6E1  "B" GIVEN?  (BE57)
  B6E6  NO >>B709
  B6EA  MLI: GET MARK <BE70>
  B6ED  ERROR? >>B70A
  B6F3  ADD "B" VALUE TO CURRENT MARK (BE5A)
  B6F6  (3 BYTE ADD) (BEC8)
  B700  OVERFLOW? >>B6BB
  B702  ---
  B704  MLI: SET MARK <BE70>
  B707  ERROR? >>B70A
  B709  ---
  B70A  ---
  B70C   EXIT TO CALLER

B70D ********** "WRITE" COMMAND ************************************

  B70D  LOOKUP OPEN FILE NAME <B479>
  B710  NOT AN OPEN FILE? >>B722
  B712  STORE READ/WRITE REFNUM (BED6)
  B715  AND GET/SET REFNUM (BEC7)
  B718  AND NEWLINE REFNUM IN PARM LISTS (BED2)
  B71B  DIR FILE? (BE47)
  B71E  NO, OK >>B724
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B71E
-------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------------


  B720  YES, "FILE LOCKED" ERROR
  B722  ---                 HANDLER
  B723   EXIT TO CALLER

                            AT $200
  B724  DATA BUFFER ADDR FOR "B", "F", AND "R" <B6C0>
  B72E  PRE-POSITION >>B747
  B731  NO ERRORS? >>RANGE ERROR?
  B733  WAS ERROR ALREADY >>B722
  B735  NO, REAL ERROR OR MLI'S?
  B737  YES, MY RANGE?2
  B739  MINE... >>B72OF FARTHER INTO FILE
  B73B  MLI'S...SET MARK <BE70>
  B73D  MLI: SET EOF?
  B740  ERROR? >>B72 AGAIN TO SET MARK <B6D0>
  B742  AND THEN TRY GIVE UP >>B722
  B745  ERROR? THEN HIMEM
  B747  BUFFER IS ABOVE "WRITE" FILE ACTIVE (BE45)
  B753  INDICATE CALLER
  B757   RETURN TO C

                            END" COMMAND ***************************************
B758 ********** "AP

  B758  ---                 IN OPEN FILE LIST <B479>
  B759  LOOK UP NAME 76A
  B75C  FOUND IT? >>FIRST <B392>
  B75F  NO, OPEN IT 8
  B762  ERROR? >>B7 ON-ZERO? (BED0)
  B764  NO, REFNUM NOB
  B767  YES, OK >>B7
  B769   ELSE, BREAK
  B76A  ---                 AD/WRITE PARM LIST (BED6)
  B76B  REFNUM TO REA IST (BEC7)
  B76E  AND GET/SET E47)
  B771  DIR FILE? (B
  B774  NO >>B77A
                            CKED"
  B776  YES, "FILE
  B778  ---                 LER
  B779   EXIT TO CA
                            VALUE (BE5F)
  B77A  PICK UP "L" CIFY ONE?
  B783  DID USER SPEC
  B785  YES... >>B7 S CURRENT "L" VALUE (BCA4)
  B787  NO, USE FILE
  B78D  ---                 M*32 FOR INDEX INTO
  B792  COMPUTE REF LE
  B793  FILE NAME TA "L" VALUE IN OPEN FILE (BCFF)
  B798  SAVE CURRENT D IN CURRENT RECLEN (BCA4)
  B79B  NAME TABLE A <BE70>
  B7A7  MLI: GET EOF
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B7AA
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------
        ERROR? >>B778
        IS "L" VALUE < 2? (NO SPECIFIC "L") (BCA5)
        NO >>B7B8
        YES >>B7BD
        NO, FORCE TO RECORD BOUNDARY <B7C0>
        ERROR? >>B778
        ELSE, GO SET EOF=MARK/OUTPUT FILE ACTIVE >>B73B

B7C0 ********** FORCE TO EVEN RECORD BOUNDARY **********
            (FIND RECORD NUMBER OF THIS POSITION)

B7C0    ---
        COPY EOF TO ACCUM (BEC7)
        CLEAR MSB'S (BCB2)
        GET READY FOR A 24 BIT DIVIDE
        DIVIDE EOF BY... <AB17>
        RECORD LENGTH (BCA4)
        ---
        WAS THERE A REMAINDER? (BCB3)
        NO, OK... >>B829
        YES, CURRENT RECORD LEN LESS REMAINDER (BCB2)
        PLUS OLD EOF MARK (BEC8)
        GIVES NEW EOF ON AN EVEN RECORD BOUNDARY (BEC9)
        "RANGE ERROR" POSSIBLE IF OVERFLOW OCCURS
        RETURN TO CALLER

********** GET FILE INFO **********

B82A    SET NUMBER OF PARMS (10)
B82F    MLI CODE FOR GET FILE INFO
B831    GO DO IT >>B848

********** SET FILE INFO **********

B833    MODIFIED TIME/DATE = 0
B841    SET NUMBER OF PARMS (7)
B846    MLI CODE FOR SET FILE INFO
B848    EXIT THRU MLI: GET/SET FILE INFO >>BE70

B84B ********** BI I/O INDIRECTION VECTORS **********

B84B    DOSOUT VECTOR >>BE38
B84E    DOSIN VECTOR >>BE3A

********** STATE I/O VECTORS TABLE **********

B851    IMMEDIATE MODE (STATE=0) CSWL/KSWL
B855    DEFERRED MODE (STATE=4) CSWL/KSWL
B859                  (STATE=8) CSWL/KSWL
B85D                  (STATE=C) CSWL
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B85D
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

B85F ********** SYSCTBL **********
        LSB'S OF MLI CALL PARAMETER LISTS IN THE
        BI GLOBAL PAGE ($BEXX)

  B85F  CREATE: $A0  DESTROY: $AC  RENAME: $AF
  B862  SFI:    $B4  GFI:     $B4  ONLINE: $C6
  B865  SPFX:   $AC  GPFX:    $AC  OPEN:   $CB
  B868  NEWLINE:$D1  READ:    $D5  WRITE:  $D5
  B86B  CLOSE:  $DD  FLUSH:   $DD  SMARK:  $C6
  B86E  GMARK:  $C6  SEOF:    $C6  GEOF:   $C6
  B871  SBUF:   $C6  GBUF:    $C6

B873 ********** APPLESOFT TOKENS **********
        TOKENS REQUIRING SPECIAL ATTENTION HAVE
        THEIR MSB OFF AND ARE AN OFFSET FROM A
        JMP IN THE TRACE HANDLER IN THE BI

  B873  FIRST IS $80 (END)
  B87D   CALL
  B88D   TRACE, NOTRACE, NORMAL
  B891   INVERSE, FLASH
  B899   RESUME
  B89D   LET, IF
  B8AD   PRINT, LIST

B8B3 ********** COMMAND NAME TABLES **********
        OFFSETS TO LAST CHARCTER OF EACH COMMAND
        NAME IN THE COMMAND NAME TABLE BELOW.
        COMMANDS ARE ARRANGED ACCORDING TO LENGTH
        WITH THREE BYTE NAMES FIRST.  IF THE MSB
        OF AN INDEX IS ON, THEN THIS IS THE LAST
        NAME OF THE GIVEN LENGTH (NEXT WILL BE
        ONE BYTE LONGER).

  B8B3  01 IN#      02 PR#      03 CAT
  B8B6  04 FRE      05 RUN      06 BRUN
  B8B9  07 EXEC     08 LOAD     09 LOCK
  B8BC  0A OPEN     0B READ     0C SAVE
  B8BF  0D BLOAD    0E BSAVE    0F CHAIN
  B8C2  10 CLOSE    11 FLUSH    12 NOMON
  B8C5  13 STORE    14 WRITE    15 APPEND
  B8C8  16 CREATE   17 DELETE   18 PREFIX
  B8CB  19 RENAME   1A UNLOCK   1B VERIFY
  B8CE  1C CATALOG  1D RESTORE  1E POSITION

  B8D1  'BSAVERIFYBLOADELETECATALOGOPENWR'
  B8F1  'ITEXECREATEFRESTORENAMEBRUNLOCKC'
  B911  'HAIN#FLUSHREADPOSITIONOMONPR#PRE'
  B931  'FIXCLOSEAPPEND'
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B931
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------


B93F ********** COMMAND HANDLER ADDRESS TABLE **********************
          ADDRESSES OF THE COMMAND HANDLER ROUTINES
          FOR EACH COMMAND IN THE ORDER GIVEN ABOVE.

  B93F  (EXTERNAL)
  B941  IN#
  B943  PR#
  B945  CAT
  B947  FRE
  B949  RUN
  B94B  BRUN
  B94D  EXEC
  B94F  LOAD
  B951  LOCK
  B953  OPEN
  B955  READ
  B957  SAVE
  B959  BLOAD
  B95B  BSAVE
  B95D  CHAIN
  B95F  CLOSE
  B961  FLUSH
  B963  NOMON
  B965  STORE
  B967  WRITE
  B969  APPEND
  B96B  CREATE
  B96D  DELETE
  B96F  PREFIX
  B971  RENAME
  B973  UNLOCK
  B975  VERIFY
  B977  CATALOG
  B979  RESTORE
  B97B  POSITION
  B97D  "-" COMMAND

B97F ********** PERMITTED KEYWORDS FOR CMDS ************************
          TWO BYTES PER COMMAND IN THE ORDER ABOVE.
          EACH ENTRY HAS 16 BIT SETTINGS FOR THE
          PARAMETERS PERMITTED ON THAT COMMAND.
          8000 = FETCH PREFIX, PATHNAME OPTIONAL
          4000 = SLOT (FOR PR# OR IN#)
          2000 = DEFERRED COMMAND ONLY
          1000 = FILENAME IS OPTIONAL
          0800 = IF FILE NOT FOUND, CREATE IT
          0400 = "T" (FILE TYPE) PERMITTED
          0200 = PATHNAME2 (RENAME) PERMITTED
          0100 = PATHNAME1 EXPECTED
          0080 = "A" (ADDRESS) PERMITTED
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B97F
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

          0040 = "B" (BYTE) PERMITTED
          0020 = "E" (END ADDRESS) PERMITTED
          0010 = "L" (LENGTH) PERMITTED
          0008 = "@" (LINE NO.) PERMITTED
          0004 = "S" AND/OR "D" (SLOT/DRIVE)
          0002 = "F" (FIELD) PERMITTED
          0001 = "R" (RECORD) PERMITTED
          ("V" IS IGNORED)

          C         P S D F N T P P A B E L @ S F R
          O         F L E N E | A A | | | | | / | |
          M         X O F O W | T T | | | | | D | |
          M         | T E P F | H H | | | | | | | |
          N         | | R T I | 2 1 | | | | | | | |
          D         | | | | L | | | | | | | | | | |

  B97F  IN#       . X . . . . . . X . . . . . . .
  B981  PR#       . X . . . . . . X . . . . . . .
  B983  CAT       X . . X . . . X . . . . . X . .
  B985  FRE       . . . . . . . . . . . . . . . .
  B987  RUN       . . . X . . . X . . . . X X . .
  B989  BRUN      . . . . . . . X X X X X . X . .
  B98B  EXEC      . . . . . . . X . . . . . X X X
  B98D  LOAD      . . . . . . . X . . . . . X . .
  B98F  LOCK      . . . . . . . X . . . . . X . .
  B991  OPEN      . . X . X X . X . . . X . X . .
  B993  READ      . . X . . . . X . X . X . X X X
  B995  SAVE      . . . . X . . X . . . . . X . .
  B997  BLOAD     . . . . . X . X X X X X . X . .
  B999  BSAVE     . . . . X X . X X X X X . X . .
  B99B  CHAIN     . . . . . . . X . . . . X X . .
  B99D  CLOSE     . . . . . . . X . . . . . . . .
  B99F  FLUSH     . . . . . . . X . . . . . . . .
  B9A1  NOMON     . . . . . . . . . . . . . . . .
  B9A3  STORE     . . . . X . . X . . . . . X . .
  B9A5  WRITE     . . X . . . . X . X . . . . X X
  B9A7  APPEND    . . X . X X . X . . . X . X . .
  B9A9  CREATE    . . . . X X . X . . . . . X . .
  B9AB  DELETE    . . . . . . . X . . . . . X . .
  B9AD  PREFIX    X . . X . . . X . . . . . X . .
  B9AF  RENAME    . . . . . . X X . . . . . X . .
  B9B1  UNLOCK    . . . . . . . X . . . . . X . .
  B9B3  VERIFY    . . . X . . . X . . . . . X . .
  B9B5  CATALOG   X . . X . X . X . . . . . X . .
  B9B7  RESTORE   . . . . . . . X . . . . . X . .
  B9B9  POSITION  . . X . . . . X . . . . . . X X
  B9BB  "-"       . . . . . . . X . . . . . X . .
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B9BB
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

B9BD *********** KEYWORD NAME TABLE ***********************************

  B9BD  'ABELSDFRV@'

B9C7 *********** KEYWORD BIT POSITION TABLE ***************************
         BIT POSITIONS IN PERMITTED PARMS TABLE
         FOR EACH KEYWORD IN THE ORDER GIVEN IN
         NAME TABLE.  "V" IS 00 (NOT USED)

  B9C7  ---

B9D1 *********** KEYWORD SIZE/OFFSET TABLE ****************************
         LOW 2 BITS - SIZE-1 OF VALUE IN BYTES
         HIGH 6 BITS- OFFSET TO LAST BYTE OF VALUE
                      FROM $BE58

  B9D1  A: 2 BYTES AT +1
  B9D2  B: 3 BYTES AT +4
  B9D3  E: 2 BYTES AT +6
  B9D4  L: 2 BYTES AT +8
  B9D5  S: 1 BYTE  AT +9
  B9D6  D: 1 BYTE  AT +A
  B9D7  F: 2 BYTES AT +C
  B9D8  R: 2 BYTES AT +E
  B9D9  V: 1 BYTE  AT +10  (IGNORED)
  B9DA  @: 2 BYTES AT +11

B9DB *********** FILE TYPES TABLES ************************************
         FILE TYPE CODES, GIVEN IN INVERSE ORDER
         TO FILE TYPE NAMES WHICH FOLLOW.

  B9DB  $FF = "SYS"
  B9DC  $FE = "REL"
  B9DD  $FD = "VAR"
  B9DE  $FC = "BAS"
  B9DF  $FB = "IVR"
  B9E0  $FA = "INT"
  B9E1  $F0 = "CMD"
  B9E2  $0F = "DIR"
  B9E3  $06 = "BIN"
  B9E4  $04 = "TXT"
  B9E5  $EF = "PAS"
  B9E6  $1A = "AWP"
  B9E7  $1B = "ASP"
  B9E8  $19 = "ADB"
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84    NEXT OBJECT ADDR: B9E8
-------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-------------------------------------------------------------------

  B9E9  ---
  B9E9  'ADBASPAWPPASTXTBINDIRCMDINTIVRBASVARRELSYS'

BA13 *********** MONTH TABLE ***************************************

  BA13  'JANFEBMARAPRMAYJUNJULAUGSEPOCTNOVDEC'
  BA37  '<NO          DATE>'

BA40 *********** MLIERTBL *****************************************
         MLI ERROR CODES WHICH HAVE BI EQUIVALENTS

  BA40  ---

BA53 *********** BIERTBL ******************************************
         BI EQUIVALENTS TO MLI ERROR CODES ABOVE
         (IF MLI CODE NOT FOUND, MAPS TO LAST CODE
         IN THIS TABLE, $08 "I/O ERRROR")

  BA53  ---

BA67 *********** INDEXS TO PACKED MESSAGES ****************************
         BY BI ERROR NUMBER

  BA67  ---

BA7B *********** COMMON LETTERS IN MESSAGES ***************************

  BA7B  ---
  BA7B  'ACDEFILMNORTU '

BA8A *********** LESS COMMON LETTERS *********************************

  BA8A  ---
  BA8B  'BGHKPSVWXY/().:'

BA9A *********** PACKED MESSAGES ***********************************

  BA9A   "COPYRIGHT APPLE COMPUTER"

  BAAA   " NAME ";TAB($10)
  BAAF  "TYPE  BLOCKS ";TAB($1E)
  BABA   "MODIFIED";TAB($2F)
  BAC0  "CREATED";TAB($40)
  BAC2
  BAC6   "ENDFILE SUBTYPE"
```

```
BASIC Inter
-----------
ADDR      DESC
-----------

          eter (BI) -- V1.0.1 -- 1 JAN 84     NEXT OBJECT ADDR: BACE
BADØ  "BLO -------------------------------------------------------
BADA   "B RIPTION/CONTENTS
BAE5  "TOT -------------------------------------------------------

BAEE   "RA
          KS FREE:";TAB($16)
BAF5  "NO  CKS USED:";TAB($2C)
          L BLOCKS:"
BBØØ  "WRI
          GE ERROR"                     ERROR=$2
BBØ9  "ENP
          DEVICE CONNECTED"             ERROR=$3
BBØF  "PA
BB12   (NO E PROTECTED"                 ERROR=$4

BB18  "I/O OF DATA"                     ERROR=$5

BB1E   "D  NOT FOUND"                   ERROR=$6
           USED) --->                    ERROR=$7
BB24  "F
          ERROR"                        ERROR=$8
BB2B  "INV
          K FULL"                        ERROR=$9
BB35  "RA
           LOCKED"                      ERROR=$A
BB42   "F
          LID PARAMETER"                ERROR=$B
BB4E   "PRO
          TOO LARGE"                    ERROR=$C
BB59  "NO
          E TYPE MISMATCH"               ERROR=$D
BB63  "SY
          GRAM TOO LARGE"                ERROR=$E
BB6B  "DIR
          DIRECT COMMAND"               ERROR=$F
BB73  "FI
          AX ERROR"                     ERROR=$1Ø
BB7B  "DUP
          CTORY FULL"                   ERROR=$11
BB86   "FI
           NOT OPEN"                    ERROR=$12
BB8D  "FI
          ICATE FILE NAME"              ERROR=$13
BB99 *******
          E BUSY"                        ERROR=$14
BB99  LENG
BB9A   (BL (S) STILL OPEN"              ERROR=$15
BB9E  BELL
BB9F  'PLE*** PAUSE MESSAGE ****************************************

          H
          NK LINE)
          CHARACTER
          SE        PRESS SPACE BAR '
```

```
BASIC Interpreter (BI) -- V1.Ø.1 -- 1 JAN 84    NEXT OBJECT ADDR: BBB6
-----------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
-----------------------------------------------------------------------

BBB6 *********** VARIABLES ********************************************

  BBB6  NUMBER OF PAGES TO ALLOCATE/FREE
  BBB7  NOT USED
  BBB8  TOP OF BUFFERS FOR GARBAGE COLLECTION
  BBB9  BOTTOM OF BUFFERS

BBBA *********** NOT USED *********************************************

  BBBA  NOT USED
  BBE4

BC7B *********** VARIABLES ********************************************

  BC7B  SAVED HIMEM VALUE DURING CHAIN LOAD
          ******** GARBAGE COLLECT MARKED GC: ****
  BC7C  GC: HIRANGE - WORKSAREASIZE
  BC7D  GC: WORKAREA MSB
  BC7E  GC: NUMBER OF PAGES IN WORKAREA
  BC7F  GC: LORANGE (START OF STRINGS TO COPY)
  BC8Ø  GC: HIRANGE (END OF STRINGS TO COPY)
  BC81  ARRAYS START LSB
  BC82  ARRAYS ENDING MSB+1
  BC83  GC: START OF STRING AREA (ALSO PGM START)
  BC85  GC: END OF STRING AREA
  BC87  MSB ADJUST FACTOR FOR STRING POINTERS
  BC88  PAGE FOLLOWING BLOCK BUFFER
          ******** STORED VARIABLES FILE HEADER ***
  BC89  COMBINED LEN OF SIMPLE/ARRAY VARS
  BC8B  LEN OF SIMPLE VARS ONLY
  BC8D  HIMEM WHEN VARS WERE COMBINED
          ****************************************
  BC8E  POINTER TO COMBINED VARIABLES/STRINGS
  BC9Ø  LENGTH OF COMBINED VARIABLES/STRINGS
  BC92  LENGTH OF STRINGS ONLY

  BC94   OPEN FILES' BUFFER MSBS
  BC9B  OPEN EXEC FILE BUFFER MSB

  BC9C   OPEN FILES' REFERENCE NUMBERS
  BCA3  OPEN EXEC FILE REFNUM

  BCA4  CURRENT RECORD LENGTH
  BCA6  NOT USED
  BCA9  CHARACTER TO FLUSH WHEN PARSING (BLANK)
  BCAA  MAXIMUM LENGTH TO PARSE
  BCAB  ADDRESS OF COMMAND HANDLING ROUTINE
  BCAD  SIZE OF KEYWORD VALUE -1 IN BYTES
  BCAE  OFFSET INTO KEYWORD PARMS TO LAST BYTE
  BCAF   GENERAL PURPOSE 4 BYTE ACCUMULATOR
```

```
BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84     NEXT OBJECT
-------------------------------------------------------------
ADDR     DESCRIPTION/CONTENTS
-------------------------------------------------------------

  BCB3  MONTH
  BCB4  DAY
  BCB5  YEAR
  BCB6  ERROR MSG LEN OR LINE LEN FOR CAT/CATALOG
  BCB7  ENTRY LENGTH IN DIRECTORY FILE
  BCB8  ENTRIES PER BLOCK IN DIRECTORY FILE
  BCB9  FILE COUNT FROM DIRECTORY FILE
  BCBB  DIRECTORY ENTRY NUMBER COUNTER

BCBC ********** PATHNAME 1 BUFFER ************************

  BCBC  COMMAND OR PATH LENGTH
  BCBD  TXBUF (COMMAND OR PATHNAME STRING)
  BCFD  NOT USED

BCFE ********** OPEN FILE NAME TABLE *********************
         (EACH ENTRY IS 32 BYTES LONG)
         (THERE ARE 8 ENTRIES)

  BCFE  FILE 0: LENGTH OF NAME
  BCFF  FILE 0: L VALUE LSB
  BD00  FILE 0: L VALUE MSB
  BD01  FILE 0: START OF NAME STRING
        (FILE NAME IS STORED BACKWARDS)
```



```
ADDR: BCB3
----------
```

BASIC INTERPRETER GLOBAL PAGE

This page of memory is rigidly defined by the ProDOS BI. Fields given here will not move in later versions of ProDOS and may be referenced by external, user-written programs. Future additions to the global page may be made in areas which are marked "Not used".

ProDOS BI Global Page — NEXT OBJECT ADDRESS: BE00

ADDR	LABEL	CONTENTS
BE00-BE02	BI.ENTRY	JMP to WARMDOS (BI warmstart vector).
BE03-BE05	DOSCMD	JMP to SYNTAX (BI command line parse and execute).
BE06-BE08	EXTRNCMD	JMP to user-installed external command parser.
BE09-BE0B	ERROUT	JMP to BI error handler.
BE0C-BE0E	PRINTERR	JMP to BI error message print routine. Place error number in A-register.
BE0F	ERRCODE	ProDOS error code (also at $DE, Applesoft ONERR code).
BE10-BE1F	OUTVEC	Default output vector in monitor and for each slot (1-7).
BE20-BE2F	INVEC	Default input vector in monitor for each slot (1-7).
BE30-BE31	VECTOUT	Current output vector.
BE32-BE33	VECTIN	Current input vector.
BE34-BE35	VDOSIO	BI's output intercept address.
BE36-BE37		BI's input intercept address.
BE38-BE3B	VSYSIO	BI's internal redirection by STATE.
BE3C	DEFSLT	Default slot.
BE3D	DEFDRV	Default drive.
BE3E	PREGA	A-register savearea.
BE3F	PREGX	X-register savearea.
BE40	PREGY	Y-register savearea.
BE41	DTRACE	Applesoft TRACE is enabled flag (MSB on).
BE42	STATE	Current intercept state. 0 = immediate command mode. >0 = deferred.
BE43	EXACTV	EXEC file active flag (MSB on).
BE44	IFILACTV	READ file active flag (MSB on).
BE45	OFILACTV	WRITE file active flag (MSB on).
BE46	PFXACTV	PREFIX read active flag (MSB on).
BE47	DIRFLG	File being READ is a DIR file (MSB on).
BE48	EDIRFLG	End of directory flag (no longer used).
BE49	STRINGS	String space count used to determine when to garbage collect.
BE4A	TBUFPTR	Buffered WRITE data length.
BE4B	INPTR	Command line assembly length.
BE4C	CHRLAST	Previous output character (for recursion check).
BE4D	OPENCNT	Number of files open (not counting EXEC).
BE4E	YXFILE	EXEC file being closed flag (MSB on).
BE4F	CATFLAG	Line type to format next in DIR file READ.
BE50-BE51	XTRNADDR	External command handler address.
BE52	XLEN	Length of command name (less one).

ProDOS BI Global Page — NEXT OBJECT ADDRESS: BE53

ADDR	LABEL	CONTENTS
BE51	XCNUM	Number of command: $00 = external $0A = OPEN $14 = WRITE $01 = IN# $0B = READ $15 = APPEND $02 = PR# $0C = SAVE $16 = CREATE $03 = CAT $0D = BLOAD $17 = DELETE $04 = FRE $0E = BSAVE $18 = PREFIX $05 = RUN $0F = CHAIN $19 = RENAME $06 = BRUN $10 = CLOSE $1A = UNLOCK $07 = EXEC $11 = FLUSH $1B = VERIFY $08 = LOAD $12 = NOMON $1C = CATALOG $09 = SAVE $13 = STORE $1D = RESTORE $1E = POSITION
BE52-BE55	PBITS	Permitted command operands bits: $8000 Prefix needed. Pathname optional. $4000 Slot number only (PR# or IN#). $2000 Deferred command. $1000 File name optional. $0800 If file does not exist, create it. $0400 T: file type permitted. $0200 Second file name required. $0100 First file name required. $0080 AD: address keyword permitted. $0040 B: byte offset permitted. $0020 E: ending address permitted. $0010 L: length permitted. $0008 @: line number permitted. $0004 S or D: slot/drive permitted. $0002 F: field permitted. $0001 R: record permitted. (V always permitted but ignored.)
BE56-BE57	FBITS	Operands found on command line. Same bit assignments as above.
BE58-BE59	VADDR	A keyword value.
BE5A-BE5C	VBYTE	B keyword value.
BE5D-BE5E	VENDA	E keyword value.
BE5F-BE60	VLNTH	L keyword value.
BE61	VSLOT	S keyword value.
BE62	VDRIV	D keyword value.
BE63-BE64	VFELD	F keyword value.
BE65-BE66	VRECD	R keyword value.
BE67	VVOLM	V keyword value (ignored).
BE68-BE69	VLINE	@ keyword value.
BE6A	VTYPE	T keyword value (in hex).
BE6B	VIOSLT	PR# or IN# slot number value.

ProDOS BI Global Page — NEXT OBJECT ADDRESS: BE6C

ADDR	LABEL	CONTENTS
BE6C-BE6D	VPATH1	Primary pathname buffer (address of length byte).
BE6E-BE6F	VPATH2	Secondary pathname buffer (address of length byte).
BE70-BE84	GOSYSTEM	Call the MLI using the parameter tables which follow.
BE85	SYSCALL	MLI call number for this call.
BE86-BE87	SYSPARM	Address of MLI parameter list for this call.
BE88-BE8A		Return from MLI call.
BE8B-BE9E	BADCALL	MLI error return: translate error code to BI error number.
BE9F	BISPARE1	Not used.
BEA0-BEAB	SCREATE	CREATE parameter list.
BEAC-BEAE	SSGPRFX	GET_PREFIX, SET_PREFIX, DESTROY parameter list.
BEAF-BEB3	SRENAME	RENAME parameter list.
BEB4-BEC5	SSGINFO	GET_FILE_INFO, SET_FILE_INFO parameter list.
BEC6-BECA	SONLINE	ONLINE, SET_MARK, GET_MARK, SET_EOF, GET_EOF, SET_BUF, GET_BUF, QUIT parameter list.
BECB-BED0	SOPEN	OPEN parameter list.
BED1-BED4	SNEWLN	SET_NEWLINE parameter list.
BED5-BEDC	SREAD	READ, WRITE parameter list.
BEDD-BEDE	SCLOSE	CLOSE, FLUSH parameter list.
BEDF-BEF4	CCCSPARE	"COPYRIGHT APPLE, 1983"
BEF5-BEF7	GETBUFR	GETBUFR buffer allocation subroutine vector.
BEF8-BEFA	FREEBUFR	FREEBUFR buffer free subroutine vector.
BEFB		Original HIMEM MSB.
BEFC-BEFF		Not used.

ProDOS VERSION 1.Ø.2

In March, 1984, Apple began shipping Version 1.Ø.2 of ProDOS along with the Apple IIc. Version 1.Ø.2 is also the base for some of Apple's own software, such as AppleWorks. The differences between this version and its predecessor, Version 1.Ø.1, are minor. Except for the specific areas mentioned below, the description of Version 1.Ø.1 in this Supplement may be used for Version 1.Ø.2.

ProDOS Loader

Version 1.Ø.2 is identical to Version 1.Ø.1.

ProDOS Relocator

Replace the comments at the following addresses:

```
20A2:   YES, QUIT VECTOR -->$EEDB
21B8:   LEN = $1EDA
21C1:   TO  = $AF71
21C5:   FRM = $AF71
249A:   'PRODOS 1.Ø.2 15-FEB-84'
```

All other addresses and comments remain the same as Version 1.Ø.1.

ProDOS MLI (Kernel)

Replace the comments at the following addresses:

```
D19A:  Indicate error type 2
DE6D:  Stomp on $F3ØØ+$5E
```

At $E948, 12 bytes are added. This causes all addresses greater than $E947 and all references to those addresses to be increased by $ØC. For example, all references to $E948 in Version 1.Ø.1 become $E954 in Version 1.Ø.2. The 12-byte insertion is commented as follows:

```
E948:  Flush file; update directory <E71C>
E94B:  No error?  >>E954
E94D:  Error, return error code
```

ProDOS System Global Page

Version 1.Ø.2 is identical to Version 1.Ø.1.

ProDOS Quit Code

Version 1.Ø.2 is identical to Version 1.Ø.1. There is different data due to different uninitialized variables in a data area at the end of the Quit Code section, but this has no effect on the operation of the software.

ProDOS Disk II Device Driver

Minor changes to the beginning of the Disk II Device Driver caused the area from $F8ØØ to $F8F3 to change and added a routine at the end of the Version 1.Ø.1 code ($FEBE to $FED1). These two areas are described on the following pages. The rest of the Disk II Device Driver is identical to Version 1.Ø.1.

ProDOS IRQ Handler

Version 1.Ø.2 is identical to Version 1.Ø.1.

ProDOS BI Relocator

Version 1.Ø.2 is identical to Version 1.Ø.1.

ProDOS BASIC Interpreter (BI)

Version 1.Ø.2 is identical to Version 1.Ø.1.

ProDOS BI Global Page

Version 1.Ø.2 is identical to Version 1.Ø.1.

```
Disk II Device Driver -- V1.0.2 -- 15 FEB 84     NEXT OBJECT ADDR: F800
--------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
--------------------------------------------------------------------------
F800 ********** PRODOS ... ES **********************************

  F800  Clear decimal ...
  F801  See if Block ...
  F804  If not exit ... ment
  F806  Eight NOP's so ...
  F807  fit up against ... d <FEBE>
  F80E  Convert Block ... 834
  F810  --- ... will
  F814  0000000T TTTT ... 996
  F815  ... Track and Sector
  F817
  F818
  F81A  00TTTTTT 0000B...
  F81C  ---
  F820  Preserve Sector ...
  F821  Execute command ... error
  F824  Restore Sector ...
  F825  No, then exit ...
  F827  Increment Buffer ...
  F829  Increment Sector ...
  F82B  Execute command ... s prior action ok?
  F82E  Decrement Buffer ... >>F810
  F830  Get error number ...
  F833  Return to caller ... >>F81C ... 2 for rest of Block

F834 ********** I/O ERR... to start of block)
                            0 indicates no error) (FB58)
  F834  Indicate "I/O E...
  F836  Set Carry flag ...
  F837  Return to caller ...

F838 ********** MAIN CO... ************************************

  F838  Set recalibration ...
  F83D  Preserve sector ...
  F840  Get "Unit number" ...
  F842  Strip out Drive ...
  F844  Preserve slot ...
  F846  Check for slot ...
  F849  See if motor is ...
  F84C  Save test results ...
  F84F  Initialize count ...
  F854  See if slot ... h off motor if so <FE9B>
  F857  Update "current ...
  F85A  Save test results ... ay routine (FB70)
  F85B  Put drive number ... anged (FB59)
  F85C  Turn motor on ... er (FB59)
  F862  Select appropriate ...
  F865  Check test results ... flag
  F866  Yes, then skip ...

  (fragments:) V1.0.2  ENTS  ORE ROUT  de  ber is g  ode belo  able at
  mber to  Number  <F838>  mber  F830  Pointer  Number  <F838>  Pointer
  (if any  R ROUTIN  1  57)  or"  n count  number  0SSS0000  0SSS0000
  mber  ange, t  C08A)  on <FCDA  slot/drive?  2  s  er for d
  rive has  unit n  s  in Carry  089)  te drive  ts - Same  elay >>F
```

```
Disk II Device Driver -- V1.0.2 -- 15 FEB 84     NEXT OBJECT ADDR: F829
--------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
--------------------------------------------------------------------------

  F869  Wait for new Drive
  F86B  to come up to speed <FB85>
  F872  Is command a status request?
  F874  Yes, then do not move disk arm >>F87C
  F876  Get track number for current request (FB56)
  F879  And go there <F90C>
  F87C  Check test results - Was motor on?
  F87D  Yes, then skip delay >>F88E
  F87F  Wait for Drive to
  F881  come up to speed <FB85>
  F889  Is motor on yet? <FCDA>
  F88C  No, then exit with error >>F8EA
  F88E  Is command a "status" request?
  F890  Yes, then determine status >>F8FD
  F892  Is command a "read" request?
  F893  Yes, then continue on >>F898
  F895  Prepair data for write (prenibblize) <FDF0>
  F898  ---
  F89A  Initialize "retry" count at 64 (FB69)
  F89D  ---
  F89F  Read an address field - Good read? <FB98>
  F8A2  Yes, then continue on >>F8BE
  F8A4  Decrement "retry" count - More to try? (FB69)
  F8A7  Yes, then try again >>F89D
  F8A9  No, just in case indicate "I/O Error"
  F8AB  Decrement "recalibration" count - More to try? (FB6A)
  F8AE  No, then exit with error >>F8EA
  F8B0  Get "current" track (FB5A)
  F8B3  Preserve it
  F8B4  Double it and
  F8B5  add 16 to it for recalibration
  F8B7  Reinitialize Retry Count
  F8BC  Branch always taken >>F8CC
  F8C1  Was the right track found? (FB5A)
  F8C4  Yes, then continue on >>F8D5
  F8C6  Get "current" track (FB5A)
  F8C9  Preserve it
  F8CA  Get track we found
  F8CB  Double it
  F8CC  Put new value in Device Track Table <FCD3>
  F8CF  Get track we want
  F8D0  And go there <F90C>
  F8D3  Branch always taken >>F89D
  F8D8  Was the right sector found? (FB57)
  F8DB  No, then try again >>F8A4
  F8DF  Is command a "write" request?
  F8E0  Yes, then go do it >>F8F4
```

```
Disk II Device Driver -- V1.0.2 -- 15 FEB 84    NEXT OBJECT ADDR: F89F
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

  F8E2  Read the data - Good read? <FBFD>
  F8E5  No, then try again >>F8A4
  F8E7  Indicate no errors
  F8E9  BNE Instruction, never taken
  F8EA  Indicate error
  F8EB  Preserve error number (FB58)
  F8EE  Get Slot
  F8F0  Turn motor off (C088)
  F8F3   Return to caller
```

```
Disk II Device Driver -- V1.0.2 -- 15 FEB 84    NEXT OBJECT ADDR: FEBB
------------------------------------------------------------------------
ADDR    DESCRIPTION/CONTENTS
------------------------------------------------------------------------

            ******* CHECK BLOCK NUMBER VALIDITY *

  FEBE  Get Block Number
  FEC2  Is Block Number good? (FB56)
  FEC5  Yes, if less than $100 >>FED0
  FEC8  No, if greater than or equal to $200 >>FECE
  FECC  No, if greater than or equal to $118 >>FED0
  FECE  Indicate error
  FECF  Return to caller
  FED0  All is well
  FED1  Return to caller
  FED2  Unused up to $FF00 >>002E
```

O BENEATH APPLE PRODOS (1st Printing, 1984)

ake the following corrections to your copy of **Beneath oDOS:**

6:

the first paragraph starting on the page, the sentence uld read "The data is dealt with in larger pieces (512 **es** vs. 256 **bytes**)...", not **512K** vs. **256K.**

4:

code for "GIVEN A PAGE NUMBER, SEE IF IT IS FREE" is orrect. Replace it with:

```
BITMAP  EQU $BF58          SEE PAGE 8-6

        LDA #PAGE          GET PAGE NUMBER (MSB OF ADDR)
        JSR LOCATE         LOCATE ITS BIT IN BITMAP
        AND BITMAP,Y       IS IT ALLOCATED?
        BNE INUSE          YES, CAN'T TOUCH IT
        TXA                PUT BIT PATTERN IN ACCUM
        ORA BITMAP,Y       MARK THIS PAGE AS IN USE
        STA BITMAP,Y       UPDATE MAP
        ...                WE'VE GOT IT NOW

LOCATE  PHA                SAVE PAGE NUMBER
        AND #07            ISOLATE BIT POSITION
        TAY                THIS IS INDEX INTO MASK TABLE
        LDX BITMASK,Y      PUT PROPER BIT PATTERN IN X
        PLA                RESTORE PAGE NUMBER
        LSR A              DIVIDE PAGE BY 8
        LSR A                                        LSR A
        LSR A
        TAY                Y-REG IS OFFSET INTO BITMAP
        TXA                PUT BIT PATTERN IN ACCUM
        RTS                DONE

BITMASK DFB $80,$40,$20,$10  BIT MASK PATTERNS
        DFB $08,$04,$02,$01
```

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Page 3-1

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Page 6-4

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Page 7-26:

Modifying the ProDOS Disk II device driver to allow 320 blocks instead of the normal 280. The fourth command line should read:

```
520D:40
```

Modifying FILER to format 40 tracks instead of 35. The fourth command line should read:

```
4244:40
```

Page 8-6:

Under "Device Information", make the following changes:

```
BF10-BF11    DEVADR01    Slot 0 reserved.
...
BF26-BF27    DEVADR32    /RAM device driver address
                         (need extra 64K).
```

Page 8-7:

The wrong bit is indicated as the "expansion bit" in the MACHID byte. The first eight rows of that description should read:

```
00.. 0...  II
01.. 0...  II+
10.. 0...  IIe
11.. 0...  III emulation
00.. 1...  Future expansion
01.. 1...  Future expansion
10.. 1...  IIc
11.. 1...  Future expansion
```

Page B-8:

In the last paragraph, the sentence should read "A second way to use **an interpreted** language..." (not **a compiled** language).

Page D-1:

In the second paragraph, the sentence should read "Versions of the Disk Drive Controller Unit are now **used...**" (not **based**).

Reference Card, Panel 4

Under "SYSTEM GLOBAL PAGE FORMAT", replace the lines beginning BF00 and BF06 with the following two lines:

```
BF06    Jump to Date/Time Address
        (or RTS if no clock)
```

The description of BF10-11 should be changed to:

```
BF10-11  Slot 0 reserved
```

The description of BF26-27 should be changed to:

```
BF26-27  /RAM
```

Under the "MACHINE IDENTIFICATION BYTE", the second column of numbers should read:

```
0...
0...
0...
0...
1...
1...
1...
1...
```

Reference Card, Panel 9

The last entry for "MLI ERROR CODES" should be:

```
$5A  Bad vol. bit map
```

(not $58).

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