

SUPPLEMENT TO

Beneath Apple ProDOS

For ProDOS Versions 1.0.1 and 1.0.2

by Don D. Worth and Pieter M. Lechner



QUALITY SOFTWARE

21601 Marilla Street
Chatsworth, California 91311

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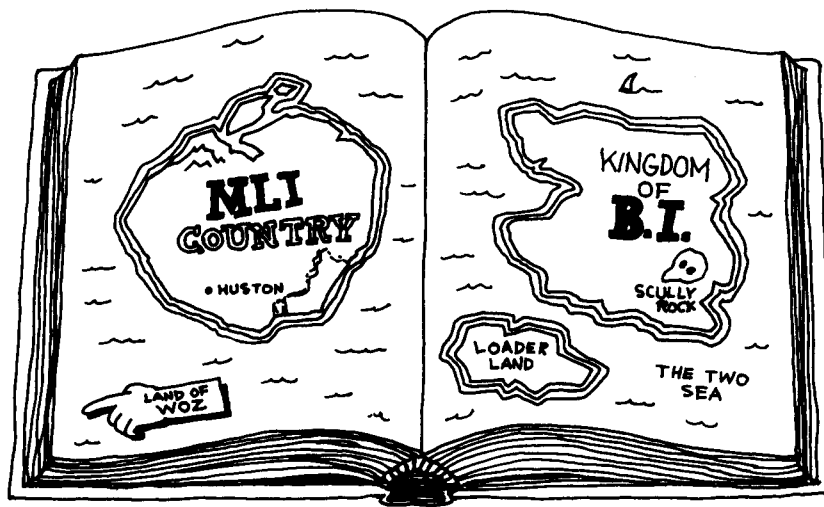
Production Editor: Kathryn M. Schmidt
Illustrations by: George Garcia

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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 1.0.1 and Version 1.0.2. Because these versions are so similar, we have included both in the same supplement. Version 1.0.1 is first presented in its complete form. Then Version 1.0.2 is presented by pointing out and documenting those areas that are different from Version 1.0.1.

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: 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 XIX1X1X1
 C68D SAVE FOR LATER
 C68F READ REGISTER FOR NEXT BYTE (C08C)
 C692 LOOP UNTIL VALID >>C68F
 C694 COMBINE WITH PREVIOUS LIX1X1X AND XIX1X1X1
 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

Disk Controller Boot ROM -- Apple Iic NEXT OBJECT ADDR: C606

 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
 * * *

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 PREPARE 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 DECREMENT 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

***** 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

***** INITIALIZATION *****

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

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

Disk Controller Boot ROM -- Apple IIC NEXT OBJECT ADDR: C65A

ADDR DESCRIPTION/CONTENTS

C65A IF SO, GO DECREMENT RETRY COUNT (HIGH BYTE) >>C641
 C65C SPACE FILLER TO POSITION CODE BELOW >>C63D
 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 >>C657
 C667 YES, CHECK REGISTER AGAIN (C08C)
 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 >>C63F
 C67D WAS IT AN \$AD?
 C67F YES, WE FOUND A DATA HEADER >>C6A6
 C681 NO, START OVER >>C63F

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 XIX1X1
 C68D SAVE FOR LATER
 C68F READ REGISTER FOR NEXT BYTE (C08C)
 C692 LOOP UNTIL VALID >>C68F
 C694 COMBINE WITH PREVIOUS IX1X1X AND XIX1X1
 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 >>C63F
 C69E GET TRACK FOUND
 C6A0 IS IT TRACK WE WANT?
 C6A2 NO, START OVER >>C63F
 C6A4 YES, INDICATE ADDRESS FOUND, GO LOOK FOR DATA FIELD >>C642

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

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

ADDR DESCRIPTION/CONTENTS

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
 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

```

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 (S26) -> S0800
C72C INITIALIZE RETRY COUNT (LOW BYTE)
C72E RETURN TO CALLER

C72F ***** ASCII ERROR MESSAGE *****
C72F "Check      Disk Drive."
C740 TERMINATE STRING

```

ProDOS Loader -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 0800 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 ***
ROM BOOT SUBRTN BUFFER PAGE ADDR
ROM BOOT SUBRTN SLOT * 16
ROM BOOT SUBRTN SECTOR TO READ
ROM BOOT SUBRTN CURRENT TRACK
ROM BOOT SUBRTN TRACK TO READ
-- BLOCK READ PARAMETER LIST --
COMMAND NUMBER (1 = READ)
SLOT * 16
I/O BUFFER ADDRESS ($44/$45)
BLOCK TO READ ($46/$47)

```

```

-----
POINTER TO BLOCK READ ROUTINE
VOL DIR ENTRY POINTER/FIRST INDEX PAGE
ADDR OF SECOND PAGE OF INDEX BLOCK
INDEX INTO INDEX BLOCK PAGES
TRACK SEEK PHASE-ON INDEX
TRACK PHASE WANTED
BLOCK READER RETRY COUNT
CURRENT TRACK PHASE/PHASE-OFF INDEX
BUFFER POINTER
SCREEN CENTER LINE
LOAD POINT FOR RELOCATOR
DISK ARM PHASE0
TURN DISK DRIVE OFF
TURN DISK DRIVE ON
HOME CURSOR/CLEAR SCREEN
FC58

```

```

***** LOAD PRODOS *****
(ENTIRE LOADER IN MEMORY NOW)
CURRENT TRACK IS ZERO
$48/49 --> $CS00
COPY A PORTION OF DISKETTE BOOT ROM
TO MY BLOCK READER SUBROUTINE (0994)
FROM $9F2 TO $A7E
MODIFY SOME BRANCHES IN THE COPIED CODE (091D)
TO SUIT MY ERROR HANDLING TASTES (0924)
AND COPY SECTOR READ SUBROUTINE EXIT CODE (092B)
TO $A7F TO $A85 (0A7F)
$48/49 --> DISKETTE BLOCK READER SUBRTN
AT $0986
---
HARD DISK OR DISKETTE?
NO, ERROR -->0890
STORE LSB OF BLOCK READER
STORE ZEROS IN SEVERAL THINGS
COMMAND = 1 (READ BLOCK)
BLOCK NUMBER = 2 (VOL DIRECTORY)
$60/61 --> $C00 (BUFFER)
$4A/4B --> $C00 (FIRST ENTRY)

```

```

***** MAIN ENTRY *****
ON ENTRY, X = SLOT*16
A = SECTOR NUMBER
LOAD UP TO SECTOR 3
ENTRY POINT
ALWAYS TAKEN -->0807
(NEVER EXECUTED) -->A132
SAVE S0
READING SECTOR 3 NEXT?
REMEMBER THIS...
MAKE SCS FROM SLOT
AND SAVE AT $49
$48/49 --> $CSFF IN ROM BOOT
CHECK $CSFF
BOOT ROM FOR DISK II?
NO, HARD DISK BOOT THEN -->085B
GOT BOTH SECTORS OF LOADER? -->0831
NO, STOP AT SECTOR 3
STORE ON PARM (0800)
SKIP SECTOR 1 (GET SEC 2)
DUMMY UP $CS5C AS RETURN ADDRESS
AND CALL ROM SECTOR READ SUBRTN

```

```

***** LOAD PRODOS *****
(ENTIRE LOADER IN MEMORY NOW)
CURRENT TRACK IS ZERO
$48/49 --> $CS00
COPY A PORTION OF DISKETTE BOOT ROM
TO MY BLOCK READER SUBROUTINE (0994)
FROM $9F2 TO $A7E
MODIFY SOME BRANCHES IN THE COPIED CODE (091D)
TO SUIT MY ERROR HANDLING TASTES (0924)
AND COPY SECTOR READ SUBROUTINE EXIT CODE (092B)
TO $A7F TO $A85 (0A7F)
$48/49 --> DISKETTE BLOCK READER SUBRTN
AT $0986
---
HARD DISK OR DISKETTE?
NO, ERROR -->0890
STORE LSB OF BLOCK READER
STORE ZEROS IN SEVERAL THINGS
COMMAND = 1 (READ BLOCK)
BLOCK NUMBER = 2 (VOL DIRECTORY)
$60/61 --> $C00 (BUFFER)
$4A/4B --> $C00 (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? >>0856
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
09A3 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"
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 Loader -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 08FF
 ADDR DESCRIPTION/CONTENTS

```

0902 ***** KERNEL NAME *****
0902 LENGTH OF KERNEL'S NAME
0903 'PRODOS', "PRODOS" (KERNEL NAME)

0912 ***** COPY BLOCK READ BUFFER PTR *****
0912 COPY $60/61 --> $44/45
0914 (BLOCK READ BUFFER POINTER)
091A THEN 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

091D ---
***** NEW BRANCH OFFSETS FOR ABOVE ****

0924 ---
***** SECTOR READ EXIT CODE *****
COPIED INTO DISKETTE SECTOR READ CODE

092B GET S0
092D AND EXIT NORMALLY
092E RETURN
092F RESTART BLOCK READ OPERATION >>09BC

0932 ***** 932-93E NOT USED *****

0932 ---
***** ERROR HANDLER *****

093F HOME CURSOR/CLEAR SCREEN <FC58>
0944 COPY "UNABLE TO LOAD PRODOS" MESSAGE (0950)
0947 TO SCREEN (05AE)
094D THEN GO TO SLEEP FOREVER >>094D
0950 '*** UNABLE TO LOAD PRODOS ***'

096D ***** MOVE ARM TO NEXT PHASE *****
096D GET CURRENT PHASE
096F CONVERT TO NEXT ARM PHASE
0972 ADD S0
0975 SELECT NEXT ARM PHASE THIS DRIVE (C080)
097A ---

```

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

```

097C    DELAY LONG ENOUGH FOR ARM TO MOVE
0983    WHEN FINISHED, RETURN WITH S0
0985    RETURN

0986    ***** DISKETTE BLOCK READ ROUTINE *****
         $44/$45 --> BUFFER
         $46/$47 = BLOCK NO.

0986    GET BLOCK NO. LSB
0988    ISOLATE SECTOR REMAINDER
098C    SKEW SECTOR BY 2
0992    AND STORE SECTOR WANTED
0994    GET MSB
0996    AND HIGH BIT OF TRACK
0999    MERGE WITH LOW PART OF TRACK
099C    STORE TRACK WANTED
099F    TRACK*2 IS PHASE WANTED
09A3    SET PAGE ADDRESS OF BUFFER
09A7    TURN DRIVE MOTOR ON (C089)
09AA    READ SECTOR <09BC>
09AD    NEXT PAGE
09B1    SKEW TO NEXT SECTOR
09B5    READ SECOND SECTOR OF BLOCK <09BC>
09B8    THEN TURN MOTOR OFF AND EXIT (C088)
09BB    RETURN
  
```

***** DISKETTE SECTOR READ ROUTINE ****

```

09BC    GET CURRENT TRACK
09BF    CONVERT TO PHASE
09C5    GET CURRENT PHASE
09C7    STORE FOR PHASE OFF
09CA    SUBTRACT PHASE WANTED TO DETERMINE...
09CC    DIRECTION -- ON CORRECT TRACK NOW? >>09E2
09D0    NO, ADJUST PHASE UP...
09D4    OR, DOWN AND...
09D6    ---
09D7    SEEK ARM ONE PHASE... <096D>
09DD    IN PROPER DIRECTION <096F>
09E0    UNTIL WE ARE THERE >>09C5
09E2    ---
09E4    RETRY COUNT OF 127
09E7    ---
09E9    LOWER RETRY COUNT
09EB    RETRIES EXHAUSTED? >>09BB
09EF    RETRIES FOR A $D5 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 $CK5E 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

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 * * * * *
 * * * * *

***** 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

***** ZERO PAGE ADDRESSES *****
 AUTOSTART ROM CHECKSUM POINTER
 CONFIGURATION BYTE (MACHID TO BE)
 GENERAL PURPOSE POINTER
 DISK TYPE (0=DISK II, 4=PROFILE)
 AND INPUT RELOC RANGE POINTER
 VOL DIR ENTRY POINTER FOR RELOCATOR
 AND OUTPUT RANGE PTR
 LENGTH OF RELOCATION RANGE
 INPUT RELOCATION RANGE POINTER
 END OF INPUT RANGE
 GENERAL PURPOSE POINTER
 GENERAL PURPOSE POINTER
 RAMDRIVE OUTPUT POINTER
 VARIOUS USES: PARM TO AUXMOVE,
 UNIT/SLOT PASSED TO RELOCATOR
 BLOCK NUMBER TO RAMDRIVE

***** INTERP LOADER ADDRESSES *****
 ENTRY OF INTERP LOADER
 'UNABLE TO FIND SYSTEM FILE'
 'INTERP FILE TOO LARGE'
 'UNABLE TO LOAD ...'
 INTERP FILE NAME ITSELF
 +1
 LENGTH OF MESSAGE
 MLI: OPEN LIST
 MLI: GET EOF
 EOF MARK
 EOF MARK+1
 EOF MARK+2 (MSB)
 MLI: READ LIST
 READ BUFFER ADDR
 +1
 MLI: CLOSE LIST
 'SYSTEM'

***** EXTERNAL ADDRESSES *****
 MACHID BUILD SUBRTN FOR 128K
 GENERAL PURPOSE BUFFER
 BUFFER+1

VOLUME DIRECTORY BUFFER
 ENTRY LENGTH
 -- RAMDRIVE VOLUME DIRECTORY
 VOLUME HDR, VOLUME NAME
 VOLUME HDR, ACCESS-TOTAL BLOCKS

***** SYSTEM GLOBAL PAGE *****
 ENTRY POINT FOR MLI
 QUIT VECTOR
 DATE/TIME
 DEVICE HANDLER TABLES
 LAST DEVICE USED
 NUMBER OF ACTIVE DISK DEVICES
 ACTIVE DISKS SEARCH LIST
 MACHINE TYPE FLAGS
 SLOT WHICH CONTAIN CARDS WITH ROM
 TOP OF 48K RAM

000A
 000B
 000C
 0010
 0011
 0012
 0013
 0014
 0015
 0016
 0017
 0018
 0019
 001A
 001B
 003C
 003D
 003E
 003F
 0040
 0041
 0042
 0043
 0046
 0047
 0080
 0280
 0281

0800
 08E2
 090A
 092A
 093B
 093C
 094F
 0950
 0956
 0958
 0959
 095A
 095B
 095E
 0960
 0963
 0965
 0C00
 0C23
 0E04
 0E22
 BF00
 BF03
 BF06
 BF10
 BF30
 BF31
 BF32
 BF98
 BF99
 BFFF

ProDOS Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 2000

ADDR DESCRIPTION/CONTENTS

***** I/O PORT ADDRESSES *****

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/ZERO PAGE
 C009 ALTERNATE STACK/ZERO PAGE
 C00C 80 COLUMN DISPLAY OFF
 C018 READ 80STORE SWITCH
 C030 SPEAKER
 C082 MOTHERBOARD ROM READ ENABLE
 C083 READ/WRITE RAM 2ND 4K BANK
 C08B READ/WRITE RAM 1ST 4K BANK
 C311 MOVE TO/FROM AUXMEM SUBROUTINE
 C314 XFER TO AUXMEM SUBROUTINE
 CFFF RESET I/O CARD ROMS

***** RAM CARD ADDRESSES *****

D000 KERNEL START (APPLESOFT START)
 FF00 START OF DEVICE DRIVERS

***** MONITOR ROM *****

FB1E PADDLE READ SUBROUTINE
 FB2F MONITOR INIT ROUTINE
 FBB3 ROM VERSION BYTE
 FBC0 SECONDARY VERSION BYTE (0-3)
 FC58 CLEAR SCREEN
 FE84 SET NORMAL VIDEO
 FE89 IN#0
 FE93 PR#0

***** PRODOS RELOCATOR MAIN ENTRY *****

2000 STORE SLOT IN MLI ONLINE PARMS
 2005 PRINT "APPLE II PRODOS..." <2448>
 200E MOVE 3PAGE/INTERP LOADER ETC. <2663>
 2011 NO ERROR? >>2016
 2013 ERROR >>212A
 2016 ---
 201A THERE MUST BE A MINIMUM OF 48K (BFFF)
 2021 IF NOT, ERROR >>2097
 2029 MAKE DOUBLY SURE >>2097
 202B SELECT MOTHERBOARD ROMS (C082)

ProDOS Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 202E

ADDR DESCRIPTION/CONTENTS

***** RELOCATE PRODOS *****

202E DETERMINE MACHINE TYPE <23B0>
 2031 PICK UP CONFIGURATION BYTE
 2033 64K OR MORE MEMORY?
 2035 YES, GOT A LANGUAGE CARD >>2047
 2037 ELSE,
 2039 USE THE 48K RELOCATION TABLES (2179)
 203C INSTEAD OF THE 64K ONES (2173)
 2042 AND PUT DISK DRIVERS AT \$B800

***** COPY/RELOCATE PRODOS ITSELF <2663>

2047 ---
 204D COPY/RELOCATE PRODOS ITSELF <2663>
 2050 ERROR? >>2097
 2052 ENABLE MOTHERBOARD ROMS AGAIN (C082)
 2055 GET SECONDARY MACHINE TYPE (FBC0)
 2058 MUST BE 0 THRU 3
 205A ELSE, IGNORE IT >>2076
 205C GET MACHID
 205E INDICATE "FUTURE SYSTEM"
 2060 TURN OFF MACHINE INDICATORS
 2062 \$FBC0 = \$00 ?
 2064 NO >>2068
 2066 YES, MACHID=\$80
 2068 \$FBC0 = \$01 ?
 206A NO >>206E
 206C YES, MACHID=\$40
 206E \$FBC0 = \$03 ?
 2070 NO, MACHID=\$00 >>2074
 2072 YES, MACHID=\$C0
 2074 REPLACE UPDATED MACHID
 2076 COPY BOOT DEVICE ID TO READ BLOCK PARMS (2165)
 207C AND AS LAST DEVICE USED (BF30)
 207F DETERMINE PERIPHERAL CARD CONFIGURATION <24E6>
 2082 BOOT DEVICE TO... (216C)
 2085 GLOBAL PAGE LAST DEVICE USED (BF30)
 208B WRITE ENABLE 1ST BANK OF LANG. CARD (C08B)
 2094 COPY CLOCK CODE TO DEVICE DRIVER AREA <2663>
 2097 ERROR? >>20C6
 2099 CHECK MACHINE TYPE AGAIN (BF98)
 209C GOT 64K OR MORE?
 20A0 NO >>20C8
 20A2 YES, QUIT VECTOR --> \$EECF
 20AC OPEN L.C. FOR WRITE, 1ST 4K (C083)
 20B5 POINT TO QUIT CODE TABLE (2178)
 20B8 MOVE QUIT CODE TO L.C. <2663>
 20BD STORE QUIT VECTOR START PAGE (D000)
 20C0 OPEN L.C. FOR WRITE, 2ND 4K... (C08B)
 20C3 AGAIN (C08B)
 20C6 ERROR DURING MOVE? >>212A
 20C8 GET MACHID YET AGAIN (BF98)

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 *** 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 ProDOS Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 21F1

 ADDR DESCRIPTION/CONTENTS

***** 48K PRODOS RELOC TABLE *****
 21A2 COPY (SYSTEM GLOBAL PAGE IMAGE)
 TO =\$BF00
 21A3 LEN=\$100
 21A5 FRM=\$4F00
 21A7 FOR ADDR=\$C1-C1
 21A9 ZERO (PRODOS KERNEL DATA AREA)
 ADR=\$B100
 21AA LEN=\$700
 21AC COPY (PRODOS KERNEL)
 TO =\$9000
 21AE LEN=\$2100
 21B1 FRM=\$2D00
 21B3 RELOCATE INSTRUCTIONS
 TO =\$9000
 21B6 LEN=\$1ECE
 21B8 FRM=\$9000
 21BA FOR ADDR=\$D0XX-\$F7XX
 21BC ADJUST BY=\$C0
 21BF RELOCATE ADDRESSES
 TO =\$AF65
 21C1 LEN=\$28
 21C3 FRM=\$AF65
 21C5 FOR ADDR=\$D0XX-\$F0XX
 21C7 ADJUST BY=\$C0
 21CA COPY (DEVICE DRIVERS)
 TO =\$B800
 21CB LEN=\$700
 21CE FRM=\$5200
 21D0 RELOCATE INSTRUCTIONS
 TO =\$B800
 21D3 LEN=\$195
 21D5 FRM=\$B800
 21D7 FOR ADDR=\$F8XX-\$FEXX
 21D9 ADJUST BY=\$C0
 21DC RELOCATE INSTRUCTIONS
 TO =\$BB85
 21DE LEN=\$339
 21E0 FRM=\$BB85
 21E2 FOR ADDR=\$F8XX-\$FEXX
 21E4 ADJUST BY=\$C0
 21E7 END OF TABLE
 21E8

***** 48K PRODOS CLOCK TABLE *****
 21E9 COPY (CLOCK DRIVER)
 TO =\$B142
 21EA LEN=\$7D
 21EC FRM=\$5000
 21EE RELOCATE INSTRUCTIONS

21F1 TO =\$B142
 21F3 LEN=\$69
 21F5 FRM=\$B142
 21F7 FOR ADDR=\$C1-C1
 =\$F1-F1
 21FA ADJUST BY=\$S0 AND \$C0
 21FC END OF TABLE
 21FE

***** 64K PRODOS RELOC TABLE *****
 21FF COPY (INTERRUPT VECTORS)
 TO =\$FF80
 2200 LEN=\$80
 2202 FRM=\$5080
 2204 COPY (SYSTEM GLOBAL PAGE)
 TO =\$BF00
 2207 LEN=\$100
 2209 FRM=\$4E00
 220B ZERO (PRODOS KERNEL DATA AREA)
 ADR=\$F100
 220E LEN=\$700
 2210 COPY (PRODOS KERNEL)
 TO =\$D000
 2212 LEN=\$2100
 2213 FRM=\$2D00
 2215 FOR ADDR=\$D0XX-\$F0XX
 2217 ADJUST BY=\$C0
 2219 COPY (DEVICE DRIVERS)
 TO =\$F800
 221A LEN=\$700
 221C FRM=\$5200
 221E END OF TABLE
 2220

***** 64K PRODOS CLOCK TABLE *****
 2221 COPY (CLOCK CODE)
 TO =\$F142
 2222 LEN=\$7D
 2224 FRM=\$5000
 2226 RELOCATE INSTRUCTIONS
 TO =\$F142
 2229 LEN=\$69
 222B FRM=\$F142
 222D FOR ADDR=\$C1XX-\$C1XX
 222F ADJUST BY=\$S0
 2232 END OF TABLE
 2233

ProDOS Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 2234

ADDR DESCRIPTION/CONTENTS

2234 ***** INTERPRETER LOADER *****
(LOADED AT \$2234, MOVED TO \$800)

2234 \$10/11 --> VOLUME DIRECTOR ENTRIES
2236 INITIALLY AT \$C00
2238 OFFSET BEYOND LINKS (+4)
223A (TURN NEXT INSTRUCTION INTO BIT)

***** SCAN DIRECTORY FOR INTERP *****

223B PICK UP LSB
223E BUMP BY ENTRY LENGTH (0C23)
2241 UPDATE LSB
2243 PAGE OVERFLOW? >>2257
2245 NO, ROOM FOR ONE MORE ENTRY? (0C23)
224A NO, CHECK MSB
224D START OF A BLOCK? >>2259
224F NO, AT END OF DIRECTORY?
2251 YES, FILE NOT FOUND IN DIRECTORY >>2271
2253 NO, START NEW BLOCK AT +4
2255 AND UPDATE LSB
2257 BUMP MSB
2259

CHECK FILE TYPE FOR PRODOS "SYS" FILE
225D NOT IT? >>223B
225F INACTIVE ENTRY?
2262 IF SO, SKIP IT >>223B
2264 SAVE NAME LENGTH AT \$280 (0280)
2268 MUST BE AT LEAST 8 CHARS LONG >>223B
226D JUMP AROUND ERROR CODE >>2274
2271 ERROR - INTERP FILE NOT FOUND >>22E1
2273 HARD BREAK IN THAT CASE
2274

IS THIS ".SYSTEM"?
2277 (SEE \$2399) (0965)
2279 NO, SKIP ENTRY >>223B
227D CHECK ALL CHARACTERS IN NAME >>2277

***** LOAD INTERPRETER AT \$2000 *****

2283 COPY NAME TO \$281
2286 AND TO "UNABLE TO LOAD" MSG (093B)
2295 ADD BLANK AT END OF NAME
2297 IN MESSAGE (093C)
229B NAMELEN + ERRORMSGLEN
229D SAVE AT \$283 (094F)
22A0 MLI: OPEN .SYSTEM FILE <BF00>
22A4 (PARM LIST AT \$238A)

ProDOS Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 22A6

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 <BF00>
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>
22D7 (PARM LIST AT \$2397)
22D9 ERROR? >>22EE
22DB NO, ENABLE MOTHERBOARD ROMS (C082)
22DE AND JUMP TO INTERPRETER >>2000

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

22E1 PRINT "UNABLE TO FIND A .SYSTEM FILE" (08E2)
22E3 THEN GO TO SLEEP >>2313
22E6
22EE GET NAME LENGTH (094F)
22F1 LINE LENGTH
22F4 LESS NAME LENGTH (094F)
22F7 DIVIDED BY 2
22F8 GIVES OFFSET TO CENTER THE LINE (094F)
22FC PRINT "UNABLE TO LOAD..." (092A)
2306 GO TO SLEEP FOREVER >>2313

2308
230A PRINT "SYSTEM PROGRAM TOO LARGE" (090A)
2313 GO TO SLEEP FOREVER >>2313

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

2316 *** UNABLE TO FIND A ".SYSTEM" FILE **
233E *** SYSTEM PROGRAM TOO LARGE **
235E *** UNABLE TO LOAD X.SYSTEM *****
2383 NAME LEN +13H (LEN OF MSG)

ProDOS Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 2383

ProDOS Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 23B0

 ADDR DESCRIPTION/CONTENTS

 ADDR DESCRIPTION/CONTENTS

```

2384 MLI: OPEN PARM LIST
2385 PATHNAME IS AT $280
2387 I/O BUFFER AT $1400
2389 REFNUM=1

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

238F MLI: READ LIST
2390 REFNUM=1
2391 READ TO $2000
2393 LENGTH (FROM EOF MARK)
2395 ACTUAL LENGTH READ

2397 MLI: CLOSE LIST
2398 REFNUM=0, CLOSE ALL FILES

2399 '.SYSTEM'

23A0 ***** END OF INTERP LOADER *****
23A0 ***** 3 PAGE VECTOR IMAGE *****
23A0 BRK HANDLER AT $FA59
23A2 RESET AT $FF59
23A4 POWER UP BYTE
23A5 & VECTOR TO $FE59 >>FF59
23A8 CTL-Y VECTOR TO $FF59 >>FF59
23AB NMI VECTOR TO $FF59 >>FF59
23AE IRQ HANDLER AT $BFEB (PRODOS)
  
```

```

23B0 ASSUME NOTHING AT FIRST
23B4 GET A ROM BYTE (FBB3)
23B7 APPLE II?
23B9 YES, SET BIT >>23DA
23BB NO,
23BD APPLE IIE?
23BF YES, SET BIT >>23DA
23C1 NO,
23C3 APPLE II+?
23C5 NO, WHAT IS IT? >>23D4
23CA REALLY A II+?
23CC YES >>23DA
23D0 /// EMULATION MODE?
23D2 YES >>23FE
23D4 OTHERWISE, UNKNOWN MACHINE
23D6 CREATE INVALID INSTR AT $80
23D8 AND GO THERE >>23FE
23DA UPDATE MACHID
23DF READ/WRITE ENABLE 1ST BANK LANG CARD (C08B)
23E4 CHECK FOR L.C. EXISTANCE (D000)
23F6 IF PRESENT, MARK IN MACHID
23FA ELSE, ONLY 48K AVAILABLE
23FC ADD TO MACHID
23FE THEN GO TO $80 (CODE BELOW) >>0080
  
```

```

2401 ***** LOOK FOR EXTENDED 80 COL CARD *****
      (CODE MOVED TO $80 TO ALLOW BANK SWITCH)
2401 UPDATE MACHID
2403 IIE? >>243A
2405 YES,
2407 BANK TO AUX MEMORY (C005)
240D STORE A PATTERN THERE (0C00)
2416 MAKE SURE PATTERN STAYS THERE
2428 ---
2429 IF NOT, ONLY GOT 64K TOTAL >>242C
242B ELSE, GOT 128K TOTAL
242C BANK BACK TO MAIN MEMORY (C004)
2432 64K? >>243A
2436 NO, INDICATE 128K
2438 IN MACHID
243A SET UP $A/B --> "APPLE II"
243D IN AUTOSTART MONITOR ROM
243F AT $FB09
2441 BUT DO IT IN A CONVOLUTED WAY
2447 RETURN TO CALLER
  
```

```

2401 ***** LOOK FOR EXTENDED 80 COL CARD *****
      (CODE MOVED TO $80 TO ALLOW BANK SWITCH)
2401 UPDATE MACHID
2403 IIE? >>243A
2405 YES,
2407 BANK TO AUX MEMORY (C005)
240D STORE A PATTERN THERE (0C00)
2416 MAKE SURE PATTERN STAYS THERE
2428 ---
2429 IF NOT, ONLY GOT 64K TOTAL >>242C
242B ELSE, GOT 128K TOTAL
242C BANK BACK TO MAIN MEMORY (C004)
2432 64K? >>243A
2436 NO, INDICATE 128K
2438 IN MACHID
243A SET UP $A/B --> "APPLE II"
243D IN AUTOSTART MONITOR ROM
243F AT $FB09
2441 BUT DO IT IN A CONVOLUTED WAY
2447 RETURN TO CALLER
  
```

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# <FE93>
 245A SET KEYBD IN# <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 II'
 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 \$L0/11 --> \$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 \$I2 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 SLBYT (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

```

2629 DEVICE SIGNATURE FOR:
262B +0,+2,+4,+6 = THUNDERCLOCK
262D +1,+3,+5,+7 = DISK
262F (+7 NOT CHECKED)
2631 BIT POSITION TABLE FOR SLOTS
CHECKSUM FOR AUTOSTART ROM
***** COMPUTE AUTOSTART ROM CHECKSUM *****
2639 ---
263A GET ZERO IN INDEX REGISTER (2631)
263D SUM $FB09 ("APPLE II") IN ROM
2644 UPDATE CHECKSUM (2631)
264B DO 8 BYTES IN ALL (2634)
2651 MOVE LENGTH TO HIGH NIBBLE
2656 AND COMBINE WITH CHECKSUM (2631)
2659 FUDGE FACTOR
265B SHOULD COME OUT ZERO >>2660
265D IT DID...RETURN WITH MACHID
265F RETURN
2660 ELSE, RETURN WITH ZERO MACHID
2662 RETURN
  
```

```

2663 ***** RELOCATION ROUTINE *****
(X/Y REGS CONTAIN TABLE ADDR)
  
```

```

2663 SAVE PASSED TABLE ADDRESS
2667 ---
2669 GET OPERATION CODE
266B VALID OPERATION? (4 OR LESS)
266D NO, ERROR >>26E1
2671 $14/15 --> OUTPUT BLOCK
267B $16/17 --> LENGTH
2684 NEGATIVE LENGTH? >>26E3
2686 CHECK OPERATION CODE
2687 ZERO BLOCK? >>26EC
268A NO, $12/13 = $18/19 --> INPUT BLOCK
2694 $1A/1B --> END OF INPUT BLOCK
26A1 COPY BLOCK ONLY? >>2710
26A3 SAVE RELOCATION OPERATION CODE (283C)
26A9 SAVE NUMBER OF RANGES TO CHECK (283D)
26AD ---
26AE COPY START PAGES TO TABLE
26B9 ---
26BA AND END PAGES
26C5 ---
26C6 AND FINALLY, RELOCATION FACTORS
26CE BUMP TO NEXT TABLE ENTRY <2716>
  
```

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 >>26E7
 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
 26EB 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 >>26E7

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 *****

 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 LAST PAGE LENGTH
 2746 ---
 2747 COPY BYTES BACKWARDS THROUGH MEMORY
 274E DROP ADDRESSES AND LENGTH BY 256
 2754 AND CONTINUE UNTIL FINISHED >>2746
 2756 RETURN
 2757 INPTR > OUTPTR, COPY PAGES FORWARD
 2759 HOW MANY FULL PAGES LEFT?
 275B NONE? >>276C
 275D COPY A FULL PAGE
 2764 AND BUMP ADDRESSES
 2768 DECREMENT LENGTH BY 256
 276A AND DO ALL PAGES >>275D
 276C GET LENGTH OF LAST PAGE
 276E EVEN PAGE BOUNDARY? >>2779
 2770 NO, COPY SHORT LAST PAGE
 2779 RETURN
 277A ***** ADDR/PAGE RELOCATE *****
 277A GET TABLE ENTRY TYPE (283C)
 277E GET PAGE TO RELOCATE
 2780 RELOCATE A SINGLE ADDRESS <27B8>
 2783 BUMP BY 1 OR 2 BYTES (283C)
 2786 ADVANCE POINTER <27D4>
 2789 AND CONTINUE UNTIL COMPLETE >>277A
 278B RETURN

278C ***** INSTRUCTIONS RELOCATE *****

 278C GET 6502 OPCODE
 278E COMPUTE INSTRUCTION LENGTH <27E7>
 2793 INVALID OPCODE? >>27A6
 2795 3 BYTE INSTRUCTIONS?
 2797 NO >>27A0
 2799 YES, 3 BYTE ADDRESS TO CORRECT
 279B RELOCATE ADDRESS <27B8>
 279E AND ADVANCE BY 3 BYTES
 27A0 NEXT INSTRUCTION <27D4>
 27A3 CONTINUE UNTIL FINISHED >>278C
 27A5 RETURN
 ***** INVALID OPCODE *****
 27A6 POP THE STACK
 27A8 RETURN WITH POINTER TO BAD INSTRUC.
 27AC DIE HORRIBLY
 27AF RETURN

ProDOS Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 27AF

 ADDR DESCRIPTION/CONTENTS

```

27B0 ***** ERROR RETURN *****
27B1 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 Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 27FC

 ADDR DESCRIPTION/CONTENTS

```

27FC ---
283C ***** RELOCATION DATA *****
283C RELOCATION CODE (3,2,1)
283D NUMBER OF RANGES
283E START OF RANGE PAGES
2846 END OF RANGE PAGES +1
284E ADDITIVE FACTORS
2856 NOT USED
285A PAD TO NEXT PAGE BOUNDARY
28CB

28FF ***** SET UP RAMDRIVE IN AUXMEM *****
28FF ---
2902 COPY RAM DRIVE DEVICE DRIVER TO.. (2C00)
2905 THE LANGUAGE CARD (FF00)
290F $3C/3D --> $2A00
2912 $3E/3F --> $2BFF
291D $42/43 --> $200
2923 MAIN MEM TO AUX MEM COPY
2924 COPY $2A00,LS200 TO AUXMEM $200 <C311>
2929 SLOT 3, DRIVE 2 DEVICE DRIVER.. (BF26)
292C IS AT $FF00
2931 BUMP DEVICE COUNT (BF31)
2937 ADD DEVICE TO VOLUME SEARCH TABLE
293C RETURN

293D ***** 293D-29FF NOT USED *****
293D NOT USED
2969

2A00 ***** RAMDRIVE DEVICE DRIVER *****
      (COPIED TO $200 IN AUXILIARY MEMORY)
2A00 SAVE THE 80STORE SETTING (C018)
2A04 FORCE RAM READ/WRITE (C000)
2A0C COPY INPUT PARAMETERS
2A14 FIRST TIME IN OR FORMAT COMMAND? (03BA)
2A17 NO? >>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 PONEY 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 RETURN TO \$FF44 (NORMAL EXIT)
 03F6
 2BF6 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 (FF7E)
 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 *
 * THE CODE NORMALLY RESIDES IN *
 * 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 USAGE *****
 0040 Pointer to callers parmlist
 0041 -- device driver parmlist --
 0042 Command
 0043 Unit Number
 0044 Buffer Pointer
 0045 Block Number
 0046 I/O Pointer - Index Block or..
 0047 caller's pathname buffer pointer
 0048 I/O Pointer - Data Block
 0049 I/O Pointer - Data Block
 004A I/O Pointer - Caller's Data or..
 004B buffer pointer passed in parmlist or..
 004C old I/O buffer

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 JAN 84 NEXT OBJECT ADDR: D000
 ADDR DESCRIPTION/CONTENTS

0040 Invalid pathname syntax
 0042 Too many files open
 0043 Invalid REF NUM
 0044 Nonexistent path
 0045 Volume not mounted
 0046 File not found
 0047 Duplicate file name
 0048 Disk full
 0049 Volume Directory full
 004A Incompatible ProDOS version
 004B Unsupported file type
 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 mounted
 005A Bad volume bit map

D000 ***** SCREEN LOCATIONS *****
 0750 For direct movement of text to screen
 07D0
 07F1
 07F2
 07F3
 07F4
 07F5
 07F6
 07F7
 07F8 Slot in use

D000 ***** SYSTEM GLOBAL PAGE EQUATES *****
 BF00 Jump to MLI entry point
 BF03 JSPARE (Jump to \$EECF, QUIT code)
 BF06 DATETIME vector
 BF09 Jump to System Error
 BF0C Jump to System Death Handler
 BF0F System Error number
 BF10 Device Driver address table
 BF30 Slot/Drive last device
 BF31 Count (-1) active devices
 BF32 List of active devices by DEVID
 BF58 Memory BITMAP for low 48K
 BF70 Open file 1 buffer address
 BF7E Open file 8 buffer address

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: D000

ADDR DESCRIPTION/CONTENTS

BF80 Interrupt handler 1
BF82 Interrupt handler 2
BF84 Interrupt handler 3
BF86 Interrupt handler 4
BF88 A reg save during interrupt
BF89 X reg save during interrupt
BF8A Y reg save during interrupt
BF8B S reg save during interrupt
BF8C P reg save during interrupt
BF8E Interrupt return address
BF90 Date/Time
BF94 File open LEVEL
BF95 Backup bit
BF9A Prefix flag (0 = no prefix)
BF9B MLI active flag
BF9C Last MLI call return address
BF9E MLI X reg savearea
BF9F MLI Y reg savearea
BFA0 Language card entry/exit routines
BFD0 Interrupt entry/exit routines
BFF4 Bank switch saved state (\$E000 byte)
BFFF Kernel version number
D000 ***** SOFT SWITCHES *****
C00C Reset 80 column mode
C051 Set TEXT mode
C053 Set Mixed text/graphics
C054 Display Primary page
C056 Set LORES graphics mode
C0FF Reset alternate I/O ROMs
D000 ***** MLI MAIN ENTRY POINT *****
D000 Clear decimal mode
D001 Save Registers (BF9F)
D007 Set (\$40) -> Address of function code -1
D00B Set CMDADR -> True return address
D01A Init Global Page System error to 0 (BF0F)
D01E Get Function Code
D021 Build hash index into Command Table (X reg)
D02A Is this code valid?
D02F No >>D0A7
D032 Set (\$40) -> Parameter list
D033 Get parameter count required (EF45)
D042 None? >>D060
D044 No - is parameter count correct?
D046 No >>D0AB
D048 Check class of function (EF25)
D04B Quit?
D04D Yes >>D05D

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 = 0)
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 *****
***** 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 *****
***** 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 (BFF4)
D09C Get RAM/ROM orientation (BFF4)
D09F Exit via RAM Global Page >>BFA0

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: D09F
 ADDR DESCRIPTION/CONTENTS

D0A2 ***** NO DEVICE CONNECTED *****
 D0A4 ---
 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? <BE89>
 D0CC Yes, then exit with error >>D0D6
 D0CE No, do Block I/O <D0DA>
 D0D1 Error? >>D0D6
 D0D3 No, then exit normally
 D0D5 RETURN
 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 *****
 D0F3 ALLOC/DEALLOC
 D0F3 Save Call Type
 D0F5 Which Type?
 D0F6 DEALLOC? >>D124

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)
 D14E And RTI Address (BF8E)
 D155 Replace stack to original condition
 D159 Save active slot index (DIC4)
 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 <DICE>
 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: 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? >>D19E
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 >>BFDD
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 infinite loop if no error code >>D239
D20B "-" (07F1)
D210 "E" (07E2)
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 function'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 after call
D25A PATHNAME not required? >>D261
D25C Required - parse and validity check <D27F>
D25F Bad Name? >>D278
D261 Reference Number in list? (F073)
D264 No >>D26B
D266 Yes - check it out <D3C5>
D269 Bad Number? >>D278
D26B Date/Time in list? (F073)
D26E No >>D273
D270 Yes - set system date just in case <BF06>
D273 Call Function Handler <D27C>
D276 If no errors the exit >>D27B
D278 Else - call system error handler <BF09>
D27B Return to caller
D27C Indirect JUMP to Handler >>F0B5

D27F ***** CHECK CALLER'S PATHNAME *****

***** COPY TO MY AREA *****

Set (\$48) -> Pathname

D28A ---
D28E Assume partial Pathname (F07C)
D291 No Pathname in my area yet (F100)
D294 Check length of caller's Pathname
D296 Zero is no good >>D2F0
D29A Nor is 65 or more >>D2F0
D29C Save length (F05E)
D29F Length + 1 (F05E)
D2A3 Get first character of his name
D2A7 Is it "/"?
D2A9 No >>D2AF
D2AB Yes - indicate fully qualified name (F07C)
D2AE Bump past "/"
D2AF ---
D2B1 Length of Index level is -1 initially (F100)
D2B4 First character of Index level (counter) (F078)
D2B7 Start of upcoming Index level in name (F07A)
D2BA At end of name yet? (F05E)
D2BD Yes >>D2F4
D2BF No - get next character in his name
D2C5 Is it "/"?
D2C7 Yes >>D309
D2C9 No - lower case?
D2CB No >>D2CF
D2CD Yes - force upper case
D2CF Copy to my Pathname buffer (F100)
D2D2 Increment Index level counter (F078)
D2D5 Subsequent characters may be A-Z,0-9 or . >>D2DC
D2D7 Increment Index level counter (F078)

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: D2DA

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: D338

ADDR DESCRIPTION/CONTENTS

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 >>D2FE
 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 *****
 ***** MLI SET PREFIX CALL *****
 D32A Copy Pathname <D27E>
 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

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
 D350 No - use old Prefix also (BF9A)
 D353 ---
 D355 Compute new Prefix Index (F05E)
 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 (F05F)
 D369 Save Keyblock for Prefix Directory (F060)
 D372 Copy Prefix to top of Path buffer (F100)
 D375 (preceeded by old Prefix if one exists) (F100)
 D37D Exit normally
 D37E Bad File Type Error
 D380 ---
 D381 RETURN

D382 ***** MLI GET_PREFIX CALL *****
 ***** MLI GET_PREFIX CALL *****
 D382 Set (\$4E) -> Data Buffer
 D38E Set Length = 64 (max)
 D398 Validity check buffer storage <EE6C>
 D39B Error? >>D380
 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 (F100)
 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 <ER26>
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 ($E) -> 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 Device 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 <DDEL>
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 *****
D4DF Get name length for loop index (F200)
D4E0 Copy name to Buffer entry (F200)
D4E1 Done yet? (F078)
D4E2 No, do another >>D4DF
D4E3 Yes, find current Buffer entry (F07A)
D4E4 Store Device number (BF30)
D4E5 Return to caller

D4F7 ***** MLI CREATE CALL *****
***** 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 occurred >>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 <DDDD>
D54C Error? Yes, then exit >>D523
D550 Set BLKNUM -> new Block number
D555 Back point to old Directory Block (F602)
D55B Loop until done >>D550
D55F Zero remainder of Block Buffer (F602)
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 number (F006)
D577 Read Block with my entry <DDEL>
D57A Entry number of my Directory (F008)
D57D None relocatable!!
D57E 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 Directory <DDDD>
D5A4 Error? then exit >>D5B5
D5A6 Start all over now that there's room >>D4F7

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 or $03
D5D9 force it to $10
D5DF else use a $D0
D5E1 Find File name (F07A)
D5E4 OR Storage type to name length (F100)
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 available? (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 *****
 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)
 D7E2 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

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: D896

 ADDR DESCRIPTION/CONTENTS

D896 or else, incompatible file format
 D898 ---
 D899 RETURN
 D89A copy DIR HDR <D8A0>
 D89D and go scan for next level >>D7DA

D8A0 ***** COPY DIRECTORY HDR *****

D8A0 Copy:
 D8A2 CREATION, VERSION, MIN VERS, ACCESS, (F61C)
 D8A5 ENTRY_LEN, ENTRIES_PER_BLK, FILE_COUNT (F00A)
 D8AB volume directory? (F604)
 D8B2 if so, exit now >>D8BF
 D8B6 else, copy PARENT_POINTER, (F627)
 D8B9 PARENT_ENTRY_NO., and PARENT_ENTRY_LEN (F006)
 D8BF RETURN

D8C0 ***** SAVE DIR ENTRY NO. & BLOCK *****

D8C0 compute entry number (F012)
 D8C9 save it (F01E)
 D8CE and the block it's in (F01C)
 D8D7 exit

D8D8 ***** SEARCH ONE DIR BLOCK FOR FILE *****

D8D8 get entries in this block (F012)
 D8DE \$48/\$49 --> first entry (D82A)
 D8E5 ---
 D8E7 skip HDR? >>D91C
 D8E9 no, non empty entry?
 D8ED yes >>D8FC
 D8EF no, do we need one? (F05B)
 D8F2 no >>D91C
 D8F4 yes, remember it <D8C0>
 D8F7 don't need another one now (F05B)
 D8FA skip to next entry >>D91C
 D8FC get length of name
 D8FE count it (F057)
 D901 save it for loop (F078)
 D907 same len as we are wanting? (F100)
 D90A no, skip it >>D91C
 D90C ---

D910 compare names (F100)
 D91A we found it! exit
 D91B RETURN

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 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 PFXPTR (BF9A)
 D98D fully qualified pathname? (F07C)
 D990 no >>D993
 D992 yes, no old PFXPTR 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

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: D9A9

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: DA54

ADDR DESCRIPTION/CONTENTS

ADDR DESCRIPTION/CONTENTS

*** FIND LAST DIR IN PREFIX OR VOL DIR ***

```

D9AC store name length (F078)
D9AF same name as in pathname? >>D9A0
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 PFI)
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 vol dir (F060)
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 VOLS ***
 *** 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 >>DALA
DA0B if none, get last in my device table (BF31)
DA16 volume not found error
DA19 RETURN

```

```

DALA ---
DALD search for device in device table (F08A)
DA25 when found, make it active device (BF30)
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 >>DA0B
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>

```

```

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

```

DA57 ***** COPY GBLB 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) (F211)
 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)
 BEC3 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

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: DBF2

ADDR DESCRIPTION/CONTENTS

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

DCA5 bad bitmap error
 DCA8 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

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

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 (F000)

go read bitmap <DD57>
 error? >>DCD1

DCD1 error exit

DCB3 scan 1st page of bitmap for free block(s) (F400)
 DCBB bump to page 1 of buffer (F064)
 DCBE bump page offset (F063)
 DCC1 scan 2nd page too (F500)
 DCC9 bump page (F063)
 DCCC get next block <DD35>
 DCCF continue >>DCAE

DCD2 save byte index (F062)
 DCD5 shift combination of page no. and (F063)
 DCD8 byte offset left 3 bits to make (F047)
 DCEB room for bit position.
 DCEA depending on buffer page ... (F064)
 DCEF 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
 DCFD then shift it back the way it was
 DCFE (with that bit turned off) >>DCFD
 DD00 store LSB of block no. (F046)
 DD03 store updated byte back in proper page (F064)
 DD10 indicate bitmap needs checkpoint
 DD18 one less block available in VCB (F051)
 DD2D ---
 DD2E return with new block no. (F046)
 DD34 RETURN

DD35 ***** GET NEXT BITMAP BLOCK *****

DD35 use blocks of vol to compute (F051)
 DD38 number of blocks in bitmap (F213)
 DD3F just scanned last block? (F21C)
 DD42 yes, no space >>DD53
 DD44 no, get next block (F21C)

DD35 use blocks of vol to compute (F051)
 DD38 number of blocks in bitmap (F213)
 DD3F just scanned last block? (F21C)
 DD42 yes, no space >>DD53
 DD44 no, get next block (F21C)

NEXT OBJECT ADDR: DC8B

NEXT OBJECT ADDR: DC8B

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 <DD9>
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 84 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 BLOCK *****
DDE3 save I/O command
DDE5 where is my buffer? (D82A)
DDE8 save flags
DDE9 and disable
DDEC Set low byte of Buffer pointer
DDEE to zero
DDE0 Initialize Global Page System error to 0 (BF0F)
DDE3 set I/O transfer occurred flag
DDF8 set unit to do I/O on (BF30)
DDFD do block I/O <D0DA>
DE00 error? >>DE05
DE02 no errors, restore things and exit
DE04 RETURN
DE05 error exit
DE07 RETURN
DE08 ***** MLI GET_MARK CALL *****
    ***** MLI GET_MARK CALL *****
DE08 copy mark to caller's list from FCB (F052)
DE18 exit with no errors
DE19 RETURN
DE1A bad position error
DE1D RETURN
DE1E ***** MLI SET_MARK CALL *****
    ***** MLI SET_MARK CALL *****

```


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 FC2'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
 DEEB 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 ***

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: DF20

 ADDR DESCRIPTION/CONTENTS

DF20 make block no. out of position (F06C)
 DF29 use as an index to examine index block
 DF2B' entry
 DF31 if its zero....
 DF35 need new data block
 DF39 set flags for what to allocate (F052)
 DF42 new index block being created?
 DF44 zero data block in any case <DF5A>
 DF47 if not index block that's it >>DF7C
 DF49 else,
 DF50 zero out index block I/O buffer
 DF57 and continue >>DF7C

DF5A ***** ZERO OUT DATA BLK I/O BUFFER *****

 DF5A ---
 DF5D zero both pages of buffer
 DF64 ---
 DF6B RETURN

DF6C ***** READ FILE DATA BLOCK *****

 DF6C set block no. LSB
 DF6E copy MSB from index entry
 DF72 ---
 DF74 read new data block <DF77>
 DF77 error? >>DF41
 DF79 reset block allocation flags <DFA2>

 *** GOT DATA BLOCK WANTED ***

DF7C ---
 DF83 save previous mark in my variables (F312)
 DF89 set new mark in the FCB (F06A)
 DF94 (\$4A/\$4B --> data block buffer)
 DF96 \$4C/\$4D --> start of the page in
 DF98 the data block buffer which contains (F06B)
 DF9B the mark.
 DFA1 exit

DFA2 ***** RESET BLOCK ALLOC FLAGS *****

 DFA2 get flags (F052)
 DFA8 turn off low 3 bits (allocate no new
 DFAA blocks to file) (F308)
 DFAD RETURN

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)
 DFB8 make it into blocks (divide by 2)
 DFCL new position beyond old? (F06B)
 DFC4 yes >>DFD4
 DFC6 else, use previous mark
 DFC8 copy to BLKNUM <DFE2>
 DFCB error? >>DFE1
 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? >>DFE1
 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,
 DFEF then go read block. >>DFE3
 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 ADDR: E020

ProDOS MLI -- V1.0.1 -- 1 JAN 84

NEXT OBJECT ADDR: E087

ADDR DESCRIPTION/CONTENTS

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 occurred flag
E06C set unit no. from DEVNUM (BF30)
E071 no errors have occurred 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 *****

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 *****

***** 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
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: E113

ADDR DESCRIPTION/CONTENTS

```

E113 Yes, no touchie >>E0C7
E115 else, check file min_version (F03C)
E118 against global page version (BFFF)
E11F if bad, unsupported version error
E122 RETURN

E123 storage type must be < $4
E127 or equal to SD
E129 else, compatibility error >>E11F
E12B ---
E12D copy key block, blocks used, and
E12F EOF mark to FCB (F052)
E13F BLKNUM = key block number
E144 store REFNUM in FCB (F05A)
E14A go check and assign I/O buffer <EDD7>
E14D error? >>E173
E14F go find VCB and set buff ptrs <D3E0>
E152 set current level in FCB (BF94)
E158 seedling, sapling or tree? (F307)
E15D no, skip next stuff >>E18A
E15F yes, make current mark in FCB outside
E161 first index block to force a read of all (F314)
E164 index blocks and BLOCK 0.
E168 zero mark wanted, however (F06A)
E16E go set mark to zero <DE3B>
E171 ok? >>E18F
E173 no, save the error code
E177 got and I/O buffer? (F30B)
E17A no >>E182
E17C yes, free it <EE34>
E182 mark FCB not in use
E188 exit with error
E189 RETURN

E18A else, read key block to I/O buffer <DFE7>
E18D error? >>E173
E18F bump open file count in VCB (F051)
E195 indicate files are open in VCB (F211)
E19D put REF NUM in caller's parmlist (F052)
E1A7 exit with no errors
E1A8 RETURN

E1A9 ***** FIND A FCB *****
E1A4 clear flags and index byte
E1B5 found a free FCB yet? (F053)
E1B8 yes >>E1BD
E1BA no, bump entry count (F05A)
E1BD FCB in use? (F300)
E1C0 yes >>E1C

```

PRODOS MLI -- V1.0.1 -- 1 JAN 84

NEXT OBJECT ADDR: E1C2

ADDR DESCRIPTION/CONTENTS

```

E1C2 no,
E1C5 save index to free FCB (F052)
E1C8 flag that we found one
E1CD and skip this FCB >>E1ED
E1CF ---
E1D5 compare file ID's to see if this FCB (F300)
E1D8 is open on the requested file. (F018)
E1E1 indicate FCB already open on file (F057)
E1E4 write enabled? (F309)
E1E9 if not, allow multiple open access to file >>E1ED
E1EB else, error exit
E1EC RETURN

E1ED return index to start of FCB
E1F1 bump to next FCB
E1F3 and loop >>E1B4
E1F5 when done, exit normally
E1F6 RETURN

E1F7 ***** MLI READ CALL *****
***** MLI READ CALL *****

E1F7 point to data buffer <E403>
E1FA copy request length <E3E8>
E1FD save access
E1FE set up marks <E415>
E202 read access permitted?
E204 yes >>E20A
E206 no, access error
E20A will we read past EOF? >>E231
E20C yes, (F052)
E20F LENGTH = EOF - current_mark (F315)
E227 are we already at EOF? (F09A)
E22A no >>E23C
E22C yes, EOF error

E231 else, zero length request? (F09A)
E237 no >>E23C
E239 yes, set mark and exit >>E2EF

E23C validity check data buffer <EE6C>
E23F no good? >>E22E
E241 ok, get storage type for file <E40E>
E244 standard kind of file?
E246 yes >>E24B
E248 no, DIR 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 occurred 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 occurred 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 *****
 E2FF ---
 E2F2 return actual length read in caller's list (F09A)
 E303 and exit by setting new mark >>DE3B

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

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 (F09A)
 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

***** COPY FROM I/O BLOCK BUFF *****

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 >>E38D
 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 (F06E)
 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) (E3A2)

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 >>D3E0

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 previous (F310)
 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
 E3EB 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 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 -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: E4EF
 ADDR DESCRIPTION/CONTENTS

E4EE update FCB flags (F308)
 E4F5 make index block offset from mark
 E4FD store new block no. in index block (F047)
 E50A and store it as current data block (F052)
 E514 set up buffer indexing <E306>
 E517 start writing <E51F>
 E51A go see if more blocks are needed >>E4A6
 E51C I/O finish up when done >>E2EF
 E51F ***** COPY WRITE DATA TO I/O BLOCK *****

 E51F lower request count by 1 (F06E)
 E522 ---
 E52A copy partial page from caller's data
 E52D to I/O block buffer
 E532 ---
 E535 next page in caller's area
 E539 bump mark by \$100 (F06B)
 E541 still in same I/O block page?
 E545 yes >>E52A
 E548 no, clear overflow (I/O incomplete) >>E56F
 E54A any complete pages left to write? (F06E)
 E54D no >>E55F
 E54F yes, more in this page?
 E550 yes >>E558
 E552 no, first block-page?
 E556 no >>E55B
 E558 yes, one less complete page to do (F06E)
 E55B readjust index
 E55C continue with full page >>E532
 E55F ---
 E560 a few bytes left to write? >>E56C
 E562 no, bump data buffer by \$100
 E564 and mark (F06B)
 E56C set overflow (I/O complete) (E3A2)
 E56F store LSB of mark (F06A)
 E572 and of request count (F06D)
 E576 indicate data block modified <E7FC>
 E579 and DIR entry needs update
 E57F advance pointer into caller's buffer (F06A)
 E58A set FCB flag to indicate write occurred <E590>
 E58E exit

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 *****

***** 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

ProDOS MLI -- V1.0.1 -- 1 JAN 84

NEXT OBJECT ADDR: E719

ADDR DESCRIPTION/CONTENTS

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 *****
***** 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 >>E701
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

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 occurred 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 occurred" 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?
E7E2 no >>E7FA
E7E6 yes, save error code (F07E)
E7F9 RETURN

E7FA else, real error right now
E7FB RETURN

E7FC ***** GET FCB FLAGS *****
E7FC load FCB flags (F052)
E7FE from FCB (F308)
E802 and exit

E803 ***** FILE ACCESS ERROR *****
E803 exit with file access error code
E806 RETURN

E807 ***** MLI SET_EOF CALL *****
***** 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... >>E803
  
```

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: E860
 ADDR 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

E94B ***** MLI GET_EOF CALL *****
***** MLI GET_EOF CALL *****

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

E95D ***** MLI NEW_LINE CALL *****
***** MLI NEW_LINE CALL *****
  
```

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 *****
 ***** 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 update the (F051)
 E989 VCB block count. <DB71>
 E98F copy blocks free from VCB (F215)
 E99B copy total blocks on volume to AUX_ID (F213)
 E9A9 total - free = blocks_used (F054)
 E9B6 shift type down from high nibble (F01F)
 E9C2 copy the data to caller's parmlist (EFCC)
 E9D3 and exit

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

E9D4 get the file entry <D798>
 E9D7 error? >>E9FE
 E9D9 indicate backup needed now (BF95)
 E9E8 copy 13 parms from caller's list to (EFCC)
 E9EB file entry staging area >>E9F2
 E9F2 ---
 E9F7 if any spurious access bits are on...
 E9FB access error!
 E9FE RETURN
 E9FF else, anything in his modification date?
 EA03 no >>EA08
 EA05 yes, go update directory >>D6BB

EA08 no, use system date then update directory >>D6AB

PRODOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: EA0B
 ADDR DESCRIPTION/CONTENTS

EA0B ***** MLI RENAME CALL *****
 ***** MLI RENAME CALL *****

EA0B follow path to file <D7AB>
 EA0E ok? >>EA4D
 EA10 no, bad name?
 EA12 no, real error >>EA2C

*** RENAME VOLUME ***
 EA14 yes, copy new name <EB35>
 EA17 error? >>EA2C
 EA19 get first length (F100)
 EA1D get next (F100)
 EA20 bad path if more than one name for vol >>EAAL
 EA25 files open on volume? (F211)
 EA28 no, continue >>EA2E
 EA2A yes, file open error
 EA2C ---
 EA2D RETURN

EA2E make type/len for a VOL DIR HDR
 EA35 write new name to VOL HDR <EB26>
 EA38 error? >>EAA3
 EA3F copy new name to device's VCB (F100)
 EA4B exit, no errors
 EA4C RETURN

*** RENAME FILE ***

EA4D get path index <EB43>
 EA50 copy old name with prefix to my buffer (F100)
 EA5C copy new name to buffer <EB35>
 EA5F error? >>EAA3
 EA61 get path index <EB43>
 EA67 compare all levels of names up to and (F600)
 EA6A including the last. Find first which
 EA6B differ.
 EA6F save indicies into names which point to (F079)
 EA72 final name. (F07A)
 EA75 ---
 EA7F exit if they match completely
 EA80 RETURN

EA81 index to differing new name (F079)
 EA84 point past it (F100)
 EA8C must be the last! (F100)
 EA8F it isn't >>EAAL
 EA91 it is, (F07A)
 EA94 do the same with the old name (F600)

```

PRODOS MLI -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: EA9F
-----
ADDR  DESCRIPTION/CONTENTS
-----
EA9F difference is only in last index? >>EAA5
EAA1 no, bad path error
EAA3, ---
EAA4 RETURN

EAA5 names good, follow path to new file <D7AB>
EAA8 better get an error >>EAAE
EAAA if found, duplicate name in directory
EAA4 RETURN

EAAE if error, better be file not found
EAB0 or else its really an error... >>EAA3
EAB2 copy old pathname again <D27F>
EAB5 get its file entry <D798>
EAB8 error? >>EAA3
EABA search FCB's <E1A9>
EABF exit if the file is open for write >>EAA3
EAC4 does ACCESS permit rename?
EAC6 yes >>EACC
EAC8 no, access error
EACA ---
EACB RETURN

EACC get type/len from entry (F01F)
EAD1 DIR file?
EAD3 yes, ok >>EADD
EAD5 seedling, sapling or tree?
EAD7 yes, ok >>EADD
EAD9 else, compatibility error
EADD copy new path again <EB35>
EAE0 error? >>EAA3
EAE2 get length of last name (F079)
EAE4 copy it and name to file entry buffer (F100)
EAFD combine new len with type (F100)
EB03 DIR file?
EB05 no, go update entry and exit >>EB23
EB07 yes, (F030)
EB11 read key block of this subdirectory <DDEL>
EB14 error? >>EAA3
EB19 copy new name to DIR HDR (F100)
EB1E and update directory's key block <EB26>
EB21 error? >>EAA3
EB23 go update directory entry and exit >>D6BB

EB26 ***** COPY PATH TO BUFF & WRITE *****
EB26 copy type/len and path to my buffer
EB32 go write 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
EB44 (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)
EBA8 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 NEXT OBJECT ADDR: EC62

ADDR DESCRIPTION/CONTENTS 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?
EBFA no, error >>EC4B
EBFC read volume bitmap block <DD57>
EBFF error? >>EC4A
EC01 BLKNUM = key block pointer (F030)
EC0B read it <DDEL>
EC0E errors? >>EC4A
EC10 if DIR has any files... (F625)
EC1A access error
EC1F write back block marking entry free (F604)
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 <DDEL>
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 occurred (F052)
EC5E restore regs and exit
EC61 RETURN

EC62 ***** TRUNCATE FILE AT EOF *****
EC62 check storage type*16 (F081)
EC65 seedling?
EC67 yes >>EC74
EC69 no, sapling?
EC6B yes >>EC77
EC6D no, tree?
EC6F yes >>EC7A
EC71 no, die horribly <BF0C>
EC74 go to seedling truncate >>ED46

EC77 go to sapling truncate >>ED0D

EC7A truncate tree,
EC7C at most 128 blocks in master index (F088)
EC7F read the master index <ED71>
EC82 error? >>ECDF
EC84 at EOF yet? (F088)
EC8A yes >>ECE0

    *** FREE WHOLE INDEX BLOCKS AFTER EOF ***
    (free 8 subindex blocks each time the
    master index block is read since we must
    share its buffer)

EC8C copy up to 8 non-zero index block
EC8E numbers to (F600)
EC91 a handy table (F08A)
ECA2 ---
ECAB if there weren't 8 left to do, zero (F08A)
ECAE remainder of the table (F092)
ECB4 ---
ECB5 update master index counter (F088)
ECBA for all 8 entries: (F089)
ECBD set BLKNUM (F08A)
ECC5 (exit when a 0 entry is found) >>EC7F
ECCC read the sub-index block <DDEL>
ECCF error? >>ECDF
ECD1 free all its blocks <EDA0>
ECD4 error? >>ECDF
ECDA and loop to do all 8 >>ECBA
ECDC then go back and reread master index >>EC7F
ECDE normal exit
ECDE RETURN

```

```

PRODOS MLI -- V1.0.1 -- 1 JAN 84          NEXT OBJECT ADDR: ECDF
-----
ADDR  DESCRIPTION/CONTENTS
-----
ECB0  now go free all the sub-index blocks (F084)
ECB4  which follow EOF <EDA2>
ECB7  error? >>ECDF
ECB9  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 occurred

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  prior 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 *****

 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

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 *****
 ***** 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 *****
 ***** MLI SET BUFF CALL *****

EEA7 mark his buffer allocated
 EEAC error? >>EECE
 EEAE get old buffer address (F09E)
 EE88 free old buffer's pages in map <EE43>
 EE8F copy old buffer contents
 EE91 to new buffer
 EE9D then exit
 EECE RETURN

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

EECF enable 2nd 4K bank of language card (C083)
 EE92 (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
 EE00 3 pages of code to copy

 EE02 copy quit code handler to \$1000
 EE03 Restore zero page to original state
 EE01 enable 1st 4K bank of language card (C08B)
 EF0D (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 JAN '84

NEXT OBJECT ADDR: EF83

PRODOS MLI -- V1.0.1 -- 1 JAN 84

NEXT OBJECT ADDR: EFB8

ADDR DESCRIPTION/CONTENTS

ADDR DESCRIPTION/CONTENTS

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

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

EF8D ***** MLI COMMAND INFO BYTE *****

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

PATHNAME FLAG
REFERENCE NUMBER FLAG
DATETIME STAMP FLAG
COMMAND NUMBER

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

EFC9 # Blocks Used

EFCB End of File

EFCF ***** SET/GET FILE_INFO OFFSETS *****

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)

EFE ***** FATAL ERROR MESSAGE *****

EFE ' INSERT SYSTEM DISK AND RESTART

E006 ---

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

PRODOS MLI -- V1.0.1 -- 1 JAN '84

NEXT OBJECT ADDR: EF83

ADDR DESCRIPTION/CONTENTS

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

EF8D ***** MLI COMMAND INFO BYTE *****

PATHNAME FLAG
REFERENCE NUMBER FLAG
DATETIME STAMP FLAG
COMMAND NUMBER

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 - DATA AREA *****

EFA1 Blocks Used
EFA3 End of File
EFA6 Special ID (Must be 5 bits on)
EFA7 'HUSTON!' Author's name
EFAE Previous Block of Vol Dir Key Block

THE FOLLOWING IS COPIED TO SUBDIR HDR+\$20

EFB0 Version of ProDOS
EFB1 Minimum Version
EFB2 Access Byte (D|Rn|B|000|W|R)
EFB3 Entry Length
EFB4 Entries per Block
EFB5 File Count
EFB7 Parent LSB (copied to SUBDIR HDR +\$20)

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: F011

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

ProDOS MLI -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: F058

ADDR DESCRIPTION/CONTENTS

- F05A Entries/Block Loop Count/Free FCB's refnum
Free Entry Found Flag (if > 0) or..
of 1st bitmap block with free bit on or..
- F05B bit for free
- F05C # Blocks in Bitmap left to search
- F05D Y Register temp
- F05E Pathname Length
- F05F Devnum for Prefix Directory Header
- F060 Block of Prefix Directory Header
- F062 Bitmap Byte Offset in Page
- F063 Bitmap Page Offset
- F064 Bitmap Buffer Page (0 or 1)
- F065 Bitmap Flag (if \$80, needs writing)
- F066 Bitmap DEVNUM
- F067 Bitmap Block Number
- F069 Bitmap Block offset for Multiblock Bitmaps
- New Mark to be Positioned to for Set Mark
or New Moving Mark (for READ)
- F06A or New EOF for SET_EOF
- F06D Request Count (Read/Write etc.)
- 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 - Backup)
- F075 Duplicate Volume Flag (if \$FF)
- F076 Duplicate Volume's VCB index
- F077 MLI function code (low 5 bits)
Characters in current Pathname indx lvl or
- F078 ONLINE: volname len - loop index
- F079 new pathname: index to last name
old pathname: index to last name or..
- F07A ONLINE: index to data buffer
- F07B Old PFIPTPR value
- F07C Pathname fully qualified flag (if \$FF)
Pathname: temp save area for index or..
- F07D ONLINE: DEVCNT
- F07E close-all error code
- F07F Set EOF: new Key Block pointer
- F081 New storage type (SET_EOF)
- F082 Freed Blocks count
- F084 EOF Block number (MSB then LSB)
- F086 EOF byte offset into Block
- F088 EOF - Master index counter
- F089 Save area for index into table below

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)

F08A device table part one
 F092 device table part two
 F09A length of path, etc.
 F09D next buffer address
 F09F 6 byte zeropage savearea >>0006
 F0A5 not used >>000A
 F0AF 16 byte interrupt savearea >>0006
 F0B5 Jump Vector

F0B7 not used >>0049

F100 ***** PATHNAME - DATA AREA *****
 | L1 | NAME1 | L2 | NAME2 | .. | 00

Prefix is at top of buffer such that a
 negative index may be used to use it,
 wrapping around to the pathname again.

F100 pathname buffer >>0100

F200 ***** VOLUME CONTROL BLOCKS *****
 VCBO starts here..

F200 Length (000LLLLL)
 F201 File Name (Max 15) >>000F
 F210 Unit Number
 F211 Files Open Flag (if \$FF)
 F212 Total Blocks
 F214 Blocks Free
 F216 Block Number of Vol Dir Key Block
 F218 not used
 F219 not used
 F21A Bit Map Pointer
 Block offset into multi-block bitmap of
 F21C next free bit.
 F21E Count of open files
 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..
 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
 lXXX XXXX Index Block Buffer Changed
 XlXX XXXX Data Block Buffer Changed
 XXlX XXXX Unused
 XXXl XXXX Directory entry needs update
 XXXX lXXX Storage Type Changed
 XXXX XlXX Allocate new Master Index Block
 XXXX XXlX Allocate new Sub Index Block

F308 XXXX XXXl 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 occurred 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 \$BFR6).	
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 (DSS\$0000) of last device.	
BF31	DEVCONT	Count (minus 1) of active devices.	
BF32-BF3F	DEVLST	List of active devices (slot, drive and identification--DSS\$IIII).	
BF40-BF4F	IRQXITX	Copyright notice.	
BF50-BF55		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
 Interrupt handler address (highest priority).
 Interrupt handler address.
 Interrupt handler address (lowest priority).
 A-register savearea.
 X-register savearea.
 Y-register savearea.
 S-register savearea.
 P-register savearea.
 Bank ID byte (ROM, RAM1, or RAM2).
 Interrupt return address.

General System Info
 YYYYYYMMMMDDDD.
 ...HHHHH ..MMMMMM.
 Current file level.
 Backup bit.
 Currently unused.
 Machine ID byte.
 00.. 0... II
 01.. 0... II+
 10.. 0... IIf
 11.. 0... III emulation
 00.. 1... Future expansion
 01.. 1... Future expansion
 10.. 1... IIf
 11.. 1... Future expansion
 ..00 ..00 Unused
 ..01 ..00 48K
 ..10 ..00 64K
 ..11 ..00 128K
 X... Reserved
 0... No 80-column card
 1... 80-column card present
 0... No compatible clock
 1... Compatible clock present
 Slot ROM map (bit on indicates ROM present).
 Prefix flag (0 indicates no active prefix).
 MLI active flag (1... ..0... indicates active).
 Last MLI call return address.
 X-register savearea for MLI calls.
 Y-register savearea for MLI calls.

ProDOS System Global Page NEXT OBJECT ADDRESS: BFA0

 ADDR LABEL CONTENTS

Language Card Bank Switching Routines
 Language card entry and exit routines.

Interrupt Routines
 Interrupt entry and exit routines.

Data
 Storage for byte at \$E000.
 Storage for byte at \$D000.
 Switch on language card and call system death handler (\$D1E4).
Version Information
 Minimum version of kernel needed for this interpreter.
 Version number of this interpreter.
 Minimum version of kernel compatible with this kernel.
 Version number of this kernel.

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

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

1000 MODULE STARTING ADDRESS

 * Quit Code:
 * Resides in alternate 4K
 * bank (\$D000) and is
 * executed at \$1000
 * *
 * *
 * * Versions 1.0.1 -- 1 JAN 84
 * *

1000 ***** INITIALIZATION *****
 1003 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 *****

1000 ***** ZERO PAGE EQUATES *****
 0024 Cursor Horizontal
 0025 Cursor Vertical

1012 Mark pages \$0, \$1, \$4 through \$7
 1014 and \$BF as in use
 1027 ***** DISPLAY CURRENT PREFIX *****

1000 ***** EXTERNAL EQUATES *****
 0280 Prefix Buffer
 1800 Buffer
 2000 Buffer
 BF00 MLI Entry
 BF58 Bitmap
 1000 ***** SOFT SWITCHES *****
 C000 Keyboard
 C000 Disable 80 column store
 C00C Disable 80 column card
 C00F Select alternate character set
 C010 Keyboard Strobe
 C082 ROM select

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 *****

1000 ***** MONITOR EQUATES *****
 FC58 Home
 FC9C Clear to end of line
 FD0C Read a key
 FD8E Output a Carriage Return
 FDED Output a Character
 FE89 Set Keyboard
 FE93 Set Video
 FF3A Sound Bell

105C ***** GET PREFIX NAME *****
 105C Initialize counter
 1063 Read a key <ED0C>
 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

```

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)
10BE 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 No, keep checking >>1112
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>
113D Increment counter
113F Found 39 characters?
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 -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 1157
 ADDR DESCRIPTION/CONTENTS

115A Get File Type (12D5)
 115D Is it ProDOS system file?
 115F Yes, continue >>1166
 1161 No, indicate Error \$01
 1163 Go to Error Handler >>11F6

 1166 Set Reference number to 0
 116B Call MLI (CLOSE) <BF00>
 116E Data: CLOSE command number
 116F Data: Pointer to Parameter list
 1171 Continue if no error >>1176
 1173 Else, go to Error Handler >>11F6
 1176 Get Access Byte (12D4)
 117B Yes, >>1182
 117D No, Indicate Error \$27
 117F Go to Error Handler >>11F6

 1182 Call MLI (OPEN) <BF00>
 1185 Data: OPEN command number
 1186 Data: Pointer to Parameter list
 1188 Continue if no error >>118D
 118A Else, go to Error Handler >>11F6

 118D Get Reference Number (12E8)
 1190 and update READ and (12EC)
 1193 GET_EOF parameter lists (12F4)
 1196 Call MLI (GET_EOF) <BF00>
 1199 Data: GET_EOF command number
 119A Data: Pointer to Parameter list
 119C Continue if no error >>11A1
 119E Else, go to Error Handler >>11F6

 11A1 Is EOF mark less than \$10000 (12F7)
 11A4 Yes, continue on >>11AB
 11A6 No, Indicate Error \$27
 11A8 Go to Error Handler >>11F6

 11AB Transfer EOF to Request count (12F5)
 11AE in READ parameter list (12EF)
 11B7 Call MLI (READ) <BF00>
 11BA Data: READ command number
 11BB Data: Pointer to Parameter list
 11BD Save status of READ
 11BE Call MLI (CLOSE) <BF00>
 11C1 Data: Get Prefix command number
 11C2 Data: Pointer to Parameter list
 11C4 Continue if no error >>11CA
 11C6 Else, retrieve status
 11C7 and go to Error Handler >>11F6

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 PREFIX (PRESS "RETURN" TO ACCEPT)'
 Prompt2 PATHNAME OF NEXT APPLICATION'
 128C Ring Bell
 128D 'NOT A TYPE "SYS" FILE'
 Error2 ERROR
 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: F86D

```

ADDR    DESCRIPTION/CONTENTS
-----
F86D    to come up to speed <FB85>
F874    Is command a status request?
F876    Yes, then do not move disk arm >>F87E
F878    Get track number for current request (FB56)
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>
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 (preinibblize) <FDF0>
F89A    ---
F89C    Initialize "retry" count at 64 (FB69)
F89F    ---
F8A1    Read an address field - Good read? <FB98>
F8A4    Yes, then continue on >>F8C0
F8A6    Decrement "retry" count - More to try? (FB69)
F8A9    Yes, then try again >>F89F
F8AB    No, just in case indicate "I/O Error"
F8AD    Decrement "recalibration" count - More to try? (FB6A)
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 <FCD3>
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

```

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 JAN 84 NEXT OBJECT ADDR: F953

 ADDR DESCRIPTION/CONTENTS

F953 Branch always taken >>F95A
 F955 Compute absolute value delta-tracks less 1
 F957 Decrement current phase to move out (FB5A)
 F95A Compare delta-tracks with phases moved (FB6B)
 F95D Use smaller value for offset to delay tables >>F962
 F962 Are we pointing at last table value yet?
 F964 Yes, then continue to use current offset >>F968
 F966 Else, use new offset
 F967 Set Carry flag for set phase operation
 F968 Set a phase <F987>
 F96B Get delay value from table (FB73)
 F96E Delay <FB85>
 F971 Get prior phase number (FB71)
 F974 Clear Carry flag for clear phase operation
 F975 Clear a phase <F98A>
 F978 Get delay value from table (FB7C)
 F97B Delay <FB85>
 F97E Increment phases moved (FB6B)
 F983 Delay <FB85>
 F987 Get "current" phase number (FB5A)
 F98A Use low two bits only, zero to three - 000000PP
 F98C Multiply by two and bring in Carry - 00000PPC
 F98D Merge in slot number
 F98F Put in X-reg for following operation
 F990 Toggle appropriate phase (C080)
 F993 Restore slot number to X-reg
 F995 Return to caller

F996 ***** TABLE 1 *****

Read Translate Table with Prenibblize
 Bit mask Tables and Epilog Table in
 unused areas

Read Translate

Bit Mask 1
 F9A0 00000000
 F9A1 00000000
 F9A2 10000000
 F9A3 10000000

Read Translate

Bit Mask 2
 F9C0 00000000
 F9C1 01000000
 F9C2 00100000
 F9C3 01100000

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 00000000
 F9E1 00010000
 F9E2 00001000
 F9E3 00011000

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

Disk II Device Driver -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: FB67
 ADDR DESCRIPTION/CONTENTS

FB69 Retry count (initially 64)
 FB6A Recalibration count (initially 1)
 FB6B Counter for Read Address routine
 FB6B Temporary storage for Read Address routine
 FB6C Track counter for Arm Move routine
 FB6C Checksum computation
 FB6D Volume found
 FB6E Sector found
 FB6F Delay counter (low byte)
 FB70 Checksum found
 FB70 Delay counter (high byte)
 FB71 Prior Track
 FB72 Track Number for Arm Move routine

FB73 ***** PHASEON/PHASEOFF TABLES *****
 Phase on table (delays for disk head acceleration)
 Phase off table (delays for disk head deacceleration)

FB85 ***** WAIT ROUTINE *****
 FB85 Wait about 100 times A-register (microseconds)
 FB87 ---
 FB92 ---
 FB97 Return to caller

FB98 ***** READ ADDRESS FIELD *****
 FB98 Initialize "must find" count at \$FCFC
 FB9D Increment count (low order byte) - Zero yet?
 FB9E No, skip ahead >>FBA5
 FBA0 Increment count (high order byte) - Zero yet? (FB6B)
 FBA3 Yes, exit and indicate Read Error >>FBFB
 FBA5 Read data register (C08C)
 FBA8 Loop until data valid >>FBA5
 FBAA Is it first address mark (\$D5)?
 FBAC No, then increment "must find" count >>FB9D
 FBAE Delay for data register to clear
 FBAF Read data register (C08C)
 FBB2 Loop until data valid >>FBAF
 FBB4 Is it second address mark (\$AA)?
 FBB6 No, then see if it's first address mark >>FBAA
 FBB8 Initialize count for four byte read
 FBB8 Read data register (C08C)
 FBBD Loop until data valid >>FBB8
 FBFF Is it third address mark (\$96)?
 FBC1 No, then see if it's first address mark >>FBAA
 FBC3 Set Interrupt flag

Disk II Device Driver -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: FBC4
 ADDR DESCRIPTION/CONTENTS

FBC4 Initialize checksum
 FBC9 Read "odd" encoded byte IX1X1XIX (C08C)
 FBCE Align "odd" bits IX1X1XIXI
 FBCF Save for later (FB6B)
 FBD2 Read "even" encoded byte IX1X1XIX (C08C)
 FBD7 Combine bytes XXXXXXXX (FB6B)
 FBDA Preserve data (Volume,Track,Sector,Checksum) (FB6D)
 FBDD Do checksum computation (FB6C)
 FBE0 Decrement counter - Finished field yet?
 FBE1 No, do some more >>FBC6
 FBE3 Is checksum computation zero?
 FBE4 No, then exit with carry set >>FBFB
 FBE6 Read data register (C08C)
 FBE9 Loop until data valid >>FBE6
 FBEB Is it first trailing byte (\$DE)?
 FBED No, then exit with carry set >>FBFB
 FBEE Delay for data register to clear
 FBF0 Read data register (C08C)
 FBF3 Loop until data valid >>FBF0
 FBF5 Is it second trailing byte (\$AA)?
 FBF7 No, then exit with carry set >>FBFB
 FBF9 Clear the Carry flag (no error)
 FBFA Return to caller
 FBFB Set the Carry flag (error occurred)
 FBFC Return to caller

FBFD ***** READ DATA (ON THE FLY) ROUTINE *****
 FBFD Convert slot number to an
 FBFE absolute reference (i.e. \$60 -> \$EC)
 FC00 Modify code for current slot number (FC5A)
 FC03 (i.e. \$C08C,X -> \$C0EC) (FC73)
 FC0F Get data buffer pointers
 FC13 Modify code for current Buffer address (FCAF)
 FC16 Provides access to top 3rd of Buffer (FCB0)
 FC1A Subtract \$54 from current address
 FC1F Modify code for current address - \$54 (FC97)
 FC22 Provides access to middle 3rd of Buffer (FC98)
 FC26 Subtract \$57 from current address
 FC2B Modify code for current address - \$AB (FC70)
 FC2E Provides access to bottom 3rd of Buffer (FC71)

FC31 Initialize must find count at \$20
 FC33 Decrement count - More to do?
 FC34 No, then exit >>FC6D
 FC36 Read data register (C08C)
 FC39 Loop until data valid >>FC36
 FC3B Is is 1st header mark (\$D5)?
 FC3D No, then try again >>FC33
 FC3F Delay for register to clear
 FC40 Read data register (C08C)

Disk II Device Driver -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: FC43

ADDR DESCRIPTION/CONTENTS

```

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 data byte (C0EC)
FC5E Translate it (F900)
FC61 Store it 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 always taken >>FC72
FC6D Set carry flag indicating error
FC6E Return to caller
FC6F Store byte in Primary buffer (bottom third) (1000)
FC72 Read a data 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 byte for later, no time now
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 (middle 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 byte and merge in (F900)
FCA8 bits from Auxiliary buffer (FA54)
FCAE Store byte in Primary buffer (top third) (1000)
FCB1 Read a byte (C0EC)
FCB6 Increment offset - done yet?
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
FCF0 Get slot number
FCF2 Read data register (C08C)
FCF5 Loop until data valid >>FCC2
FCF7 Is is 1st trailing mark ($DE)?
    
```

Disk II Device Driver -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: FCCA

ADDR DESCRIPTION/CONTENTS

```

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
FCFB Just in case indicate No Device Connected Error
FCFE Decrement count - 256 tries yet?
FCF0 No, try again >>FCDE
FCF0 Return to caller

FCF1 ***** CONVERT SLOT/DRIVE TO TABLE OFFSET * SKP 1***
FCF1 Preserve A-register DSSS0000
FCF2 Get Unit number 0000DSSS
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 >>FD0F
FD0C Put transition byte from secondary buffer (FB00)
FD0E Use 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
    
```

Disk II Device Driver -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: FD20
 ADDR DESCRIPTION/CONTENTS

```

FD20 Write "sync" byte <FDE7>
FD23 Decrement counter, done yet?
FD24 No, then do another >>FD1E
FD26 Write first data mark ($D5)
FD2B Write second data mark ($AA)
FD30 Write third data mark ($AD)
FD35 Initialize checksum
FD36 Initialize index into Auxiliary buffer
FD38 Branch always taken >>FD3D
FD3A Get data byte (Auxiliary buffer) (FB00)
FD3D Exclusive-or with previous data byte (FAFF)
FD40 Put result in X-reg for table lookup
FD41 Lookup "disk byte" in table (FA03)
FD44 Get slot
FD46 Write "disk byte" (C08D)
FD4C Decrement index - Done with Auxiliary buffer?
FD4D No, then another byte >>FD3A
FD4F Get last byte of Auxiliary buffer
FD51 Initialize index into Primary buffer
FD53 Exclusive-or with next data byte (1000)
FD56 Strip out last two bits XXXXX00
FD58 Strip out last two bits XXXXX00
FD59 Put result in X-reg for table lookup
FD59 Lookup "disk byte" in table (FA03)
FD5C Get slot
FD5E Write "disk byte" (C08D)
FD64 Get data byte (Primary buffer) (1000)
FD67 Increment offset, end of this page?
FD68 No, then continue on >>FD53
FD6A Did buffer start on page boundary?
FD6C Yes, then go write checksum >>FDC0
FD6E Did buffer start one past page boundary?
FD70 Yes, then go write last byte >>FDB3
FD72 Carry indicates odd or even buffer end
FD73 Get transition byte
FD75 Write it (C08D)
FD7B Get second transition byte
FD7D Delay 2 cycles for correct timing
FD7E Increment offset, buffer end on odd byte?
FD7F Yes, go see if we're done then >>FD99
FD81 Exclusive-or with next data byte (1100)
FD84 Strip out last two bits XXXXX00
FD86 Put result in X-reg for table lookup
FD87 Lookup "disk byte" in table (FA03)
FD8A Get slot
FD8C Write "disk byte" (C08D)
FD92 Get data byte (Primary buffer - page 2) (1100)
FD95 Increment offset
FD96 Exclusive-or with next data byte (1100)
FD99 End of buffer? - Put result in carry
FD9B Strip out last two bits XXXXX00
FD9D Put result in X-reg 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
FDEE Clear Carry flag (no error)
FDEF Select read mode (C08E)
FDE5 Return to caller

FDE6 ***** WRITE A BYTE SUBROUTINE *****
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 *****
FDF0 Get buffer pointer
FDF5 Add $2 to buffer address
FDF7 To access top third of buffer >>FDEA
FDEA 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 0000BAA00 (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 (F9C0)
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 .XXXXXXXX00
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	Compare 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 Bank1 Select

FF9B ***** IRQ CODE *****
 FF9B Put A-Register on stack
 FF9C Get Accumulator value from \$45
 FF9E and save it (BF56)
 FF A1 Replace \$45 with A-Register
 FF A2 since it may have been destroyed
 FF A4 Load Status register
 FF A5 Restore onto stack
 FF A6 Isolate B flag - Was it a BRK?
 FF A8 Yes, skip Interrupt stuff >>FFC2
 FF AA Else, Check location \$D000 (D000)
 FF AD Do we have RAM active
 FF AF Yes, indicate so >>FFB3
 FF B1 Else, indicate ROM
 FF B3 Update Bank ID byte (BF8D)
 FF B6 Also save temporarily (BF57)
 FF B9 Push (\$BF50) address of
 FF BB routine to bank in Ram and
 FF BC call IRQ on the stack
 FF BE Push a new P-Register on stack with
 FF C1 the Interrupt Disable flag set
 FF C2 Push (\$FA4) address less 1 of
 FF C4 Monitor IRQ on the stack
 FF C8 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
 FF D8 Save Accumulator in Global page (BF88)
 FF DB Restore \$45 with original value (BF56)
 FF E0 Select RAM (read & write) (C08B)
 FF E3 use Bank 1 (C08B)
 FF E6 Get Bank ID byte (BF57)
 FF E9 Leave via Global Page IRQ exit code >>BFD3

FFEC ***** UNUSED *****
 FFEC --- >>000E

FFFA ***** VECTORS *****
 FF EA NMI Vector
 FF FC Reset Vector
 FF FE 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 *****
 FROM POINTER FOR COPY
 TO POINTER FOR COPY
 CSWL VECTOR
 KSWL VECTOR
 APPLESOFT START OF STRINGS
 APPLESOFT HIMEM
 APPLESOFT TRACE FLAG

***** EXTERNAL ADDRESSES *****
 PATHNAME BUFFER
 PREFIX BUFFER
 START OF PREFIX NAME
 WARMSTART VECTOR
 COLDSTART VECTOR
 BRK HANDLER ADDRESS
 RESET HANDLER ADDRESS
 POWER-UP BYTE
 APPLESOFT & VECTOR
 CTL-Y VECTOR

***** SCREEN LINE ADDRESSES *****
 FIRST SCREEN BUFFER LINE
 SCREEN BUFFER LINE
 SCREEN BUFFER LINE

BI Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 2000

 ADDR DESCRIPTION/CONTENTS

***** BASIC GLOBAL PAGE *****
 BASIC INTERPRETOR ENTRY POINT
 BI COMMAND SCANNER (SYNTAX)
 COUT VECTORS FOR EACH SLOT
 KSWL VECTORS FOR EACH SLOT
 DEFAULT SLOT NO.
 DEFAULT DRIVE NO.
 HIMEM

***** SYSTEM GLOBAL PAGE *****
 MACHINE LANGUAGE INTERFACE ENTRY
 LAST DEVICE USED
 MEMORY MAP
 MACHINE TYPE FLAGS
 SLOTS WHICH CONTAINS CARDS WITH ROM
 IF 0, NO PREFIX ACTIVE

***** I/O PORT ADDRESSES *****
 TURN OFF 80 COLUMN BOARD
 ***** ROM ADDRESSES *****

APPLESOFT ENTRY POINT
 BRK HANDLER
 INIT SCREEN, MONITOR, ETC.
 CLEAR SCREEN, HOME CURSOR
 CHARACTER OUTPUT TO SCREEN
 SET NORMAL CHARACTER ATTRIBUTE

***** 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-\$BFFF ARE FREE

BI Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 204D

 ADDR DESCRIPTION/CONTENTS

```

204D LOOK AT LANGUAGE IN ROM (E000)
2050 IS IT APPLESOFT?
2052 NO, THEN CAN'T RUN INTERP >>2068
2057 GOT AT LEAST 64K?
2059 NO, THIS ONLY WORKS IN 64K >>2068
205D SET MY CSWL/KSWL FOR INTERP INIT (21CB)
2063 COPY ALL 4 BYTES >>205D
2065 THEN GO TO BASIC COLDSTART >>E000
      (WE WILL GET CONTROL AT 208B AGAIN)

2068 ***** ERROR EXIT *****
2068 ---
206A PRINT "UNABLE TO EXECUTE BASIC SYSTEM" (21F8)
2073 ALLOW REBOOT IF RESET PRESSED (03E4)
2079 GO TO SLEEP FOREVER >>2079

207B ***** COPY PAGES ($0/1-->$2/3) *****
207B ---
207C COPY FROM $0/1
207E TO $2/3
2081 A PAGE AT A TIME >>207B
2087 COUNT PAGES
208A RETURN

208B ***** CSWL INTERCEPT / CONTINUE *****
208B "]" APPLESOFT PROMPT?
208D NO...DON'T PRINT WHATEVER IT IS >>208A
208F YES, APPLESOFT DONE SETTING UP (BE10)
2092 POINT CSWL TO STANDARD OUTPUT
2099 CHECK LAST DEVICE USED (BF30)
209C SET ONLINE PARAMETER TO THIS (21F1)
20A2 DRIVE ONE OR TWO? >>20A5
20A5 STORE DEFAULT DRIVE (D) (BE3D)
20A9 ISOLATE SLOT FROM DEVICE NO.
20AE AND STORE DEFAULT SLOT (S) (BE3C)
20B5 GET SLOT BYTE SHOWING CARDS PRESENT (BF99)
20B9 PICK OFF ITS BITS ONE BY ONE
20BF SET OUTVECS AND INVECS TO $CS00 (BE10)
20C2 FOR ALL SLOTS WITH ROMS IN THEM (BE20)
20CC ---
20D2 SET HIMEM TO $9600
20D4 IN VARIOUS PLACES
20DB GOT A DEFAULT PREFIX? (BF9A)
20DE NO >>2105
20E0 YES, MLI: GET PREFIX <BF00>
20E6 ERROR? >>2142
20ED BACKSCAN PREFIX FOR "/"'S (0280)
20F2 AND COUNT THEM IN $21EE (21F7)
  
```

BI Relocator -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 20F5

 ADDR DESCRIPTION/CONTENTS

```

20F5 ---
20F6 FOR A COUNT OF SUBLEVELS >>20ED
20FD MORE THAN JUST VOLUME NAME? >>2126
20FF NO, MLI: SET PREFIX <BF00>
2105 MLI: ONLINE <BF00>
210B ERROR? >>2142
210D GET VOL NAME LENGTH (0281)
2112 NONE THERE? >>2142
2116 ADD ONE TO NAME LENGTH (0280)
211B AND PREFIX IT WITH A "/" (0281)
211E MLI: SET PREFIX <BF00>
2124 ERROR? >>2142

***** FIND STARTUP FILE *****
2126 MLI: GET FILE INFO <BF00>
2129 FIND "STARTUP" FILE
212C ERROR? >>2142
2131 SAVE LENGTH OF STARTUP FILE NAME (21EF)
2134 COPY NAME TO $200 (21E5)
213D FIRST COMMAND WILL BE "--STARTUP"
2142 CHECK NUMBER OF SUBLEVELS (21F7)
2147 MORE THAN JUST VOL? >>214F
2149 MLI: SET PREFIX <BF00>
214F ANY STARTUP FILE NAME? (21EF)
2152 YES, SKIP MESSAGE >>2178
2154 SET TRUE KSWL <21BA>
2159 PRINT '    PRODOS BASIC 1.0' (2220)
2164 PRINT '    COPYRIGHT ... (223C)
216D SKIP THREE LINES

***** FINISH UP AND GO TO BI *****
2178 ---
217A 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)
218F COPY BRK HANDLER JMP ALSO (21B3)
219E AND RESET JMP (03F2)
21A9 SET POWER-UP BYTE ACCORDINGLY (03F4)
21AE SET APPLESOFT IN NON-TRACE MODE
21B0 AND GO TO INTERPRETER >>BE00

***** VECTOR ADDRESSES *****
  
```

BI Relocator -- V1.0.1 -- 1 JAN 84	BI Relocator -- V1.0.1 -- 1 JAN 84	NEXT OBJECT ADDR: 21B3	NEXT OBJECT ADDR: 225C
-----	-----	-----	-----
ADDR	DESCRIPTION/CONTENTS	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 ---

```

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 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 APPLESOFT: START OF PROGRAM PTR
 00B8
 00B9
 00D6 APPLESOFT: PROGRAM LOCKED (PROTECTED)
 00D8 APPLESOFT: ONERR ACTIVE FLAG
 00DE APPLESOFT: ONERR CODE
 00F2 APPLESOFT: TRACE ACTIVE FLAG
 00F8 APPLESOFT: INTERNAL STACK
 ***** EXTERNAL ADDRESSES *****
 0100 START OF 6502 STACK
 0200 KEYBOARD INPUT LINE BUFFER
 03F4 POWERON RESET FLAG

***** BI GLOBAL PAGE *****
 EXTERNAL COMMAND ENTRY TO BI
 PRINT ERROR MESSAGE ENTRY TO BI
 PRODOS ERROR CODE
 OUTPUT VECTORS FOR ALL SLOTS
 CURRENT OUTPUT VECTOR
 CURRENT INPUT VECTOR
 PRODOS INTERCEPT VECTORS (INPUT/OUTPUT)
 BI'S INTERNAL REDIRECTION VECTORS
 DEFAULT SLOT
 DEFALUT DRIVE
 A REGISTER SAVE AREA
 X REGISTER SAVE AREA
 Y REGISTER SAVE AREA
 TRACE FLAG (APPLESOFT TRACE ON/OFF)
 IMMEDIATE COMMANDS=0, DEFERRED=1
 EXEC FILE ACTIVE=\$80
 READ FILE ACTIVE=\$80
 WRITE FILE ACTIVE=\$80
 READING PREFIX ACTIVE=\$80
 DIRECTORY FILE BEING ACCESSED
 FREE STRING SPACE DURING GARBAGE COLLECT
 BUFFERED I/O BYTE COUNT
 INDEX INTO INPUT COMMAND LINE
 LAST OUTPUT CHAR TO PREVENT RECURSION
 NUMBER OF OPEN NON-EXEC FILES
 EXEC FILE BEING CLOSED FLAG
 READ FILE IS TRANSLATED DIRECTORY
 VECTOR TO EXTERNAL COMMAND HANDLER
 LENGTH-1 OF EXTERNAL COMMAND STRING
 COMMAND NUMBER
 PARAMETERS ALLOWED FOR THIS COMMAND
 (SEE BIT DEFINITIONS IN TABLE LATER)
 PARAMETERS FOUND WITH THIS COMMAND
 (SAME BIT DEFINITIONS AS FOR PBITS)

BE06
 BE0C
 BE0F
 BE10
 BE30
 BE32
 BE34
 BE38
 BE3C
 BE3E
 BE3F
 BE40
 BE41
 BE42
 BE43
 BE44
 BE45
 BE46
 BE47
 BE49
 BE4A
 BE4B
 BE4C
 BE4D
 BE4E
 BE4F
 BE50
 BE52
 BE53
 BE54
 BE56

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9A00
 ADDR DESCRIPTION/CONTENTS

BE58 A KEYWORD VALUE
 BE5A B KEYWORD VALUE
 BE5D E KEYWORD VALUE
 BE5F L KEYWORD VALUE
 BE61 S KEYWORD VALUE
 BE62 D KEYWORD VALUE
 BE63 F KEYWORD VALUE
 BE65 R KEYWORD VALUE
 BE68 @ KEYWORD VALUE
 BE6A T KEYWORD VALUE
 BE6B SLOT NUMBER FROM IN# OR PR#
 BE70 ISSUE MLI CALL AND XLATE ERROR CODES
 MLI PARM LIST FIELDS
 CREATE: ACCESS CODE
 CREATE: FILE ID
 CREATE: AUX ID
 BEA3 CREATE: FILE KIND
 BEA4 SET/GET FILE INFO: PARM COUNT
 BEA7 SET/GET FILE INFO: ACCESS CODE
 BEB4 SET/GET FILE INFO: FILE ID
 BEB7 SET/GET FILE INFO: AUX ID
 BEB8 SET/GET FILE INFO: FILE KIND
 BEB9 SET/GET FILE INFO: BLOCKS USED
 BEBB SET/GET FILE INFO: MODIFY DATE/TIME
 BEBE SET/GET FILE INFO: MARK/EOF/BUF: REF NUM
 BEC7 ONLINE/GET/SET MARK/EOF/BUF: MARK/BUF
 BEC8 OPEN: SYSTEM BUFFER
 BECE OPEN: REF NUM RETURNED
 BED0 NEWLINE: REF NUM
 BED2 NEWLINE: NEW LINE CHAR (ALWAYS CR)
 BED3 READ/WRITE: REF NUM
 BED6 READ/WRITE: DATA ADDRESS
 BED7 READ/WRITE: LENGTH OF DATA
 BED9 READ/WRITE: ACTUAL LENGTH TRANSMITTED
 BEDB CLOSE/FLUSH: REF NUM
 BEDE BASIC HIMEM VALUE
 BEFB ***** SYSTEM GLOBAL PAGE *****

BEF3 QUIT VECTOR
 BEF30 LAST DEVICE USED
 BEF58 MEMORY UTILIZATION BIT MAP
 BEF94 OPEN FILE LEVEL
 BE9A PREFIX ACTIVE FLAG (IF NONZERO)
 ***** INPUT/OUTPUT LOCATIONS *****

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9A00
 ADDR DESCRIPTION/CONTENTS

C000 KEYBOARD STROBE
 C010 KEYBOARD STROBE CLEAR
 CFFF RESET I/O ROMS
 ***** APPLESOFT ROM LOCATIONS *****
 D43F APPLESOFT RESTART ENTRY
 D61A FIND LINE BY NUMBER IN APPLESOFT
 D665 SET POINTERS IN APPLESOFT
 D7D2 EXECUTE NEW 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)
 FEDE COUT VECTOR

9A00 ***** BASIC INTERPRETOR LOAD POINT *****
 (ENTRY POINT IS AT \$AC35, WARMDOS)

9A00 ***** 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 SET I/O VECTORS <9FAD>
 9A1C KSWL/H ALREADY SET?
 9A21 NO? THEN CHECK CSWL >>9A26
 9A23 YES, CONTINUE >>9AA3
 9A26 CSWL/H ALREADY SET?
 9A2B YES, CONTINUE >>9AA3
 9A2D NO, SAVE CURRENT INTERCEPTS FIRST >>9A8D

9A2F ***** OUTPUT INTERCEPT: MODE = 0 *****
 (IMMEDIATE MODE)

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9A2F
ADDR DESCRIPTION/CONTENTS

9A2F "# CHARACTER? (9F98)
9A32 NO... >>9A54
9A34 ELSE, SAVE X REG (BE3F)
9A38 CHECK STACK FOR \$D12 AS RETURN ADDR (0103)
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
9A54 NOT A #, SAME AS LAST OUTPUT THO? (BE4C)
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? (BCBD)
9A67 (MUST BE ALPHA)
9A69 RESTORE A REG
9A6B PATHNAME IS THERE... >>9A74
9A6D ELSE, WE ARE RECURSING INFINITELY, EXIT!
9A6E WE WERE'NT TRACING AFTER ALL, RESTORE X (BE3F)
9A71 AND A REGS, THEN FALL THRU TO EXIT (9F98)
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 NOW) (BE41)
9A87 FORCE APPLESOFT TO TRACE FOR MY BENEFIT ONLY
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)

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9AA3
ADDR DESCRIPTION/CONTENTS

9AA3 ***** SET CSWL/KSWL INTERCEPTS *****
9AA3 ---
9AA4 COPY VDOSIO VECTORS (BE34)
9AA7 TO CSWL
9AB1 AND KSWL
9AB9 EXIT TO CALLER
9ABA ***** INPUT INTERCEPT: MODE = 0 *****
(IMMEDIATE MODE)
9ABA IS EXEC FILE ACTIVE? (BE43)
9ABD NO >>9AC5
9ABF YES, SAVE REGISTERS <9F99>
9AC2 AND GO READ EXEC FILE FOR INPUT COMMANDS >>9BDE
9AC5 NO EXEC FILE, RESTORE REAL CSWL/KSWL <9A00>
9AC8 PROGRAM LOCKED?
9ACA YES, DON'T LET HIM INTO IMMEDIATE MODE >>9AFA
9ACC NO, READ A KEY FROM KEYBOARD <FD10>
9ACF RETURN?
9AD1 NO, EXIT >>9AEF
9AD3 YES, SAVE REGISTERS <9F99>
9AD6 STORE IT IN LINE BUFFER (0200)
--> THIS ENTRY CALLED BY EXEC TO PROCESS
A COMMAND STRING STORED AT \$200
9AD9 GO PROCESS THE COMMAND STRING <A6B4>
9ADC CHECK COMMAND NUMBER RETURNED FROM PARSE (BE53)
9ADF EXIT BI RIGHT NOW? >>9AEC
9AE1 NO, COMMAND RETURNED WITH ERROR CODE? >>9E22
9AE3 NO, RESTORE Y REG (BE40)
9AE6 RETURN A BACKSPACE TO CALLER OF KEYBOARD
9AE8 AND A LINE INDEX OF ZERO
9AEA EXIT THE BI >>9AEF
9AEC RESTORE CALLER'S REGISTERS <9FA3>
9AEF AND EXIT BI BY INSTALLING INTERCEPTS >>9A8D

9AF2 ***** SPECIAL ABORT EXIT *****
9AF2 ERROR=6, "PATH NOT FOUND"
9AF4 GO SAY SO <BE0C>
9AFA SAVE CALLER'S CSWL/KSWL VECTORS <9A8D>
9AFD ---
9AFF PRINT "PLEASE PRESS SPACE BAR" (BB9A)
9B0B FORCE REBOOT ON RESET (03F4)
9B0E CHECK KEYBOARD (C000)
9B13 IS IT A SPACE?
9B15 NO >>9B0E
9B17 YES, CLEAR KEYBOARD STROBE (C010)
9B1A CLEAR THE SCREEN <FC58>

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9B1D
 ADDR DESCRIPTION/CONTENTS

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9BA2
 ADDR DESCRIPTION/CONTENTS

9B1D AND CLOSE FILES AND QUIT SYSTEM >>9F8F

9B20 ***** ERROR HANDLER *****

9B20 ERROR=3, "NO DEVICE CONNECTED"
 9B22 MAIN ENTRY: STORE ERROR CODE (BE0F)
 9B25 AND IN APPLESOFT ONERR
 9B27 CHECK BI STATE (BE42)
 9B2A MEMORIZE WHETHER IT'S IMMEDIATE MODE
 9B2F SET A HIGH FILE LEVEL FOR NON-EXEC FILES (BF94)
 9B34 NO ACTIVE READ/WRITE FILES OR PREFIX READ (BE44)
 9B3D CLOSE ALL OPEN FILES AT OR ABOVE (BEDE)
 9B40 FILE LEVEL = \$0F
 9B42 MLI: CLOSE (ALL) <BE70>
 9B45 ERROR? >>9B59
 9B47 WRITE ANY DATA I HAVE BUFFERED <A037>
 9B4A ERROR? >>9B59
 9B4C PUT FILE LEVEL BACK TO ZERO
 9B54 NOW FLUSH ALL OPEN FILES
 9B56 MLI: FLUSH (ALL) <BE70>
 9B59 ---
 9B5A ASSUME MODE WILL BE 4 (DEFERRED)
 9B5C MEMORIZE WHETHER BASIC ONERR ACTIVE
 9B5E DEFERRED MODE CURRENTLY? >>9B62
 9B60 NO, STILL IMMEDIATE MODE (MODE=0)
 9B62 ---
 9B63 SET MODE AS DEFINED ABOVE <9FAD>
 9B66 RESTORE BI'S CSWL/KSWL INTERCEPTS <9AA3>
 9B69 GET ERROR CODE (BE0F)
 9B6D BASIC ONERR ACTIVE? THEN GO HANDLE IT >>9B7F
 9B70 NO, JUST PRINT ERROR MESSAGE <BE0C>
 9B73 CLOSE EXEC FILE IF ONE IS OPEN <B355>
 9B77 DEFERRED MODE? >>9B85
 9B79 IMMED. MODE, PRINT RETURN AND... <9FE2>
 9B7C WARMSTART APPLESOFT >>D43F
 9B7F RESTORE STACK FOR BASIC
 9B84 PASS ERROR CODE TO BASIC
 9B85 ---
 9B87 JUMP INTO APPLESOFT ERROR HANDLER >>D865

9B8A ***** RETURN TO IMMED. MODE *****

9B8A CLEAR APPLESOFT ERRNUM
 9B8E WILL LOOK FOR "#" FROM APPLESOFT
 9B93 SET NORMAL VIDEO IN APPLESOFT <F273>
 9B96 RESTORE TRUE CSWL/KSWL <9A00>
 9B99 TRY TO WRITE BUFFERED DATA <A02B>
 9B9C REST MODE/SET UP BI'S INTERCEPTS <9A17>
 9B9F RESTORE REGISTERS <9FA3>
 9BA2 GO TO PROCESS IMMED. INPUT REQUEST >>9ABA

9BA5 ***** INPUT INTERCEPT: MODE=4 OR 8 *****

9BA5 SAVE REGISTERS <9F99>
 9BA8 PREFIX INPUT ACTIVE? (BE46)
 9BAB NO >>9BB0
 9BAD YES, GO DO SPECIAL HANDLING >>9D96
 9BB0 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 <9A00>
 9BC6 AND PASS CALLER'S ARG TO REMOVE CURSOR (BE3E)
 9BC9 REMOVE CURSOR AND GET A KEYPRESS <FD10>
 9BCC BACKSPACE?
 9BCE NO, EXIT BI >>9BDB
 9BD0 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
 9BE0 CHECK PROMPT CHARACTER
 9BE2 IF ITS A ">"...
 9BE4 DO THINGS DIFFERENTLY >>9C21
 9BE6 CHECK KEYBOARD (C000)
 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 >>9C30
 9BF7 YES, CLEAR KEYBOARD STROBE (C010)
 9BFA AND GO START NEW LINE >>9C30
 9BFC SET UP FOR EXEC LINE READ <9DB9>
 9BFF READ A LINE TO \$200 <9C9B>
 9C02 ERROR? >>9C29
 9C04 SAVE REGISTERS <9F99>
 9C07 HOP INTO LOOP >>9C0D
 9C09 ---
 9C0A BACKSCANNING \$200 BUFFER (0200)
 9C0D FORCING THE MSB ON
 9C15 RESTORE TRUE CSWL/KSWL <9A00>

```

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)

```

Beneath Apple ProDOS Supplement

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9D77

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9CF9

ADDR DESCRIPTION/CONTENTS

ADDR DESCRIPTION/CONTENTS

9D77 CURRENT POSITION IN THIS BLOCK (BCB7)
 9D7F READ NEXT DIR ENTRY FROM FILE <B22B>
 9D82 NO ERROR? >>9D90
 9D84 ERROR, IF RANGE ERROR....
 9D86 NO, TRUE ERROR >>9D4E
 9D88 RANGE ERROR, READY FOR SUMMARY LINE NEXT (BE4F)
 9D8D RETURN A BLANK LINE THIS TIME >>9D02
 9D90 FORMAT FILE/DIR ENTRY INTO \$201 <A501>
 9D93 AND RETURN IT TO CALLER >>9D24
 9D96 ***** PREFIX INPUT ACTIVE *****
 9D96 PROMPT = "]"?
 9D98 NO, ALL IS WELL >>9D9D
 9D9A YES, RETURN TO IMMEDIATE MODE NOW >>9B8A
 9D9D REMOVE CURSOR FROM SCREEN (BE3E)
 9DA4 PREFIX NO LONGER ACTIVE AFTER THIS (BE46)
 9DAA COPY PATHNAME BUFFER (PREFIX) (BCBC)
 9DAD TO \$200 (0IEF)
 9DB3 RETURN WITH IT TO BASIC (BCBC)
 9DB8 RETURN
 9DB9 ***** SETUP TO READ LINE FROM EXEC *****
 9DB9 SET READ REF NUM FOR EXEC FILE (BCA3)
 9DBF READ TO \$200
 9DC4 FOR SEF BYTES OF LENGTH
 9DC9 (OR UNTIL A RETURN CHAR)
 9DD1 RETURN
 9DD2 ***** OUTPUT INTERCEPT: MODE = C *****
 (LOOK FOR CONTROL-D)
 9DD2 SAVE REGISTERS <9F99>
 9DD5 PRINTING A CONTROL-D?
 9DD7 NO >>9DF0
 9DD9 YES, WRITE OUT ANY BUFFERED DATA <A02B>
 9DDC NOTHING IN COMMAND LINE (BE4B)
 9DDE READ FILE INACTIVE (BE44)
 9DE2 WRITE FILE INACTIVE (BE45)
 9DE5 PREFIX READ INACTIVE (BE46)
 9DEA SET MODE = 8 FROM NOW ON <9FAD>
 9DED RESTORE REGS AND EXIT >>9FA3
 9DF0 GOT A CONTROL-D...
 9DF2 SET MODE = 4 FROM NOW ON <9FAD>
 9DF5 RESTORE REGISTERS <9FA3>
 9DF8 OUTPUT CHARACTER AND EXIT >>B84B

9CF9 THE OPEN FILE LIST TO THE ENTRY LENGTH (BCB8)
 9CFC AND THE NUMBER OF ENTRIES PER BLOCK (BD00)
 ***** FORMAT DIRECTORY NAME *****
 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 -- 1 JAN 84 NEXT OBJECT ADDR: 9DF8
 ADDR DESCRIPTION/CONTENTS

```

9DFB ***** OUTPUT INTERCEPT: MODE = 8 *****
      (ASSEMBLE COMMAND LINE)

9DFB SAVE REGISTERS <9F99>
9E01 SAVE CHAR IN COMMAND LINE (0200)
9E04 WAS IT A RETURN?
9E06 YES, READY TO ROLL >>9E16
9E08 NO, BUMP CHARACTER COUNTER (BE4B)
9E0B AND EXIT TO CALLER >>9E12
9E0D OOPS! LINE TOO LONG
9E0F "SYNTAX ERROR" >>9E22
9E12 ELSE, RESTORE X REG AND EXIT (BE3F)
9E15 RETURN

9E16 ---
9E18 NULL LINE? >>9E25
9E1A NO, PUT BACK TRUE CSWL/KSWL <9A00>
9E1D SYNTAX SCAN CMD LINE <A6B4>
9E20 ERROR? >>9E0F
9E22 NO, PUT BACK BI'S INTERCEPTS <9A8D>
9E25 ---
9E27 MODE = 4 NOW <9FAD>
9E2A RESTORE REGS AND EXIT >>9FA3

9E2D ***** WRITE BUFFERED CHARACTER *****
9E2D SAVE Y REG (BE40)
9E30 CHECK PROMPT
9E32 CHECK TO SEE IF WE ARE IN "IF", >>9E40
9E35 "PRINT", "LIST", OR "CALL" STATEMENTS >>9E40
9E38 OF AN APPLESOFT PROGRAM >>9E40
9E3A IF NOT, EXIT TO CALLER... (BE40)
9E3D WITH CHARACTER ECHOED TO SCREEN >>9A74

9E40 GET INDEX TO TEMPORARILY BUFFERED CHARS (BE4A)
9E45 STORE INTO BUFFER JUST ABOVE HIMEM
9E4A BUMP INDEX (BE4A)
9E4D OK >>9E5A
9E4F BUFFER FULL, SAVE REGISTERS <9F99>
9E52 WRITE BUFFER OUT TO DISK <A025>
9E55 ERROR? >>9E0F
9E57 RESTORE REGISTERS <9FA3>
9E5A AND EXIT ANYWAY
  
```

```

9E5B ***** OUTPUT INTERCEPT: MODE = 4 *****
      (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 >>9E65
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 ABOUT "]"?
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 PROMPT FOR RECURSION
9EE0 RETURN

9EE1 ***** APPLESOFT TRACE INTERCEPT *****
      (CONTROL PASSES HERE FOR EVERY STATEMENT)
      (EXECUTED WHILE PRODOS IS ACTIVE)
*****

9EE1 BUMP APPLESOFT LINE POINTER
9EE5 ---
9EE9 MARK PROMPT FOR RECURSION
9EEB JUST IN CASE WE DIE IN HERE
9EED RESTORE APPLESOFT'S STACK
9EF0 DOES BI KNOW WE ARE TRACING? (BE41)
9EF3 YES, REAL LIVE TRACE THEN >>9F68

9EF5 ELSE, PICK UP NEXT TOKEN ON LINE
9EF9 IS IT A TOKEN? >>9F20
9EFB OR END OF LINE? >>9F1D
9EFD NEITHER, DECREMENT STRING SPACE CTR (BE49)
9F00 OK >>9F1B
9F02 COMPUTE SIZE OF FRGSPACE IN PAGES
9F06 AT LEAST 3 PAGES AVAILABLE?
9F08 YES >>9F14
9F0A NO, WRITE BUFFERED DATA <A02B>
9F0D AND THEN GARBAGE COLLECT <A07B>
9F12 COMPUTE FREE SPACE NOW
9F14 AND SAVE IN STRING SPACE CTR (BE49)
9F19 GET NEXT TOKEN
9F1B ---
9F1D JUMP BACK INTO APPLESOFT TO EXECUTE IT >>D820
9F20 STORE TOKEN IN PROMPT
9F23 LOOK UP TOKEN IN BI'S TOKEN TABLE (B7F3)
9F26 ITS NOT ONE BI IS INTERESTED IN >>9F1D
9F28 IT IS INTERESTING, CHANGE BRANCH (9F2C)
9F2B AND JUMP TO ONE OF THE FOLLOWING: >>9F2D

9F2D IF OR PRINT: PROMPT = 0
9F2F CLEAR OUT LAST CHAR SAVEAREA (BE4C)
9F32 GO TO MODE = C NEXT TIME THRU (B85D)
9F35 (BEGIN LOOKING FOR COMMANDS) (BE38)
9F3E NOW GO PROCESS THE IF OR PRINT >>9F5D

9F40 LIST: PROMPT = 1
9F42 (DON'T LOOK FOR COMMANDS NOW)
9F44 GO DO IT >>9F5D

9F46 CALL: PROMPT = 2
9F48 (DON'T LOOK FOR COMMANDS NOW)
9F4A GO DO IT >>9F5D

```

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: 9F4A

ADDR DESCRIPTION/CONTENTS

```

9F4C LET: DECREMENT STRING CTR
9F4D AND GO BACK FOR NEXT TOKEN >>9EFD

9F50 TRACE: TURN TRACE ON (BE41)
9F53 THEN CONTINUE BELOW >>9F59

9F55 NOTRACE: DROP INTO BACKGROUND TRACE (BE41)
9F58 CHANGE TOKEN TO "TRACE"
9F59 FORCE ON APPLESOFT TRACE
9F5D ---
9F5E GO BACK TO APPLESOFT TO PERFORM IT >>D820

9F61 RESUME: CLEAR ONERR CODE
9F66 GO TO APPLESOFT TO PROCESS IT >>9F1B

***** REAL TRACE ACTIVE *****

9F68 RESTORE TRUE CSWL/KSWL <9A00>
9F6D PRINT "#" <FDED>
9F74 USE APPLESOFT TO PRINT CURRENT LINE NO. <ED24>
9F79 PRINT A BLANK SPACE <FDED>
9F7C PUT BI'S CSWL/KSWL INTERCEPTS BACK <9A8D>
9F80 THEN GO BACK AND HANDLE AS USUAL >>9EF5

9F83 LOOKING FOR A LOWER CASE "c"
9F87 LOOKING FOR A "#"
9F89 STORE CHAR TO SEARCH FOR (9F98)
9F8D BRANCH BACK INTO APPLESOFT >>9F1B

9F8F ***** EXIT SYSTEM VECTOR *****

9F8F CLOSE ALL OPEN FILES <B54C>
9F94 MLI: QUIT <BE70>

9F98 "#" CHARACTER (ASOFT TRACE CHAR)

9F99 ***** SAVE CALLERS REGISTERS *****
9F99 SAVE A, X AND Y REGS (BE3E)
9FA2 RETURN

9FA3 ***** RESTORE CALLERS REGISTERS *****
9FA3 RESTORE A, X AND Y REGS (BE3E)
9FAC RETURN

```

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 ---
 9FE7 NOTHING IN BUFFER AT FIRST
 9FEF 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 ---
 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 GET TAB POSITION (BA9A)
 A017 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

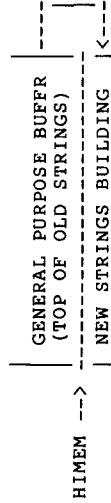
A037 ***** WRITE ALL BUFFERED DATA *****

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)

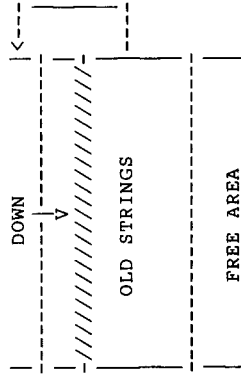
A054 DO GARBAGE COLLECTION NORMALLY FIRST <A07B>
 A057 ERROR? >>A07A
 A05B START OF STRING AREA = PROGRAM START PTR (BC84)
 A063 USE GENERAL PURPOSE BUFFER (ABOVE HIMEM)
 A065 FOR A GARBAGE COLLECT WORKAREA (BC7D)
 A06A IT IS 3+1 PAGES IN LENGTH (BC7E)
 A06F END OF STRING AREA IS AT END OF FREEAREA (BC86)
 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 >>A0ED
 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 TO PRODUCE THE MAXIMUM SIZED RANGE (BC7C)
 A10F IS THIS BELOW THE BOTTOM OF THE STRINGS? (BC84)
 A112 NO >>A119
 A114 YES, USE THE BOTTOM POINTER INSTEAD (BC84)
 A117 (ADJUSTING FOR PARTIAL PAGE)
 A119 STORE FINAL LORANGE VALUE (BC7F)
 A11C COPY SOME PAGES BELOW HIRANGE TO WORKAREA <A1D2>
 A11F (TO MAKE ROOM FOR NEW STRINGS)
 A121 COLLECT SIMPLE STRING VARS FOR THIS RANGE <A134>
 A124 ERROR? >>A131
 A126 THEN COLLECT STRING ARRAYS <A16A>
 A129 NEW HIRANGE = OLD LORANGE (BC7F)
 A12F CONTINUE LOOPING >>A0DC
 A131 IF ERROR, "RAM TOO LARGE"
 A133 EXIT TO CALLER

A134 ***** COLLECT SIMPLE STRINGS *****

A134 ---
 A135 ADD 7 BYTES TO \$3E/\$3F PTR FOR NEXT VAR
 A13F PTR AT ARRAYS NOW?
 A145 IF SO, WE ARE DONE >>A168
 A147 IS THIS A STRING VARIABLE?
 A14E NO >>A134
 A150 MAKE ABSOLUTELY SURE
 A154 GET MSB OF STRING POINTER
 A158 IS IT WITHIN MY RANGE? (BC7E)
 A15B NO >>A135
 A160 NO >>A134
 A162 YES, PULL IT OUT AND TACK IT TO HIMEM <A1F5>
 A165 ALL WENT WELL, GET NEXT VARIABLE >>A135
 A167 IF ERROR, EXIT NOW
 A168 NORMAL EXIT TO CALLER
 A169 RETURN

A16A ***** COLLECT STRING ARRAYS *****

A16A FIND THE NEXT ARRAY <A199>
 A16D NO MORE? >>A168
 A16F GOT ONE, GET MSB OF ITS STRING PTR
 A173 WITHIN MY RANGE? (BC7F)
 A176 NO >>A183
 A17B NO >>A183
 A17D YES, PULL IT OUT AND TACK IT TO HIMEM <A1F5>
 A180 AND CONTINUE WITH NEXT ARRAY ELEMENT >>A184
 A182 ERROR EXIT

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A182
 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
 A1BE 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?

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A220
 ADDR DESCRIPTION/CONTENTS

A220 YES, NO MOVE TO DO >>A22B
 A223 ---
 A224 ELSE, COPY STRING OUT
 A22B ---
 A22C OUT OF FREESPACE? (BC82)
 A231 RETURN TO CALLER WITH INDICATION

A232 ***** ALLOCATE BUFFER *****

A232 NEED 4 PAGES
 ***** GENERAL PURPOSE ALLOCATE *****
 A234 STORE THAT (BBB6)
 A237 GO GARBAGE COLLECT TO GET SPACE <A07B>
 A23A ERROR? >>A287
 A23E HOW MANY FREE PAGES ARE THERE?
 A240 ARE THERE ENOUGH? (BBB6)
 A243 IF NOT, "RAM TOO LARGE" MSG
 A245 TOO FEW... >>A287
 A247 GOT ENOUGH, \$3A-->TOP OF FREESPACE
 A24E AND \$3C-->NEW TOP AFTER ALLOCATION
 A258 COMPUTE LENGTH OF STRINGS FOR COPY
 A266 COPY STRINGS DOWN "N" PAGES IN MEMORY <A396>
 A26C SUBTRACT "N" FROM STRING ADDRESS MSB'S (BBB6)
 A272 ADJUST ALL POINTERS IN SIMPLE & ARRAY VARS <A3DA>
 A277 OLD HIMEM BECOMES BUFF ADDR HIGH WATER MARK (BBB8)
 A27E NEW HIMEM IS "N" PAGES LOWER
 A283 FIND PAGE JUST BEYOND A FILE BUFFER (BC88)
 A286 RETURN
 A287 ---
 A288 RETURN

A289 ***** FREE BUFFER *****

A289 GARBAGE COLLECT STRINGS <A07B>
 A28C ERROR? >>A2D4
 A292 PUT HIMEM-\$100 INTO \$3A/3B
 A296 AND HIMEM+\$400 INTO \$3C/3D
 A29C (COPY LSB'S)
 A2A3 BC92 = LENGTH OF STRINGS (BC92)
 A2AD COPY STRINGS UP 4 PAGES <A3BA>
 A2B2 PREPARE TO ADJUST THEM BY \$400 (BC87)
 A2B8 NEW HIMEM+\$400
 A2BA ADJUST ALL STRING ADDRS UP BY \$400 <A3DA>
 A2C0 ARE WE FREEING BOTTOM-MOST BUFFER?
 A2C2 YES, DONE! >>A2EE
 A2C5 CHECK OPEN FILE COUNT (BE4D)
 A2C8 NONE OPEN? (HOW CAN THAT BE?) >>A2D4
 A2CA WHICH FILE'S BUFFER IS NEXT TO HIMEM?
 A2CF SEARCH UNTIL IT IS FOUND... >>A2D5

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A2D4

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A34E

ADDR DESCRIPTION/CONTENTS

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

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

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.

A396 ***** COPY BLOCK DOWN IN MEMORY *****
 COPY ALL FULL PAGES DOWN TO THEIR NEW HOME
 COPYING \$3A-->\$3C
 BUMP BOTH MSB'S
 DROP PAGE COUNTER (BC93)
 AND CONTINUE >>A39D
 NO SHORT LAST PAGE? (BC92)
 THEN EXIT NOW >>A3B9
 ELSE, COPY PARTIAL PAGE
 THEN EXIT

A2F1 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

A398 ***** COPY BLOCK UP IN MEMORY *****
 PARTIAL PAGE? (BC92)
 NO, JUST COPY FULL PAGES NOW >>A3C6
 YES, COPY SHORT PAGE FIRST <A3D1>
 DROP BOTH MSB'S
 PAGE COUNT GONE TO ZERO? (BC93)
 YES, DONE >>A3D9

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.

A38D ---
 A38E USE BOTTOM BUFFER PTR (BBB9)
 A391 SET FILE BUFFER <A2D6>
 A395 AND EXIT

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.

A38D ***** SET BUFFER BELOW ALL OTHERS ***
 USE BOTTOM BUFFER PTR (BBB9)
 SET FILE BUFFER <A2D6>
 AND EXIT

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.

A396 ***** COPY BLOCK DOWN IN MEMORY *****
 COPY ALL FULL PAGES DOWN TO THEIR NEW HOME
 COPYING \$3A-->\$3C
 BUMP BOTH MSB'S
 DROP PAGE COUNTER (BC93)
 AND CONTINUE >>A39D
 NO SHORT LAST PAGE? (BC92)
 THEN EXIT NOW >>A3B9
 ELSE, COPY PARTIAL PAGE
 THEN EXIT

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.

A38D ***** SET BUFFER BELOW ALL OTHERS ***
 USE BOTTOM BUFFER PTR (BBB9)
 SET FILE BUFFER <A2D6>
 AND EXIT

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.

A38D ***** SET BUFFER BELOW ALL OTHERS ***
 USE BOTTOM BUFFER PTR (BBB9)
 SET FILE BUFFER <A2D6>
 AND EXIT

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

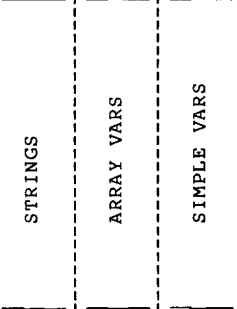
A40D COPY ARRAYS STARTING LSB
 A40F (MSB IS IN X REGISTER NOW) (BC81)
 A412 ---
 A413 FIND A STRING ARRAY <A199>
 A416 NO MORE? THEN DONE... >>A434
 A418 ---
 A41B ADJUST ITS ADDRESS IF NEED BE <A435>
 A421 SKIP TO NEXT STRING ELEMENT OF ARRAY
 A429 AT END OF THIS ARRAY YET? (BC81)
 A42C NO... >>A418
 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 -->



A449 GARBAGE COLLECT FIRST <A054>
 A44C ERROR? >>A44E
 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 ALIGNMENT)
 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

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A5DE

ADDR DESCRIPTION/CONTENTS

```

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)
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)

```

A648 ---
A648 ADD 100 TO FORCE SIGNIFICANCE IN TENS
A64A CONVERT IT <A66C>
A64D IGNORE 100'S PLACE
A64E RETURN

```

A64F ***** CONVERT TO HEX *****

```

A650 ---
A650 ISOLATE LOW NIBBLE
A652 AND GO CONVERT IT FIRST <A65A>
A656 NOW ISOLATE HIGH NIBBLE
A659 AND FALL THRU TO CONVERT IT ALSO

```

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A659

ADDR DESCRIPTION/CONTENTS

```

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 FIELD DIGIT (BCB0)
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 10 *****

```

A68A 24 BIT SHIFT (3 BYTES)
A68E CLEAR SUM (BCB2)
A691 GO ROL ACCUMULATOR LEFT ONE BIT <A617>
A694 ALSO ROL 4TH BYTE OF ACCUM (BCB2)
A698 IF MSB > 10.. (BCB2)
A6A2 THEN ADD ONE TO ACCUMULATIVE SUM (BCAF)
A6A5 ---
A6A6 SHIFT 24 TIMES >>A691
A6A8 RETURN
A6A9 ---
A6B3 RETURN

```

A6B4 ***** SYNTAX: PARSE COMMAND LINE *****
(ALSO EXTERNAL ENTRY FOR COMMAND STRINGS)

```

A6B4 INIT COMMAND NUMBER TO -1
A6BB A BLANK ENDS EACH STRING (BCA9)
A6C0 AT MOST 8 CHARACTERS IN A COMMAND (BCAA)
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 >>A879
A6D4 SCAN FOR COMMAND IN TABLES <AB21>
A6D7 BAD COMMAND? >>A6D1

```

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A6D9

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A77C

ADDR DESCRIPTION/CONTENTS

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#/PR#, REPARSE COMMAND <AA5B>

A77C RETURN FOUND - ERROR >>A76C
 A77E "A"? (ADDRESS KEYWORD)
 A780 IF SO, GO PARSE THAT KEYWORD ONLY >>A7CC
 A782 ELSE, ZERO ACCUMULATOR <AB77>
 A785 CONVERTING ONE BYTE'S WORTH (BCAD)
 A78A PUT IT IN PR#/IN# SLOT VALUE AREA (BCAE)
 A78F FOUND SLOT FOR PR#/IN# (BE56)
 A792 CONVERT SLOT # <A9A0>
 A795 ERROR? >>A7A1
 A797 GET CONVERTED VALUE (BE6B)
 A79A >8?
 A79C NO, ITS OK >>A7D1
 A79E YES, "RANGE ERROR"
 A7A1 RETURN
 A7A2 SECOND PATHNAME EXPECTED?
 A7A3 NO >>A7C7
 A7A5 YES, FLUSH TO NON-BLANK <AA7A>
 A7A8 NOTHING ELSE ON LINE??? >>A76C
 A7AB DON'T FLUSH ANY BLANKS OUT OF PATHNAME
 A7B2 COPY SECOND PATHNAME TO \$281 <AA40>
 A7B7 SAVE IT'S LENGTH (LESS 1) (0280)
 A7BC FOUND PATHNAME1 AND PATHNAME2 (BE56)
 A7C0 GET LAST CHARACTER AGAIN <AA7A>
 A7C3 IF NOT COMMA OR RETURN, "SYNTAX ERROR" >>A76C
 A7C5 RETURN? >>A7D8
 A7C7 NO, COMMA, FLUSH TO NON-BLANK <AA7A>
 A7CA SYNTAX ERROR IF TWO COMMAS IN A ROW >>A76C
 A7CC LOOKUP KEYWORD CHAR AND PARSE ITS VALUE <A928>
 A7CF EXIT NOW? >>A7A1
 A7D1 NO, FLUSH TO NON-BLANK <AA7A>
 A7D4 SYNTAX ERROR IF COMMA OR RETURN NOT FOUND >>A76C
 A7D6 COMMA? YES, GO GET NEXT KEYWORD >>A7C7
 A7D8 GET PARSED SLOT (BE61)
 A7DB MUST BE NON-ZERO >>A79E
 A7DD AND LESS THAN 8
 A7DE OR ELSE - "RANGE ERROR" >>A79E
 A7E1 CHECK DRIVE TOO (BE62)
 A7E6 MUST BE EITHER 1 OR 2
 A7ED IS THIS A DEFERRED COMMAND?
 A7F0 NO... >>A7FB
 A7F2 YES, IS A PROGRAM RUNNING? (BE42)
 A7F5 YES >>A7FB
 A7F7 NO, "NOT DIRECT COMMAND"
 A7FA RETURN
 A7FB EXPECTING NO PATHNAMES? >>A83D
 A7FD NO... (BE55)
 A800 ARE S AND D VALID FOR THIS CMD?
 A802 NO >>A83D
 A804 YES, HAVE WE GOT PATHNAME1? (BE56)
 A808 YES >>A813

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A80D

 ADDR DESCRIPTION/CONTENTS

A80D IS PATHNAME REQUIRED?
 A80E YES, "SYNTAX ERROR" >>A879
 A811 NO, OPTIONAL - NO PREFIX FETCH THEN >>A83D
 A816 DOES PATHNAME1 START WITH A "/"?
 A818 YES, FULLY QUALIFIED >>A81F
 A81A NO, IS THERE A PREFIX ACTIVE? (BF9A)
 A81D NO >>A838
 A81E YES, (BE57)
 A822 SLOT/DRIVE GIVEN WITH THIS COMMAND?
 A824 NO, FORGET IT >>A83D
 A826 YES, DO WE HAVE PATHNAME ALSO? >>A838
 A828 NO,
 A82A NULL OUT PATHNAME1 (BCBC)
 A832 MARK THAT WE WILL HAVE ONE SOON (BE56)
 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 HANDLING ROUTINE (B93F)
 A84B AND STORE IT FOR INDIRECT JMP (BCAC)
 A850 EXTERNAL COMMAND? IF SO GO NOW! >>A876
 A852 MY OWN COMMAND, "PREFIX"
 A854 YES, GO NOW >>A876
 A859 S OR D VALID KEYWORDS FOR THIS CMD?
 A85B NO, GO NOW >>A876
 A860 PATHNAME1 GIVEN WITH THIS COMMAND?
 A861 NO, GO NOW >>A876
 A863 YES, GET FILE INFO FOR PATHNAME1 <B82A>
 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 >>BCAB

A879 ***** SYNTAX ERROR *****
 A879 LOAD BI CODE FOR "SYNTAX ERROR"
 A87B AND RETURN WITH ERROR CONDITION
 A87C RETURN

A87D ***** ADD PREFIX TO PATHNAMES *****
 A87D GET SLOT NUMBER (BE61)
 A884 PUT SLOT IN HIGH 3 BITS
 A886 ADD DRIVE TO TOP BIT AND SHIFT SLOT DOWN (BE62)
 A88E ...TO FORM THE UNIT NUMBER (BEC7)
 A893 READ THE PATHNAME PREFIX TO \$201 (BEC8)
 A89D MLI: ONLINE <BE70>

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A8A0

 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, HE GAVE TYPE IN HEX >>A9B6
 A95C IS IT ALPHABETIC?
 A95E NO, CONVERT DECIMAL TYPE >>A9A0
 A960 ELSE, GO LOOKUP TYPE NAME IN TABLE >>A9F6

 A963 "INVALID PARAMETER"
 A964 RETURN
 A966
 A967 GET BIT POSITION OF THIS KEYWORD (B9C7)
 A96A IGNORE "v" >>A987
 A96C IS THIS KEYWORD PERMITTED? (BE55)
 A96F NO, NOT WITH THIS COMMAND ANYWAY >>A963
 A971 S OR D?
 A973 NO >>A981
 A975 YES, ALREADY FOUND IT ON THIS LINE? (BE57)
 A978 YES, DON'T CHANGE DRIVE DEFAULT >>A987
 A97A ELSE, ASSUME DRIVE = 1
 A981 MARK WE HAVE SLOT/DRIVE (BE57)
 A987 GET SIZE-1 IN BYTES OF VALUE (B9D1)
 A994 AND OFFSET TO VALUE IN STORAGE AREA (BCAE)
 A997 FLUSH TO NON-BLANK <AA7A>
 A99A NOTHING ELSE THERE? >>A9F0
 A99C IS NEXT CHAR A "q"?

A99E YES, GO CONVERT HEX - ELSE, FALL THRU >>A9B6
 A9A0 ***** CONVERT DECIMAL NUMBER *****
 A9A0 SAVE LINE INDEX (BE4B)
 A9A3 CONVERT/ADD ONE DECIMAL DIGIT TO ACCUM <AA9C>
 A9A6 OK.. >>A9AC
 A9A8 OVERFLOW? THEN "RANGE ERROR" >>A9F3
 A9AA BAD DIGIT? THEN "SYNTAX ERROR" >>A9F0
 A9AC RESTORE LINE INDEX (BE4B)
 A9AF FLUSH TO NEXT NON-BLANK <AA7A>
 A9B2 AND GO BACK TO CONVERT NEXT DIGIT >>A9A0
 A9B4 ALL DONE, END OF LINE OR COMMA >>A9CF

A9B6 ***** CONVERT HEX NUMBER *****
 A9B6 FLUSH TO NEXT NON-BLANK (SKIP "q") <AA7A>
 A9B9 NOTHING LEFT? >>A9F0
 A9BB SAVE LINE INDEX (BE4B)
 A9BE CONVERT HEX DIGIT <AAEE>
 A9C1 OK.. >>A9C7
 A9C3 OVERFLOW? THEN "RANGE ERROR" >>A9F3
 A9C5 BAD DIGIT? THEN "SYNTAX ERROR" >>A9F0
 A9C7 RESTORE LINE INDEX (BE4B)
 A9CA FLUSH TO NEXT NON-BLANK <AA7A>
 A9CD AND GO CONVERT NEXT DIGIT >>A9BB

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: A9CD
 ADDR DESCRIPTION/CONTENTS

A9CF ***** STORE KEYWORD VALUE *****
 A9CF HOW MANY BYTES TO CHECK?
 A9D4 ALL HAVE BEEN CHECKED? >>A9DE
 A9D6 NO, INSURE MSB'S OF ACCUM ARE ZERO (BCAF)
 A9D9 IF NUMBER IS A SHORT INTEGER >>A9F3
 A9E1 COPY ACCUM TO PROPER PARM STORAGE CELL (BCAF)
 A9EB RESTORE LINE INDEX (BE4B)
 A9EF AND EXIT
 A9F0 "SYNTAX ERROR" JUMP >>A879
 A9F3 "RANGE ERROR" JUMP >>A79E

A9F6 ***** STORE KEYWORD VALUE *****

 A9F6 COPY 3 CHARACTER TYPE TO ACCUM (BCAF)
 A9F8 (COPIED ALL 3?) >>AA07
 A9FE (GET NEXT CHAR IGNORING BLANKS) <AA7A>
 AA00 MUST HAVE 3 CHARACTERS! >>A9F0
 AA05 SAVE LINE INDEX (BE4B)
 AA07 INITIALIZE NAME INDEX TO ZERO
 AA0A HAVE ALL 13 BEEN CHECKED?
 AA11 YES, NO MATCH >>A9F0
 AA14 ELSE, INDEX*3 (BCAD)
 AA18 COMPARE TYPE GIVEN (BCAF)
 AA1B TO TYPES IN TABLE (B9E9)
 AA1E (IGNORE MSB'S)
 AA1F NO MATCH ALREADY... >>AA29
 AA23 ELSE,
 AA25 CHECK ALL THREE CHARS >>AA18
 AA27 THEY ALL MATCH! WE FOUND IT >>AA2E
 AA29 NOT THE RIGHT ONE, (BCAD)
 AA2C GO TRY THE NEXT ONE >>AA0A
 AA2E REVERSE NAME INDEX
 AA35 AND GET TYPE VALUE FROM TABLE (B9DB)
 AA38 STORE IT IN TYPE VALUE STORAGE AREA (BE6A)
 AA3B RESTORE LINE INDEX (BE4B)
 AA3F AND EXIT

AA40 ***** COPY PATHNAME2 *****
 AA40 GET NEXT CHARACTER <AA8A>
 AA43 AND STORE IT INDEXED OFF \$280 (0280)
 AA47 COMMA?
 AA49 YES, DONE >>AA77
 AA4B BLANK?
 AA4D YES, DONE >>AA77
 AA4F RETURN?
 AA51 YES, OUT NOW >>AA88

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 >>AAAA
 AA9E YES >>AAAA
 AA9A NOT NUMERIC, EXIT WITH CARRY SET
 AA95 AND Z-FLAG RESET
 AA97 RETURN
 AA98 ISOLATE DECIMAL PORTION OF DIGIT
 AA9B CURRENT VALUE OF ACCUM... (BCBL)
 AA9E >1,703,936?
 AA98 YES, OVERFLOW >>AAD4
 AA94 PUSH ENTIRE ACCUM ONTO STACK (BCAF)
 AA9B ACCUM*2 (ROL IT ONCE) <AB17>
 AA9E 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? >>AADD
 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
 AAF8 "F"
 AAF0 YES! >>AB02
 AAFE ---
 AAF0 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 Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: AB17

ADDR DESCRIPTION/CONTENTS

AB17 SHIFT THE THREE BYTE WORK ACCUM (BCAF)
 AB20 RETURN

AB21 ***** SCAN CMD TABLE FOR COMMAND *****

AB21 START WITH LAST COMMAND IN TABLE
 AB26 IS IT A "-" COMMAND? (BCBD)
 AB2B NOPE >>AB35
 AB2D YES, SPECIAL COMMAND NUMBER (BE53)
 AB30 ZERO LENGTH COMMAND STRING (BE52)
 AB33 CONTINUE >>AB52
 AB35 FIRST COMMANDS IN TABLE ARE 8 CHARS
 AB3A GET INDEX TO NEXT NAME (B8B2)
 AB3D SAME LENGTH AS LAST NAME? >>AB45
 AB3F NO,
 AB42 NAMES ARE ONE BYTE SHORTER FROM NOW ON (BE52)
 AB45 ---
 AB46 COMPARE HIS NAME TO MY TABLE (BCBD)
 AB4C NOT IT... >>AB65
 AB50 COMPARE ENTIRE NAME >>AB46

AB52 FOUND IT! GET COMMAND INDEX (BE53)
 AB55 *2 FOR MOST THINGS
 AB57 PICK UP PERMITTED PARMS BITS (B97E)
 AB63 EXIT HAPPILY
 AB64 RETURN

AB65 NOT THE ONE, SKIP TO NEXT (BE52)
 AB66 IF THERE ARE ANY MORE >>AB3A
 AB70 ELSE, NO SUCH COMMAND (BE53)
 AB74 XRETURN THRU \$BE06 VECTOR >>BE06

AB77 ***** ZERO THREE BYTE ACCUM *****

AB77 ZERO THE THREE BYTE WORK
 AB79 ..ACCUMULATOR (BCAF)
 AB82 RETURN

AB83 ***** "-" COMMAND *****

AB83 CHECK FILE TYPE (BEB8)
 AB86 APPLESOFT PROGRAM?
 AB88 YES, "RUN" IT >>ABF2
 AB8A BINARY FILE?
 AB8C YES, "BRUN" IT >>ABCD
 AB8E TEXT FILE?
 AB90 NO >>AB95
 AB92 YES, "EXEC" IT >>B27B
 AB95 SYS FILE?
 AB97 YES, GO RUN IT >>AB9D

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>
 AB9E CLOSE EXEC <B355>
 AB9F LSB OF A\$ IS 00 (BE58)
 ABAA FREE UP ALL OF BI'S MEMORY (BF6B)
 ABAB 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>
 ABEA RESTORE OLD HIMEM
 ABE6 ERROR? >>AC58
 ABE8 NO, CLEAR VARIABLES <D665>
 ABEB REEXPAND VARIABLES DOWN AGAINST LOMEM <A4AF>
 ABF0 THEN GO "RUN" PROGRAM >>AC07

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 >>AB79

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 ***** WARMDS: 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 LOWMEM = 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 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).
 ACFE 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)
 AD1E GO CREATE A NEW FILE <AD8B>
 AD22 ERROR? >>AD6D
 AD24 WRITE ACCESS REQUESTED
 AD26 BAS TYPE FILE
 AD28 OPEN IT <BLEE>
 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

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: ADD4
 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 (BEGA)
 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)
 ADB 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)
 ADCF TURN OFF ALL...
 ADD4 THEN GO SET UPDATED FILE INFO >>B841

ADD7 ***** "UNLOCK" COMMAND *****

ADD7 GET FILE INFO FOR PATHNAME1 <B82A>
 ADDA TURN ON ALL FILE ACCESSES
 ADEE THEN GO SET UPDATED FILE INFO >>B841

ADE5 ***** "PREFIX" COMMAND *****

ADE5 SLOT/DRIVE GIVEN ON COMMAND? (BE57)
 ADEB IF SO, GOT OPERAND ALREADY >>ADFL
 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

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AE57 "PATH NOT FOUND" ERROR
AE58 ---
AE59 RETURN
AE5A

AE5B ***** "BRUN" COMMAND *****
      (DOES NOT SET MODE=4 SO DOS COMMANDS MAY
      NOT BE ISSUED AS WITH A BASIC PROGRAM)

AE5B BLOOD IT FIRST <AE68>
AE5E ERROR? >>AE59
AE60 THEN CALL IT <AE65>
AE63 THEN EXIT
AE64 RETURN
AE65 INDIRECT JMP TO BINARY PROGRAM >>BED7

AE68 ***** "BLOOD" COMMAND *****
AE68 READING...
AE6A TYPE = BIN
AE6C OPEN THE FILE <BLEE>
AE6F ERROR? >>AE59
AE71 ASSUME USER SPECIFIED AD KEYWORD (BE58)
AE7A IF SO, USE HIS ADDRESS >>AE8C
AE7C ELSE, USE AD IN FILE INFO (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
AEA9 YES... (BE5D)
AEA9 COMPUTE L = (E - AD) (BE58)
AEB4 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

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AEC7 ---
AEC9 MLI: GET EOF <BE70>
AEC9 ERROR? >>AEDB
AEC9 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 >>AE0F
AEEC YES, COPY B VALUE TO SET MARK LIST (BESA)
AEF5 ---
AEF7 MLI: SET MARK <BE70>
AEF7 NO ERROR? >>AE0F
AEFF ERROR, RANGE ERROR?
AF01 NO >>AEDB
AF03 BSAVING (NOT BLOOD/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? >>AF41
AF55 COMPRESS APPLESOFT VARS AGAINST HIMEM <A449>

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BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: AF5C

 ADDR DESCRIPTION/CONTENTS

AF5C OPEN "VAR" FILE FOR WRITE <BLEE>
 AF5E 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 <BLEE>
 AFB8 ERROR? >>AF9A
 AFB8 SET UP TO READ THE HEADER <AFA2>
 AFBD READ 5 BYTE HEADER <B000>
 AFC0 ERROR? >>AF9A
 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 >>AF9A
 AFE7 COMPUTE LENGTH OF ALL VARS/STRINGS
 AFE9 (HIMEM-START) (BC8F)
 AFED GO READ COMBINED VARS INTO MEMORY <B000>
 AFB0 ERROR? >>AF9A

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: AFF2

 ADDR DESCRIPTION/CONTENTS

AFF2 CLOSE THE FILE <AFFC>
 AFF5 EXIT BY REEXPANDING THE VARS DOWN >>AF9A
 AFF8 "PROGRAM TOO LARGE" ERROR
 AFFB RETURN
 AFFC ***** CLOSE FILE *****
 AFFC SET MLI CLOSE OPCODE
 AFFE AND GO TO MLI >>B00C
 B000 ***** READ/WRITE A RANGE *****
 B000 READ MLI OPCODE
 B002 JUMP IN >>B006
 B004 WRITE MLI OPCODE
 B006 STORE LENGTH (BEDA)
 B00C EXIT THRU MLI:READ OR WRITE >>BE70
 B00F ***** "PR#" COMMAND *****

B00F USE CSWL AND OUTVEC
 B014 JUMP TO COMMON CODE >>B01D
 B016 ***** "IN#" COMMAND *****
 B016 USE KSWL
 B01B AND INVEC

B01D OR IN SLOT GIVEN BY USER (BEGB)
 B020 *2 FOR USE AS INDEX INTO TABLE
 B025 WAS SLOT PARAMETER GIVEN?
 B027 NO... >>B03A
 B029 YES, (BE57)
 B02C AD GIVEN? >>B04F
 B02E NO, GET INVEC OR OUTVEC FOR THIS SLOT (BE10)
 B031 AND STORE ON AD KEYWORD VALUE (BE58)
 B03A VALIDITY CHECK I/O DRIVER <B061>
 B03D NO GOOD? >>B04E
 B03F GET INDEX TO CSWL OR KSWL (BCA9)
 B045 AND REPLACE ONE OR THE OTHER WITH (0036)
 B048 HIS ADDRESS (BE59)
 B04E RETURN
 B04F VALIDITY CHECK AD KEYWORD VALUE <B061>
 B052 NO GOOD? >>B060
 B054 GOOD, COPY VALUE TO INVEC OR OUTVEC (BE59)
 B060 EXIT BUT DON'T REDIRECT I/O NOW

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) (BEGA)
 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 (BEGA)

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: B0DA
 ADDR DESCRIPTION/CONTENTS

B0DA ANY TYPE WILL DO? >>B0E1
 B0DC NO, 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 FOR A CONTROL-C
 B0EC IGNORE ANYTHING ELSE >>B0F8
 B0EE CONTROL-C, WHAT STATE ARE WE IN? (BE42)
 B0F1 DEFERRED >>B0FD
 B0F3 NO, IMMEDIATE, RESET KEYBOARD STROBE (C010)
 B0F6 AND EXIT RIGHT NOW >>B0FD
 B0F8 ELSE, ANY FILES LEFT IN COUNT? (BCBA)
 B0FB YES, CONTINUE >>B0D2
 B0FD ELSE, 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 ---
 B125 ISOLATE NAME LENGTH FROM TYPE
 B127 AND SET UP LENGTH TO COPY (0200)
 B12C COPY DIRECTORY NAME TO (0259)
 B131 ...LINE (0200)
 B13B SET \$200 TO MAXIMUM LENGTH
 B140 RETURN
 B141 ***** FORMAT BLOCKS FREE/INUSE *****
 B141 POINT 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 CHARACTER (BCBD)
 B167 GET FILE INFO FOR PREFIX <B82A>
 B16A ERROR? >>B111
 B16C BLANK \$201 BUFFER <A6A9>
 B171 UNPACK "BLOCKS FREE: BLOCKS USED.." <9FE7>
 B174 ZERO THE THREE BYTE ACCUM <AB77>
 B17F CONVERT AUXID (TOTAL BLOCKS) <A66C>
 B18A CONVERT BLOCKS USED <A66C>
 B191 BLOCKS FREE = TOTAL BLOCKS (BEBC)
 B198 ... - BLOCKS USED (BEBD)
 B19F CONVERT BLOCKS FREE <A66C>
 B1A3 DONE!

B1A4 ***** OPEN/READ DIRECTORY HDR *****

B1A4 READ ONLY
 B1A8 CHECK FILE KIND (BEBC)
 B1AB VOLUME DIRECTORY?
 B1AD NO >>B1B2
 B1AF YES, TYPE = DIR (BEBC)
 B1B2 OPEN THE FILE <B1FA>
 B1B5 ERROR? IF NOT, FALL THRU >>B1ED

B1B7 ***** READ DIRECTORY HDR *****

B1B7 BUFFER IS \$259
 B1C3 LENGTH IS \$2B (ONE ENTRY) (BED9)
 B1CD MLI: READ <BE70>
 B1D0 ERROR? >>B1ED
 B1D4 COPY ENTRY LENGTH, ENTRIES PER BLOCK, (027C)
 B1D7 AND FILE COUNT FROM DIR HDR (BCB7)
 B1DD STORE ENTRY LENGTH IN READ LENGTH NOW (BED9)
 B1E2 SET COUNTER TO FIRST ENTRY IN BLOCK (BCBB)
 B1E7 MARK = 0 (START OF FILE) (BEC9)
 B1ED RETURN

B1EE ***** OPEN FILE *****
 A REGISTER = ACCESS BITS
 X REGISTER = DEFAULT TYPE

B1FE ---
 B1F2 T KEYWORD GIVEN?
 B1F4 NO >>B1F9
 B1F6 YES, USE KEYWORD VALUE INSTEAD (BE6A)
 B1F9 ---
 B1FA EXISTING FILE OF THIS TYPE? (BEBC)
 B1FD NO, ERROR >>B223
 B1FE CHECK ACCESS REQUESTED (BEB7)
 B202 REQUESTED ACCESS NOT PERMITTED >>B227
 B204 SET SYSTEM BUFFER IN OPEN PARM LIST (BC88)
 B20C LEVEL = \$0F (BE94)

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 >>BB50

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 ARG
 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 *****
 B37B JUMP INTO FLUSH >>B389
 B37D ***** "FLUSH" COMMAND *****
 B380 ---
 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) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: B3E6
 ADDR DESCRIPTION/CONTENTS

B3E6 ERROR? >>B3A3
 B3E8 CHECK FILE TYPE (BEB8)
 B3EB AGAINST HIS "T" VALUE (BE6A)
 B3EE MISMATCH? >>B39D
 B3F0 NO, TYPE = TXT?
 B3F2 NO >>B407
 B3F4 YES, GET RECORD LENGTH FROM AUXID (BEBA)
 B3FF WAS "L" KEYWORD VALUE GIVEN?
 B3FF YES, USE THAT INSTEAD >>B407
 B401 OTHERWISE, SAVE AUXID RECORD LEN (BE60)
 B407 ALLOCATE A NEW FILE BUFFER <A232>
 B40A ERROR? >>B3A3
 B40C GET BUFFER PAGE NO. (BC88)
 B40F AND STORE IN OPEN LIST (BECF)
 B414 LEVEL = 7 (BF94)
 B419 MLI: OPEN <BE70>
 B41C NO ERRORS? >>B425
 B41E ---
 B41F ERROR, FREE BUFFER FIRST <A289>
 B424 THEN EXIT WITH ERROR CODE
 B425 CHECK FILE TYPE AGAIN (BEB8)
 B428 "DIR" FILE?
 B42A YES >>B42D
 B42C NO
 B42D ---
 B430 SET DIR FLAG ACCORDINGLY (BE47)
 B433 USING OPEN COUNT AS AN INDEX (BE4D)
 B439 STORE BUFFER LOCATION IN OPEN FILE LIST (BC94)
 B43F ALSO, THE REFNUM (BC9C)
 B442 AND BUMP OPEN FILE COUNT AND FALL THRU (BE4D)
 B445 ***** SAVE FILE NAME/RECLEN IN TABLE *****
 B445 MAKE INDEX FROM REFNUM*32 BYTES
 B44B GET NAME LENGTH (0280)
 B44E OR IN DIR FLAG (BE47)
 B451 AND STORE IN OPEN FILE NAME LIST (BCFE)
 B457 NAME > OR = TO 30 BYTES?
 B459 NO... >>B45D
 B45B YES, USE 29
 B45D STORE THAT AS A LOOP COUNTER
 B462 COPY "L" KEYWORD VALUE TO NAME LIST TOO (BCFF)
 B46B ---
 B46C COPY FILE NAME TO NAME LIST (0280)
 B475 COPY ALL OF NAME, THEN FALL THRU TO EXIT >>B466

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: B475
 ADDR DESCRIPTION/CONTENTS

B477 ***** "MON" AND "NOMON" COMMANDS *****
 B477 ' IGNORE THESE COMMANDS AND
 B478 RETURN TO CALLER

B479 ***** LOOKUP OPEN FILENAME *****
 (RETURNS REFNUM OF OPEN FILE)

B479 ---
 B47C WAS PATHNAME1 GIVEN?
 B47E YES >>B484
 B480 NO, "SYNTAX ERROR"
 B483 EXIT WITH ERROR
 B484 ANY FILES CURRENTLY OPEN? (BE4D)
 B487 NO, CAN'T FIND IT THEN >>B4A2
 B489 YES, CLEAR EXEC FILE CLOSING FLAG (BE4E)
 B48C STORE FILE COUNT AS LOOP COUNTER
 B48E GET NEXT REFNUM (BC9B)
 B491 COMPARE FILENAMES <B4BC>
 B494 NOT THE ONE? >>B49D
 B496 ELSE, WE'VE GOT IT!
 B498 PICK UP APPROPRIATE REFNUM (BC9B)
 B49B ---
 B49C AND RETURN WITH IT
 B49D ELSE, NOT IT, TRY NEXT ONE
 B4A0 AND CONTINUE LOOPING >>B48C

B4A2 CAN'T FIND IT, IS EXEC ACTIVE? (BE43)
 B4A5 NO, THEN WE MUST GIVE UP >>B4B8
 B4AA IS HE LOOKING FOR EXEC FILE? <B4BC>
 B4AD NO, GIVE UP >>B4B8
 B4B1 YES, EXEC FILE CLOSING (BE4E)
 B4B6 AND RETURN WITH EXEC'S REFNUM >>B498

B4B8 "FILE NOT OPEN" ERROR
 B4BB RETURN WITH ERROR CODE

B4BC ***** COMPARE FILENAMES *****

B4BC REFNUM*32 FOR FILENAME INDEX
 B4C2 PICK UP DIR FLAG FROM THIS ENTRY (BCFE)
 B4CA SAME LENGTH AS HIS FILENAME? (0280)
 B4CD NO, CAN'T BE IT THEN >>B4F2
 B4D0 MAKE SURE LENGTH DOES NOT EXCEED 29
 B4D4 IF IT DOES, ONLY LOOK AT FIRST 29
 B4D6 USE \$3A AS LOOP COUNTER
 B4DB COPY "L" OF THIS FILE TO KEYWORD (BCA4)
 B4E4 ---

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: B4E5
 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 REFNUM IN READ/WRITE PARMLIST (BED6)
 B574 AND SET NEWLINE LIST (BED2)
 B577 DIR FILE? (BE47)
 B57A YES, GET OUT RIGHT NOW! >>B5DA
 B57C "F" OR "R" GIVEN? (BE57)
 B581 NO, INVALID PARM >>B5D7
 B583 BOTH GIVEN?
 B585 YES, INVALID PARM >>B5D7
 B587 JUST "R" GIVEN?
 B589 NO, JUST "F" >>B597
 B58B JUST "R", COPY "R" VALUE TO "F" (BE65)
 B58E ("R" AND "F" ARE ALIASES) (BE63)
 B597 SET COUNT TO 239. (MAXIMUM LINE LEN)
 B5A6 BUFFER IS AT \$200 (BED8)
 B5A9 ---
 B5AB NEW LINE CHAR IS EITHER \$0D OR \$0D (BED3)
 B5AB MLI: SET NEWLINE <BE70>
 B5B3 ERROR? >>B5D9

***** SKIP LINES BY READING THEM *****

B5B5 ---
 B5B8 "F" = 0? (BE64)
 B5BC YES, DONE >>B5DA
 B5BE ELSE...
 B5C0 MLI: READ NEXT FIELD (LINE) <BE70>
 B5C3 ERROR? >>B5D9
 B5C8 DECREMENT "F" VALUE BY ONE
 B5D5 AND GO CHECK IT AGAIN >>B5B5
 B5D7 "INVALID PARAMETER" ERROR
 B5D9 ---
 B5DA EXIT TO CALLER
 B5DB ***** COMPUTE NEW FILE POSITION *****
 (COMPUTES ABSOLUTE FILE POSITION MARK)
 B5DB ACCUM = CURRENT RECORD LENGTH (BCA4)
 B5EF MARK = 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 (BCAF)
 B612 OVERFLOW? >>B62C
 B617 ACCUM OVERFLOW? >>B62C
 B619 SCALE ACCUM (MULTIPLIER) UP BY 2 (BCAF)
 B622 IF "R" NON ZERO... (BE65)
 B628 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 IS 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
 B643 NO, PRE-POSITION FOR "B", "F", OR "R" <B6C0>
 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 QUOTE IT SO COMMAS COME THRU (0200)
 B664 READ INTO \$201
 B666 IF NO "L", READ TO \$200 (BED7) (BED3)
 B66C NL CHAR = \$0D/\$0D (OR NONE IF "L")
 B67B MLI: SET NEWLINE <BE70>
 B67E ERROR? >>B685
 B680 ---
 B682 MARK INPUT "READ" FILE ACTIVE (BE44)
 B685 AND RETURN

***** READ DIR FILE *****

B686 SET READ/WRITE LIST REFNUM (BED6)
 B689 AND GET/SET LIST REFNUM (BEC7)
 B68E READING TO \$259 (BED7)
 B698 INIT CAT FLAG TO FIRST LINE VALUE (BE4F)
 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>
 B6DE 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 ---
 B723 EXIT TO CALLER
 B724 DATA BUFFER AT \$200
 B72E PRE-POSITION FOR "B", "F", AND "R" <B6C0>
 B731 NO ERRORS? >>B747
 B733 WAS ERROR A RANGE ERROR?
 B735 NO, REAL ERROR >>B722
 B737 YES, MY RANGE ERROR OR MLI'S?
 B739 MINE... >>B722
 B73B MLI'S...SET EOF FARTHER INTO FILE
 B73D MLI: SET EOF <BE70>
 B740 ERROR? >>B722
 B742 AND THEN TRY AGAIN TO SET MARK <B6D0>
 B745 ERROR? THEN I GIVE UP >>B722
 B747 BUFFER IS AT HIMEM
 B753 INDICATE OUTPUT "WRITE" FILE ACTIVE (BE45)
 B757 RETURN TO CALLER
 B758 ***** "APPEND" COMMAND *****
 B758 ---
 B759 LOOK UP NAME IN OPEN FILE LIST <B479>
 B75C FOUND IT? >>B76A
 B75F NO, OPEN IT FIRST <B392>
 B762 ERROR? >>B778
 B764 NO, REFNUM NON-ZERO? (BED0)
 B767 YES, OK >>B76B
 B769 ELSE, BREAK!!!
 B76A ---
 B76B REFNUM TO READ/WRITE PARM LIST (BED6)
 B76E AND GET/SET LIST (BEC7)
 B771 DIR FILE? (BE47)
 B774 NO >>B77A
 B776 YES, "FILE LOCKED"
 B778 ---
 B779 EXIT TO CALLER
 B77A PICK UP "L" VALUE (BE5F)
 B783 DID USER SPECIFY ONE?
 B785 YES... >>B78D
 B787 NO, USE FILE'S CURRENT "L" VALUE (BCA4)
 B78D ---
 B792 COMPUTE REFNUM*32 FOR INDEX INTO
 B793 FILE NAME TABLE
 B798 SAVE CURRENT "L" VALUE IN OPEN FILE (BCFF)
 B79B NAME TABLE AND IN CURRENT RECLEN (BCA4)
 B7A7 MLI: GET EOF <BE70>

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: B7AA
 ADDR DESCRIPTION/CONTENTS

B7AA ERROR? >>B778
 B7AC IS "L" VALUE < 2? (NO SPECIFIC "L") (BCA5)
 B7AE NO >>B7B8
 B7B6 YES >>B7BD
 B7B8 NO, FORCE TO RECORD BOUNDARY <B7C0>
 B7BB ERROR? >>B778
 B7BD ELSE, GO SET EOF=MARK/OUTPUT FILE ACTIVE >>B73B
 B7C0 ***** FORCE TO EVEN RECORD BOUNDARY *****
 (FIND RECORD NUMBER OF THIS POSITION)

B7C0 ---
 B7C2 COPY EOF TO ACCUM (BEC7)
 B7CB CLEAR MSB'S (BCB2)
 B7D1 GET READY FOR A 24 BIT DIVIDE
 B7D3 DIVIDE EOF BY... <AB17>
 B7E0 RECORD LENGTH (BCA4)
 B7F5 ---
 B7FB WAS THERE A REMAINDER? (BCB3)
 B7FF NO, OK... >>B829
 B805 YES, CURRENT RECORD LEN LESS REMAINDER (BCB2)
 B812 PLUS OLD EOF MARK (BEC8)
 B81C GIVES NEW EOF ON AN EVEN RECORD BOUNDARY (BEC9)
 B827 "RANGE ERROR" POSSIBLE IF OVERFLOW OCCURS
 B829 RETURN TO CALLER

B82A ***** GET FILE INFO *****
 B82A SET NUMBER OF PARMS (10)
 B82F MLI CODE FOR GET FILE INFO
 B831 GO DO IT >>B848

B833 ***** 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

B851 ***** 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 ***** SYSCBL *****
 LSP'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 SFX: \$AC GPF: \$AC OPEN: \$CB
 B868 NEWLINE:\$D1 READ: \$D5 WRITE: \$D5
 B86B CLOSE: \$DD FLUSH: \$DD SMARK: \$C6
 B86E GMARK: \$C6 EOF: \$C6 GEOFF: \$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 CHARACTER 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 'BSVERIFYBLOADDELETECATALOGOPENWR'
 B8F1 'ITEXEGREATRESTORENAMEBRUNLOCK'
 B911 'HAIN#FLUSHREADPOSITIONMONPR#PRE'
 B931 'FIXCLOSEAPPEND'

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)

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: B9BB
 ADDR DESCRIPTION/CONTENTS
 B9E9 ---
 B9E9 'ADBASPWPASTXTBINDIRCMDINTIVRBASVARELSYS'
 BA13 ***** MONTH TABLE *****
 BA13 'JANFEBMARAPRMAJUNJULAUUGSEPCTNOVDEC'
 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 ERROR")
 BA67 ***** INDEXES TO PACKED MESSAGES *****
 BY BI ERROR NUMBER
 BA67 ---
 BA7B ***** COMMON LETTERS IN MESSAGES *****
 BA7B 'ACDEFILMNORTU '
 BA8A ***** LESS COMMON LETTERS *****
 BA8A 'BGHKPSVWXY/()..:'
 BA9A ***** PACKED MESSAGES *****
 "COPYRIGHT APPLE COMPUTER"
 "NAME ";TAB(\$10)
 "TYPE BLOCKS ";TAB(\$1E)
 "MODIFIED";TAB(\$2F)
 "CREATED";TAB(\$40)
 "ENDFILE SUBTYPE"

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 \$F9 = "CMD"
 B9E2 \$F8 = "DIR"
 B9E3 \$F6 = "BIN"
 B9E4 \$F4 = "TXT"
 B9E5 \$F3 = "PAS"
 B9E6 \$1A = "AMP"
 B9E7 \$1B = "ASP"
 B9E8 \$19 = "ADB"

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: BACE
 ADDR DESCRIPTION/CONTENTS

BAD0 "BLOCKS FREE: ";TAB(\$16)
 BADA "BLOCKS USED: ";TAB(\$2C)
 BAE5 "TOTAL BLOCKS:"
 BAE6 "RANGE ERROR" ERROR=\$2
 BAF5 "NO DEVICE CONNECTED" ERROR=\$3
 BB00 "WRITE PROTECTED" ERROR=\$4
 BB09 "END OF DATA" ERROR=\$5
 BB0F "PATH NOT FOUND" ERROR=\$6
 BB12 "(NOT USED) ---> ERROR=\$7
 BB18 "I/O ERROR" ERROR=\$8
 BB1E "DISK FULL" ERROR=\$9
 BB24 "FILE LOCKED" ERROR=\$A
 BB2B "INVALID PARAMETER" ERROR=\$B
 BB35 "RAM TOO LARGE" ERROR=\$C
 BB42 "FILE TYPE MISMATCH" ERROR=\$D
 BB4E "PROGRAM TOO LARGE" ERROR=\$E
 BB59 "NOT DIRECT COMMAND" ERROR=\$F
 BB63 "SYNTAX ERROR" ERROR=\$10
 BB6B "DIRECTORY FULL" ERROR=\$11
 BB73 "FILE NOT OPEN" ERROR=\$12
 BB7B "DUPLICATE FILE NAME" ERROR=\$13
 BB86 "FILE BUSY" ERROR=\$14
 BB8D "FILE(S) STILL OPEN" ERROR=\$15

BB99 ***** PAUSE MESSAGE *****
 BB99 LENGTH
 BB9A (BLANK LINE)
 BB9E BELL CHARACTER
 BB9F 'PLEASE PRESS SPACE BAR'

BASIC Interpreter (BI) -- V1.0.1 -- 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
 BBBA NOT USED
 BC7B ***** VARIABLES *****
 BC7B SAVED HIMEM VALUE DURING CHAIN LOAD
 ***** GARBAGE COLLECT MARKED GC: ****
 BC7C GC: HIRANGE - WORKAREA SIZE
 BC7D GC: WORKAREA MSB
 BC7E GC: NUMBER OF PAGES IN WORKAREA
 BC7F GC: LORANGE (START OF STRINGS TO COPY)
 BC80 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
 BC90 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
 BCAF OFFSET INTO KEYWORD PARAMS TO LAST BYTE
 BCAF GENERAL PURPOSE 4 BYTE ACCUMULATOR

BASIC Interpreter (BI) -- V1.0.1 -- 1 JAN 84 NEXT OBJECT ADDR: BCB3

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)

PRODOS BI Global Page		NEXT OBJECT ADDRESS: BE00
ADDR	LABEL	CONTENTS
BE00-BE02	BI.ENTRY	JMP to WARMDS (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.
BE0F	ERRCODE	Place error number in A-register.
BE10-BE1F	OUTVEC	PRODOS error code (also at \$DE, AppleSoft ONERR code).
BE20-BE2F	INVEC	Default output vector in monitor and for each slot (1-7).
BE30-BE31	VECTOUT	Default input vector in monitor for each slot (1-7).
BE32-BE33	VECTIN	Current output vector.
BE34-BE35	VDOSIO	Current input vector.
BE36-BE37	VSYSIO	BI's output intercept address.
BE38-BE3B	DEFSLT	BI's input intercept address.
BE3C	DEFDRV	BI's internal redirection by STATE.
BE3E	PREGA	Default slot.
BE3F	PREGX	Default drive.
BE40	PREGY	A-register savearea.
BE41	DTRACE	X-register savearea.
BE42	STATE	Y-register savearea.
BE43	EXACTV	AppleSoft TRACE is enabled flag (MSB on).
BE44	IFILACTV	Current intercept state. 0 = immediate command mode. >0 = deferred.
BE45	OFILACTV	EXEC file active flag (MSB on).
BE46	PFXACTV	READ file active flag (MSB on).
BE47	DIRFLG	WRITE file active flag (MSB on).
BE48	EDIRFLG	PREFIX read active flag (MSB on).
BE49	STRINGS	File being READ is a DIR file (MSB on).
BE4A	TBUFPTR	End of directory flag (no longer used).
BE4B	INPTR	String space count used to determine when to garbage collect.
BE4C	CHRLAST	to buffered WRITE data length.
BE4D	OPENCNT	Command line assembly length.
BE4E	YXFILE	Previous output character (for recursion check).
BE4F	CATFLAG	Number of files open (not counting EXEC).
BE50-BE51	XTRNADDR	EXEC file being closed flag (MSB on).
BE52	XLEN	Line type to format next in DIR file READ.
		External command handler address.
		Length of command name (less one).

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: BE53

 ADDR LABEL CONTENTS

BE53 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

BE54-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.
 VADDR A keyword value.
 BE58-BE59 VBYTE B keyword value.
 BE5A-BE5C VENDA E keyword value.
 BE5D-BE5E VLNTH L keyword value.
 BE5F-BE60 VSLOT S keyword value.
 BE61 VDRIV D keyword value.
 BE62 VFELD F keyword value.
 BE63-BE64 VVOLD R keyword value.
 BE65-BE66 VVOLM V keyword value (ignored).
 BE67 VVOLUME @ keyword value.
 BE68-BE69 VVLINE T keyword value (in hex).
 BE6A VTYPE PR# or IN# slot number value.
 BE6B VIOSLT

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 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 1.0.2

In March, 1984, Apple began shipping Version 1.0.2 of ProDOS along with the Apple IIc. Version 1.0.2 is also the base for some of Apple's own software, such as AppleWorks. The differences between this version and its predecessor, Version 1.0.1, are minor. Except for the specific areas mentioned below, the description of Version 1.0.1 in this Supplement may be used for Version 1.0.2.

ProDOS Loader

Version 1.0.2 is identical to Version 1.0.1.

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 1.0.2 15-FEB-84'
```

All other addresses and comments remain the same as Version 1.0.1.

ProDOS MLI (Kernel)

Replace the comments at the following addresses:

```
D19A:  Indicate error type 2
DE6D:  Stomp on $F300+$5E
```

At \$E948, 12 bytes are added. This causes all addresses greater than \$E947 and all references to those addresses to be increased by \$0C. For example, all references to \$E948 in Version 1.0.1 become \$E954 in Version 1.0.2. 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 1.0.2 is identical to Version 1.0.1.

ProDOS Quit Code

Version 1.0.2 is identical to Version 1.0.1. 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 \$F800 to \$F8F3 to change and added a routine at the end of the Version 1.0.1 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 1.0.1.

ProDOS IRQ Handler

Version 1.0.2 is identical to Version 1.0.1.

ProDOS BI Relocator

Version 1.0.2 is identical to Version 1.0.1.

ProDOS BASIC Interpreter (BI)

Version 1.0.2 is identical to Version 1.0.1.

ProDOS BI Global Page

Version 1.0.2 is identical to Version 1.0.1.

Disk II Device Driver -- V1.0.2 -- 15 FEB 84 NEXT OBJECT ADDR: F800

ADDR DESCRIPTION/CONTENTS

F800 ***** PRODOS CORE ROUTINES *****

F800 Clear decimal mode
 F801 See if Block number is good <FBEE>
 F804 If not exit with error >>F834
 F806 Eight NOP's so code below will
 F807 fit up against Table at \$F996
 F80E Convert Block Number to a Track and Sector
 F810 ---
 F814 0000000T TTTTABC
 F815 . . . >>F810
 F817 . . . >>F81C
 F818 . . . >>F81C
 F81A 00TTTTT 000BC0A
 F81C ---
 F820 Preserve Sector Number
 F821 Execute command <F838>
 F824 Restore Sector Number - Was prior action ok?
 F825 No, then exit >>F830
 F827 Increment Buffer Pointer
 F829 Increment Sector Number by 2 for rest of Block
 F82B Execute command <F838>
 F82E Decrement Buffer Pointer (to start of block)
 F830 Get error number (if any - 0 indicates no error) (FB58)
 F833 Return to caller

F834 ***** I/O ERROR ROUTINE *****

F834 Indicate "I/O Error"
 F836 Set Carry flag
 F837 Return to caller

F838 ***** MAIN CODE *****

F838 Set recalibration count to 1
 F83D Preserve sector number (FB57)
 F840 Get "Unitnum" DSSS0000
 F842 Strip out Drive 0SSS0000
 F844 Preserve slot number
 F846 Check for slot change, turn off motor if so <FE9B>
 F849 See if motor is on <FCDA>
 F84C Save test results
 F84F Initialize counter for delay routine (FB70)
 F854 See if slot or drive has changed (FB59)
 F857 Update "current" unit number (FB59)
 F85A Save test results
 F85B Put drive number in Carry flag
 F85C Turn motor on (C089)
 F862 Select appropriate drive (C08A)
 F865 Check test results - Same slot/drive?
 F866 Yes, then skip delay >>F872

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 Prepare 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

ERRATA TO BENEATH APPLE PRODOS (1st Printing, 1984)

Please make the following corrections to your copy of **Beneath Apple ProDOS**:

Page 3-16:

In the first paragraph starting on the page, the sentence should read "The data is dealt with in larger pieces (512 bytes vs. 256 bytes)...", not 512K vs. 256K.

Page 6-64:

The code for "GIVEN A PAGE NUMBER, SEE IF IT IS FREE" is incorrect. 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
        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

```

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 BF05 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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footnote:

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