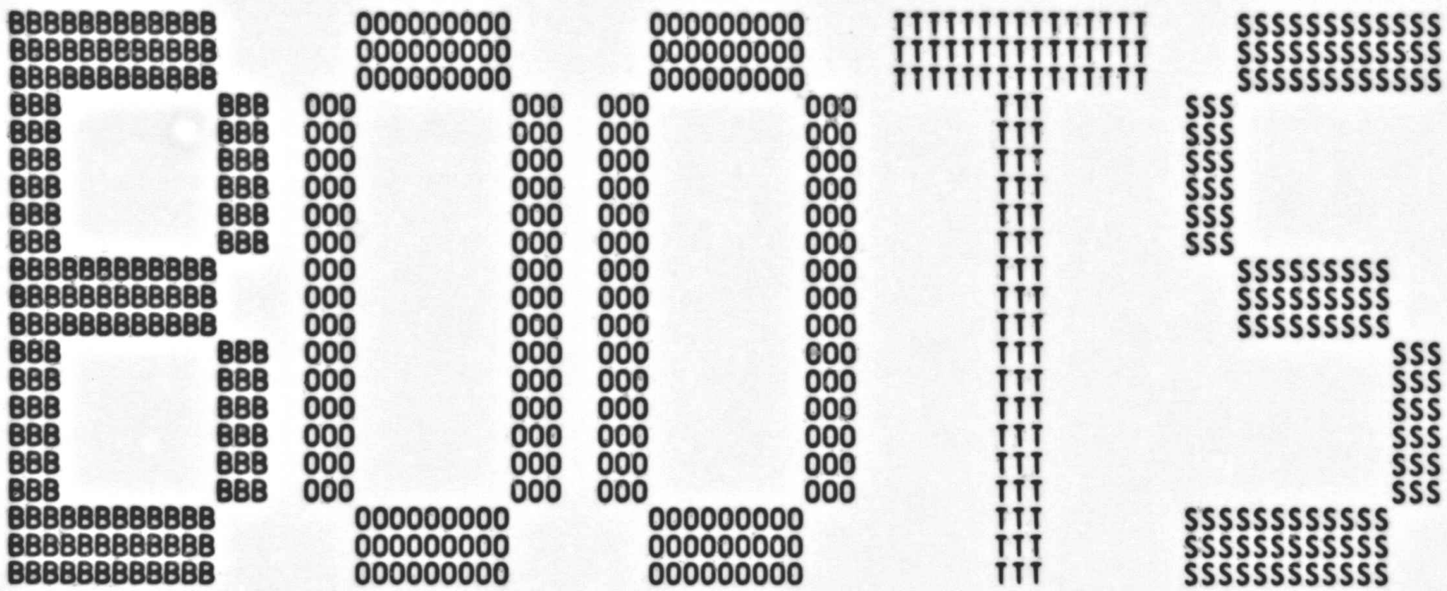
BBBBBBBBBBB OOOOOOOOO OOOOOOOOO TTTTTTTTTTTTTTT SSSSSSSSSSS
BBB BBB OOO OOO OOO OOO TTT SSS
BBBBBBBBBBB OOO OOO OOO OOO TTT SSSSSSSSS
BBB BBB OOO OOO OOO OOO TTT SSS
BBBBBBBBBBB OOOOOOOOO OOOOOOOOO TTT SSSSSSSSSSS

FILEID**BOOTDRIVR

```
BBBBBBBB      000000      000000    TTTTTTTTTT  DDDDDDDD    RRRRRRRR     IIIIII    VV      VV  RRRRRRRR
BBBBBBBB      000000      000000    TTTTTTTTTT  DDDDDDDD    RRRRRRRR     IIIIII    VV      VV  RRRRRRRR
BB      BB  00      00  00      00      TT      DD      DD  RR      RR     II      VV      VV  RR      RR
BB      BB  00      00  00      00      TT      DD      DD  RR      RR     II      VV      VV  RR      RR
BB      BB  00      00  00      00      TT      DD      DD  RR      RR     II      VV      VV  RR      RR
BB      BB  00      00  00      00      TT      DD      DD  RR      RR     II      VV      VV  RR      RR
BBBBBBBB    00      00  00      00      TT      DD      DD  RRRRRRRR     II      VV      VV  RRRRRRRR
BBBBBBBB    00      00  00      00      TT      DD      DD  RRRRRRRR     II      VV      VV  RRRRRRRR
BB      BB  00      00  00      00      TT      DD      DD  RR   RR       II      VV      VV  RR   RR
BB      BB  00      00  00      00      TT      DD      DD  RR   RR       II      VV      VV  RR   RR
BB      BB  00      00  00      00      TT      DD      DD  RR    RR     II        VV  VV    RR    RR      ....
BB      BB  00      00  00      00      TT      DD      DD  RR    RR     II        VV  VV    RR    RR      ....
BBBBBBBB      000000      000000        TT      DDDDDDDD    RR     RR  IIIIII        VV      RR     RR     ....
BBBBBBBB      000000      000000        TT      DDDDDDDD    RR     RR  IIIIII        VV      RR     RR     ....
```

```
LL              IIIIII      SSSSSSSS
LL              IIIIII      SSSSSSSS
LL                II      SS
LL                II      SS
LL                II      SS
LL                II      SS
LL                II        SSSSSS
LL                II        SSSSSS
LL                II              SS
LL                II              SS
LL                II              SS
LL                II              SS
LLLLLLLLLL      IIIIII    SSSSSSSS
LLLLLLLLLL      IIIIII    SSSSSSSS
```

Table of contents

```
                        N 3
0000     1          .TITLE  BOOTDRIVR DISPATCHER FOR BOOTSTRAP I/O DRIVERS
0000     2          .IDENT  'V04-000'
0000     3
0000     4  ;
0000     5  ;*****************************************************************************
0000     6  ;*                                                                           *
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0000    24  ;*                                                                           *
0000    25  ;*                                                                           *
0000    26  ;*****************************************************************************
0000    27  ;
0000    28  ;++
0000    29  ;
0000    30  ;  FACILITY:
0000    31  ;
0000    32  ;       Minimal bootstrap driver for all VMS system disks.
0000    33  ;
0000    34  ; ENVIRONMENT:
0000    35  ;
0000    36  ;       Runs at IPL 31, kernel mode, memory management may be on or off,
0000    37  ;       IS=1 (running on interrupt stack), code must be PIC.
0000    38  ;
0000    39  ; ABSTRACT:
0000    40  ;
0000    41  ;       This module contains a routine called BOO$QIO that handles I/O
0000    42  ;       transfers to and from the VMS system disks.
0000    43  ;
0000    44  ; AUTHOR:
0000    45  ;
0000    46  ;       The VMS group
0000    47  ;
0000    48  ; REVISION HISTORY:
0000    49  ;
0000    50  ;       V03-011 TCM0005         Trudy C. Matthews       24-Jul-1984
0000    51  ;               Bump the VMB version number to indicate that the field
0000    52  ;               RPB$B_CTRLLTR is now being initialized.
0000    53  ;
0000    54  ;       V03-010 KPL0101         Peter Lieberwirth       11-Apr-1984
0000    55  ;               Update VMB version number for word-sized RPB field.  This
0000    56  ;               should have been done as part of v03-009.
0000    57  ;
```

```
0000     58 ;        V03-009 KPL0100         Peter Lieberwirth       12-Feb-1984
0000     59 ;                Change use of RPB$B_BOOTNDT to RPB$W_BOOTNDT, since BI
0000     60 ;                devices will have 16-bit device types.
0000     61 ;
0000     62 ;        V03-008 KDM0084         Kathleen D. Morse       23-Sep-1983
0000     63 ;                Add Micro-VAX I to CPUDISP.
0000     64 ;
0000     65 ;        V03-007 KDM0073         Kathleen D. Morse       22-Aug-1983
0000     66 ;                Add EXE$GL_TENUSEC and EXE$GL_UBDELAY to the fixed
0000     67 ;                data cells used by the bootstrap drivers.  Create
0000     68 ;                BQO symbols for these data cells.
0000     69 ;
0000     70 ;        V03-006 TCM0004         Trudy C. Matthews       02-Aug-1983
0000     71 ;                Add definition for EXE$GB_CPUDATA cell.
0000     72 ;
0000     73 ;        V03-005 KTA3059         Kerbey T. Altmann       21-Jun-1983
0000     74 ;                Add entries for unit disconnect and boot device name -
0000     75 ;                thus bumping VMB version number.
0000     76 ;
0000     77 ;        V03-004 RLRCPUDISP      Robert L. Rappaport     15-Jun-1983
0000     78 ;                Recode CPUDISP macros to use new format.
0000     79 ;
0000     80 ;        V03-003 TCM0003         Trudy C. Matthews       23-Feb-1983
0000     81 ;                Increment VMB version number to indicate adding RPB$L_BADPGS
0000     82 ;                field.
0000     83 ;
0000     84 ;        V03-002 TCM0002         Trudy C. Matthews       05-Jan-1983
0000     85 ;                Add 11/790-specific path to BOO$PURDPR.
0000     86 ;
0000     87 ;        V03-001 KTA0092         Kerbey T. Altmann       02-Apr-1982
0000     88 ;                Bump the version number because of KTA0090.
0000     89 ;
0000     90 ;        V02-021 KTA0090         Kerbey T. Altmann       26-Mar-1982
0000     91 ;                Add new cell to IOVEC to contain address of microcode
0000     92 ;                required by a booting device.
0000     93 ;
0000     94 ;--
```

```
                        0000     96          .SBTTL  Declarations
                        0000     97
                        0000     98 ;
                        0000     99 ; MACRO LIBRARY CALLS
                        0000    100 ;
                        0000    101
                        0000    102          $BQODEF                         ; Define boot qio offsets
                        0000    103          $BTDDEF                         ; Define boot device types
                        0000    104          $IODEF                          ; DEFINE I/O FUNCTION CODES
                        0000    105          $MBADEF                         ; DEFINE MASSBUS ADAPTER REGISTERS
                        0000    106          $NDTDEF                         ; NEXUS device types
                        0000    107          $PRDEF                          ; DEFINE PROCESSOR REGISTERS
                        0000    108          $PTEDEF                         ; DEFINE PAGE TABLE ENTRY FIELDS
                        0000    109          $RPBDEF                         ; DEFINE RESTART PARAMETER BLOCK
                        0000    110          $SSDEF                          ; DEFINE STATUS CODES
                        0000    111          $UBADEF                         ; UNIBUS ADAPTER REGISTER DEFINITIONS
                        0000    112          $UBIDEF                         ; 11/750 UNIBUS adapter regs.
                        0000    113          $VADEF                          ; DEFINE VIRTUAL ADDRESS FIELDS
                        0000    114
                        0000    115 ;
                        0000    116 ; MACROS
                        0000    117 ;
                        0000    118
                        0000    119 ;
                        0000    120 ; LOCAL SYMBOLS
                        0000    121 ;
                        0000    122
                        0000    123          $DEFINI BDT                     ; Define Boot Driver Table offsets
                        0000    124
                        0000    125 $DEF     BDT$L_CPUTYPE    .BLKW   1      ;  CPU type
                        0002    126 $DEF     BDT$L_DEVTYPE    .BLKW   1      ;  Boot R0 device type
                        0004    127 $DEF     BDT$L_ACTION     .BLKL   1      ;  Action routine
                        0008    128 $DEF     BDT$L_SIZE       .BLKL   1      ;  Driver size
                        000C    129 $DEF     BDT$L_ADDR       .BLKL   1      ;  Driver address (offset)
                        0010    130 $DEF     BDT$L_ENTRY      .BLKL   1      ;  Driver entry (offset from address)
                        0014    131 $DEF     BDT$L_DRIVRNAME  .BLKL   1      ;  Driver name (offset from address)
                        0018    132 $DEF     BDT$L_AUXDRNAME  .BLKL   1      ;  Auxiliary driver name (offset)
                        001C    133 $DEF     BDT$L_UNIT_INIT  .BLKL   1      ;  Driver unit init (offset from address)
                        0020    134 $DEF     BDT$L_UNIT_DISC  .BLKL   1      ;  Driver unit disc (offset from address)
                        0024    135 $DEF     BDT$L_DEVNAME    .BLKL   1      ;  Device name (offset from address)
                        0028    136
00000028                0028    137 BDT$K_LENGTH=.                           ;  Length of entry
                        0028    138
                        0028    139          $DEFEND BDT                     ; End of Boot Driver Table definitions
```

```
                                                D 4
                     0000   141          .SBTTL  DRIVER FIXED DATA AREA
                     0000   142
                     0000   143 ;
                     0000   144 ;       FIXED DATA CELLS FOR BOOTSTRAP DRIVER
                     0000   145 ;
                     0000   146
                 00000000   147          .PSECT  BOOTDRIVR_1,LONG        ; CERTAIN DRIVERS REQUIRE ALIGNMENT!
                     0000   148
                     0000   149 BOO$AL_VECTOR::                          ; VECTOR TO BOOT DRIVER ENTRY POINTS
 00000046'           0000   150          .LONG   BOO$QIO-BOO$AL_VECTOR   ; OFFSET TO BOOTSTRAP QIO ROUTINE
 0000011D'           0004   151          .LONG   BOO$MAP-BOO$AL_VECTOR   ; OFFSET TO MAPPING ROUTINE
 00000000'           0008   152          .LONG   BOO$SELECT-BOO$AL_VECTOR; OFFSET TO BOOTSTRAP I/O DRIVER
                     000C   153                                          ; INITIALLY SET TO ROUTINE WHICH
                     000C   154                                          ; SELECTS DRIVER
 00000000            000C   155          .LONG   0                       ; OFFSET TO SYSTEM DISK DRIVER NAME
                     0010   156                                          ; (ASCIC STRING). SET UP BY BOOT DRIVER.
                     0010   157 ;
                     0010   158 ; The next two words are the version number and the version number check fields.
                     0010   159 ; (The second word is the ones complement of the first word.)  The version
                     0010   160 ; number should be incremented whenever the interface between VMB and the
                     0010   161 ; rest of the system changes.  Release 1.0 VMB did not contain these fields.
                     0010   162 ;
                     0010   163 ;       Version 2 - Boot driver passes system disk driver name to SYSBOOT
                     0010   164 ;       Version 3 - VMB build memory description vector into RPB
                     0010   165 ;       Version 4 - VMB BOOTDRIVR purges UBA buffered datapath, all drivers
                     0010   166 ;                   return to BOOTDRIVR with success/failure status
                     0010   167 ;       Version 5 - VMB passes an argument list to the secondary boot
                     0010   168 ;                   in AP.  FILEREAD cacheing is present.
                     0010   169 ;       Version 6 - VMB passes nexus device type of boot adapter in
                     0010   170 ;                   RPB$B_BOOTNDT.
                     0010   171 ;       Version 7 - BOO$AL_VECTOR now has new entry points for RESELECTing
                     0010   172 ;                   a driver and UNIT_INIT for a driver.  Also new info
                     0010   173 ;                   passed in the argument list.
                     0010   174 ;       Version 8 - BOO$AL_VECTOR now has a new cell: BQO$L_UCODE.
                     0010   175 ;       Version 9 - VMB passes number of bad memory pages found during
                     0010   176 ;                   bootstrap scan in RPB$L_BADPGS.
                     0010   177 ;       Version 10- BOO$AL_VECTOR has two new cells: UNIT_DISC and DEVNAME
                     0010   178 ;
                     0010   179 ;       Version 11- BOO$AL_VECTOR has two new cells:  TENUSEC and UBDELAY
                     0010   180 ;
                     0010   181 ;       Version 12- RPB$W_BOOTNDT is defined, high byte of this word must
                     0010   182 ;                   be cleared in SYSBOOT for versions of VMB less than 12.
                     0010   183 ;
                     0010   184 ;       Version 13- RPB$B_CTRLLTR is defined; SYSBOOT must clear this field
                     0010   185 ;                   for older versions of VMB.
                     0010   186 ;
                     0010   187
 0000000D            0010   188 VMB_VERSION = 13
                     0010   189
                     0010   190          ASSUME  <.-BOO$AL_VECTOR> EQ BQO$W_VERSION
 FFF2 000D           0010   191          .WORD   VMB_VERSION,^C<VMB_VERSION> ; VERSION # AND VERSION # CHECK FIELD.
  00000063'          0014   192          .LONG   BOO$RESELECT-BOO$AL_VECTOR ; Offset to set new driver
  00000012'          0018   193          .LONG   BOO$MOVE-BOO$AL_VECTOR  ; Offset to routine to select and move
                     001C   194          ASSUME  <.-BOO$AL_VECTOR> EQ BQO$L_UNIT_INIT
  00000000           001C   195          .LONG   0                       ; Offset to UNIT_INIT
                     0020   196          ASSUME  <.-BOO$AL_VECTOR> EQ BQO$L_AUXDRNAME
  00000000           0020   197          .LONG   0                       ; Offset to auxiliary driver name
```

```
                     0024   198                                    ;  second driver
                     0024   199                ASSUME  <.-BOO$AL_VECTOR> EQ BQO$L_UMR_DIS
                     0024   200 BOO$GL_UMR_DIS::                    ; Number of map registers disabled
00000000             0024   201                .LONG   0
                     0028   202                ASSUME  <.-BOO$AL_VECTOR> EQ BQO$L_UCODE
                     0028   203 BOO$GL_UCODE::                      ; Address of microcode in memory
00000000             0028   204                .LONG   0
                     002C   205                ASSUME  <.-BOO$AL_VECTOR> EQ BQO$L_UNIT_DISC
00000000             002C   206                .LONG   0            ; Offset to UNIT_DISC
                     0030   207                ASSUME  <.-BOO$AL_VECTOR> EQ BQO$L_DEVNAME
00000000             0030   208                .LONG   0            ; Offset to boot device name
                     0034   209                ASSUME  <.-BOO$AL_VECTOR> EQ BQO$L_UMR_TMPL
                     0034   210 BOO$GL_UMR_TMPL::                   ; UNIBUS map register template
80000000             0034   211                .LONG   UBA$M_MAP_VALID  ;  Default is valid, no buff data path
                     0038   212                ASSUME  <.-BOO$AL_VECTOR> EQ BQO$B_UMR_DP
                     0038   213 BOO$GB_UMR_DP::                     ; UNIBUS map register data path
                01   0038   214                .BYTE   1            ;  Default is Buffered #1
                     0039   215                ASSUME  <.-BOO$AL_VECTOR> EQ BQO$B_CPUTYPE
                     0039   216 EXE$GB_CPUTYPE::                    ; Location to hold processor
                01   0039   217                .BYTE   1            ;  identification code
                     003A   218                ASSUME  <.-BOO$AL_VECTOR> EQ BQO$L_CPUDATA
                     003A   219 EXE$GB_CPUDATA::                    ; Location to hold contents of SID.
00000001             003A   220                .LONG   1
                     003E   221                ASSUME  <.-BOO$AL_VECTOR> EQ BQO$L_TENUSEC
                     003E   222 EXE$GL_TENUSEC::                    ; Location to hold TIMEDWAIT delay count
00000001             003E   223                .LONG   1
                     0042   224                ASSUME  <.-BOO$AL_VECTOR> EQ BQO$L_UBDELAY
                     0042   225 EXE$GL_UBDELAY::                    ; Location to hold TIMEDWAIT delay count
00000001             0042   226                .LONG   1
```

```
                        0046   228          .SBTTL  BOO$QIO - BOOTSTRAP QIO ROUTINE
                        0046   229
                        0046   230 ;++
                        0046   231 ; FUNCTIONAL DESCRIPTION:
                        0046   232 ;
                        0046   233 ;       BOO$QIO PROVIDES THE DEVICE INDEPENDENT I/O INTERFACE FOR BOTH
                        0046   234 ;       READING AND WRITING THE BOOTSTRAP DEVICE.
                        0046   235 ;
                        0046   236 ; CALLING SEQUENCE:
                        0046   237 ;
                        0046   238 ;       CALLG   ARGLIST,BOO$QIO
                        0046   239 ;
                        0046   240 ; INPUT PARAMETERS:
                        0046   241 ;
                        0046   242 ;       BUF(AP)  - BUFFER ADDRESS
                        0046   243 ;       SIZE(AP) - SIZE OF BUFFER IN BYTES
                        0046   244 ;       LBN(AP)  - LOGICAL BLOCK NUMBER
                        0046   245 ;       FUNC(AP) - FUNCTION CODE
                        0046   246 ;                  ACCEPTS IO$_READLBLK AND IO$_WRITELBLK
                        0046   247 ;       MODE(AP) - ADDRESS INTERPRETATION MODE
                        0046   248 ;                  0 => PHYSICAL, 1 => VIRTUAL
                        0046   249 ;       RPB(AP) - ADDRESS OF RESTART PARAMETER BLOCK
                        0046   250 ;
                        0046   251 ; OUTPUT PARAMETERS:
                        0046   252 ;
                        0046   253 ;       R0 - COMPLETION STATUS CODE
                        0046   254 ;       R1 - TOTAL BYTES TRANSFERRED
                        0046   255 ;
                        0046   256 ;--
                        0046   257
                        0046   258 ;
                        0046   259 ; Offsets from AP to input arguments:
                        0046   260 ;
                        0046   261
                00000004 0046   262          BUF     = 4
                00000008 0046   263          SIZE    = 8
                0000000C 0046   264          LBN     = 12
                00000010 0046   265          FUNC    = 16
                00000014 0046   266          MODE    = 20
                00000018 0046   267          RPB     = 24
                        0046   268
                        0046   269 BOO$QIO::
                    0FFC 0046   270          .WORD   ^M<R2,R3,R4,R5,R6,R7,-  ; PRESERVE REGISTERS
                        0048   271                  R8,R9,R10,R11>
                        0048   272
                        0048   273 ;
                        0048   274 ; If mapping is enabled, the processor register RP$_MAPEN contains a 1.
                        0048   275 ; Otherwise, the register contains a 0. Use this value as an index to
                        0048   276 ; choose the appropriate address of the adapter's register space.
                        0048   277 ;
                        0048   278
   59    18 AC    D0   0048   279          MOVL    RPB(AP),R9              ; GET BASE ADDRESS OF RESTART PARAMETER BLK
      51    38    DB   004C   280          MFPR    #PR$_MAPEN,R1           ; CHECK FOR MAPPING ENABLED
                        004F   281          ASSUME  RPB$L_ADPVIR EQ RPB$L_ADPPHY+4
53    5C A941    D0   004F   282          MOVL    RPB$L_ADPPHY(R9)[R1],R3 ; GET CORRECT POINTER TO CONFIG REG
                        0054   283
                        0054   284 ;
```

```
                                0054   285 ; Using the argument list as input, calculate the transfer size, number
                                0054   286 ; of map registers, starting LBN, starting VPN, and base of a page table
                                0054   287 ; to use in mapping.
                                0054   288 ;
                                0054   289
          5A   04 AC   D0       0054   290          MOVL    BUF(AP),R10             ; Get buffer address
          58   08 AC   3C       0058   291          MOVZWL  SIZE(AP),R8             ; GET TRANSFER SIZE IN BYTES
                 04   12       005C   292          BNEQ    10$                     ; CONTINUE IF LEGAL SIZE
       58   01   10   9C       005E   293          ROTL    #16,#1,R8               ; ELSE FORCE TO 64K SIZE
57     5A   09   00   EF       0062   294 10$:     EXTZV   #VA$V_BYTE,#VA$S_BYTE,R10,R7    ; Get byte offset into page
   57   03FF C847   9E       0067   295          MOVAB   ^X3FF(R8)[R7],R7        ; Calculate highest address plus
                                006D   296                                          ; an overflow page.
 57   57   F7 8F   78         006D   297          ASHL    #-9,R7,R7               ; Reduce to number of pages
                                0072   298                                          ; (= number of map registers).
          5B   0C AC   D0       0072   299          MOVL    LBN(AP),R11             ; AND BLOCK NUMBER FOR RETRY
          51   50 A9   D0       0076   300          MOVL    RPB$L_SVASPT(R9),R1     ; ASSUME SYSTEM SPACE
          03 5A    1F   E0       007A   301          BBS     #VA$V_SYSTEM,R10,20$    ; Branch if system address
             51    08   DB       007E   302          MFPR    #PR$_P0BR,R1            ; OTHERWISE GET P0 PT BASE
52   5A   15   09   EF       0081   303 20$:     EXTZV   #VA$V_VPN,#VA$S_VPN,R10,R2      ; Get base VPN for transfer
               66 A9   91       0086   304          CMPB    RPB$B_DEVTYP(R9),-      ; If booting from console block
                    20                  0089   305                  #BTD$K_HSCCI       ; storage device or CI,
                    67   18     008A   306          BGEQ    PUSH_RETRY              ; don't load map registers
                                008C   307
                                008C   308 ;
                                008C   309 ; Register usage right now is as follows:
                                008C   310 ;
                                008C   311 ;       R1      - address of page table for virtual-->physical mapping
                                008C   312 ;       R2      - base VPN for the transfer
                                008C   313 ;       R3      - address of the adapter's configuration register
                                008C   314 ;       R7      - number of map registers needed (plus one extra)
                                008C   315 ;       R8      - transfer size in bytes
                                008C   316 ;       R9      - address of the RPB
                                008C   317 ;       R10     - buffer address
                                008C   318 ;       R11     - starting LBN of the transfer
                                008C   319 ;
                                008C   320 ; In an adapter-dependent fashion, initialize the required number of
                                008C   321 ; adapter map registers. First calculate the address of the starting map
                                008C   322 ; register number. Right now, map registers for all UNIBUS and MASSBUS
                                008C   323 ; adapters for all processors start at the same offset from the base of
                                008C   324 ; the adapter's register space.
                                008C   325 ;
                                008C   326 ; During map register initialization, the following registers change
                                008C   327 ; for each page mapped:
                                008C   328 ;
                                008C   329 ;       R2      - address of the next VPN to map
                                008C   330 ;       R4      - address of the next map register to load
                                008C   331 ;       R5      - PFN of the page being mapped
                                008C   332 ;
                                008C   333
                                008C   334 INIT_MAPREGS:                          ; Initialize the map registers.
                                008C   335          ASSUME  MBA$L_MAP EQ UBA$L_MAP
                                008C   336          ASSUME  MBA$L_MAP EQ UBI$L_MAP
  54   FF94 CF   D0             008C   337          MOVL    W^BOO$GL_UMR_DIS,R4     ; Pick up number of disable UMR's
54   0800 C344   DE             0091   338          MOVAL   MBA$L_MAP(R3)[R4],R4    ; Point to first useable map register
                                0097   339
                                0097   340 COMPUTE_PFN:                           ; Loop once per page.
       55   82   9E             0097   341          MOVAB   (R2)+,R5                ; Get a virtual page number.
```

```
                 0B 14 AC    E9  009A   342          BLBC    MODE(AP),10$            ; If physical page #, branch.
              55    6145    D0  009E   343          MOVL    (R1)[R5],R5             ; Get page table entry
        55    FFE00000 8F    CA  00A2   344          BICL    #^C<PTE$M_PFN>,R5       ; and extract PFN from entry
                                 00A9   345
                                 00A9   346 ;
                                 00A9   347 ; Derive the boot device adapter's type (UNIBUS adapter or MASSBUS
                                 00A9   348 ; adapter) from the RPB, and save a flag indicating the adapter type
                                 00A9   349 ; in a register.  The seemingly complicated fooling around with both
                                 00A9   350 ; a UMR_DP and UMR_TMPL is to allow flexibility in what devices desire
                                 00A9   351 ; in the way of data paths: Only UNIBUS devices will ever even pick up
                                 00A9   352 ; the UMR_DP bit.  Thus all non-UNIBUS boot devices will never purge
                                 00A9   353 ; a data path.  UNIBUS devices have a choice: by clearing UMR_DP in
                                 00A9   354 ; their UNIT_INIT routines, the boot drivers can elect to not use
                                 00A9   355 ; the buffered data path.
                                 00A9   356 ;
                                 00A9   357
                    50    D4     00A9   358 10$:    CLRL    R0                      ; Assume not UNIBUS
              56    00A1 C9    3C  00AB   359          MOVZWL  RPB$W_BOOTNDT(R9),R6    ; Pick up nexus type of boot adapter
                    56    03    CA  00B0   360          BICL    #3,R6                   ; Make canonical adapter type
                    28    56    B1  00B3   361          CMPW    R6, #NDT$_UBO           ; If boot adapter is a UNIBUS,
                          11    12  00B6   362          BNEQ    20$                     ;  then
                          50    D6  00B8   363          INCL    R0                      ;   Set a flag for later user
                    FF7A  CF    F0  00BA   364          INSV    BOO$GB_UMR_DP,-         ;   Pick up the data path
                    02    15        00BE   365                  #UBA$V_MAP_DPD,#2,-
                    FF71  CF        00C0   366                  BOO$GL_UMR_TMPL         ;   and put it in the template
                                    00C3   367
                                    00C3   368 ;
                                    00C3   369 ; This is a UNIBUS adapter.
                                    00C3   370 ;
                                    00C3   371 ; Map registers for the UNIBUS adapter look like the following:
                                    00C3   372 ;
                                    00C3   373 ;       +-----------------------------------------------+
                                    00C3   374 ;       ! V !   ! BO ! DP # !  !  page frame number   !
                                    00C3   375 ;       +-----------------------------------------------+
                                    00C3   376 ;
                                    00C3   377 ; The code sets the byte offset bit if relevant, sets the valid bit,
                                    00C3   378 ; sets the low bit in the 4-bit data path field to indicate that the
                                    00C3   379 ; first buffered data path is to be used (if selected), and loads the
                                    00C3   380 ; page frame number into the low bits.
                                    00C3   381 ;
                                    00C3   382
              19    04 AC       F0  00C3   383          INSV    BUF(AP),#UBA$V_MAP_BO,- ; Set UBA byte offset bit if
                 55    01           00C7   384                  #1,R5                   ; necessary.
                                    00C9   385 ;
                                    00C9   386 ; ****** NOTE *****  For most devices, always uses Datapath #1,
                                    00C9   387 ;                        IOC$PURDPR depends on this!!
                                    00C9   388 ;
        84    FF66 CF     55    C9  00C9   389 20$:    BISL3   R5,BOO$GL_UMR_TMPL,(R4)+; Set PFN and byte offset, valid bit,
                                    00CF   390                                      ;  and buffered DP number into map.
                                    00CF   391 ;
                                    00CF   392 ; This is a MASSBUS adapter.
                                    00CF   393 ;
                                    00CF   394 ; MASSBUS adapter's map registers look like the following:
                                    00CF   395 ;
                                    00CF   396 ;       +-----------------------------------------+
                                    00CF   397 ;       ! V !                 ! page frame number !
                                    00CF   398 ;       +-----------------------------------------+
```

```
                                00CF   399 ;
                                00CF   400 ;
                                00CF   401 ;*****
                                00CF   402 ;       BISL3   R5,#MBA$M_MAP_VALID,-   ; Set the PFN and the valid bit
                                00CF   403 ;               (R4)+                   ; in the map register.
                                00CF   404 ;*****
                                00CF   405 ;
                                00CF   406                                         ; Is there another page to do?
                    57    D7    00CF   407         DECL    R7                      ; Decrement # of map registers.
                    F4    14    00D1   408         BGTR    COMPUTE_PFN             ; Loop to fill next map register
                                00D3   409                                         ; if byte count not exhausted.
                                00D3   410
                                00D3   411 ;
                                00D3   412 ; All map registers are set up. Set up 2 more inputs to driver code.
                                00D3   413 ; Since the loaded MBA map registers are registers #0-n, the starting
                                00D3   414 ; address of the transfer to be loaded into a device register by the
                                00D3   415 ; device driver, is now simply the offset into the first page of the
                                00D3   416 ; transfer buffer.  However, for the UBA, there may be some disabled
                                00D3   417 ; map registers as a result of UNIBUS memory on the UBA.  Therefor,
                                00D3   418 ; the starting address of the transfer must include the lowest enabled
                                00D3   419 ; UMR in bits 9-17.
                                00D3   420 ;
                                00D3   421
                09    00    EF  00D3   422         EXTZV   #VA$V_BYTE,#VA$S_BYTE,- ; Get byte offset into page
                5A    5A        00D6   423                 R10,R10                 ; in R10
                                00D8   424
                                00D8   425 ;
                                00D8   426 ; Invalidate the last UBA map register so that a wild transfer will stop
                                00D8   427 ; at the end of the last valid block. Get the proper UMR to start with.
                                00D8   428 ;
                                00D8   429
              10    50    E9  00D8   430         BLBC    R0,30$                  ; Skip invalidation for MBA.
        74  80000000    8F    CA  00DB   431         BICL    #UBA$M_MAP_VALID,-(R4)  ; Invalidate last map register.
    50  FF3D    CF    09    9C  00E2   432         ROTL    #9,W^BOO$GL_UMR_DIS,R0  ; Form UNIBUS address of UMR
              5A    50    C8  00E8   433         BISL    R0,R10                  ; Set into address register.
                                00EB   434
                                00EB   435 ;
                                00EB   436 ; If it is a UNIBUS boot device, derive the address of the device's CSR.
                                00EB   437 ;
                                00EB   438
                                00EB   439         ASSUME  RPB$L_CSRVIR  EQ  RPB$L_CSRPHY+4
                                00EB   440
              50    38    DB  00EB   441 30$:    MFPR    #PR$_MAPEN,R0           ; Check for mapping enabled
        57    54  A940    D0  00EE   442         MOVL    RPB$L_CSRPHY(R9)[R0],R7 ; Get address of device's CSR
                                00F3   443
                                00F3   444 PUSH_RETRY:
                    0A    DD  00F3   445         PUSHL   #10                     ; Push retry count on stack
                                00F5   446
              55    5B    D0  00F5   447 10$:    MOVL    R11,R5                  ; Get a working copy of the block number
           50    34  A9    D0  00F8   448         MOVL    RPB$L_IOVEC(R9),R0      ; Get address of boot vectors
              08  B040    16  00FC   449         JSB     @BOO$L_SELECT(R0)[R0]   ; Call driver thru self-relative vector
                    15    E1  0100   450         BBC     #UBA$V_MAP_DPD,-        ; Branch if not using the Buffered
        10  FF2F    CF        0102   451                 BOO$GL_UMR_TMPL,100$    ;  data path
                    50    DD  0106   452         PUSHL   R0                      ; Save driver status
                  006A    30  0108   453         BSBW    BOO$PURDPR              ; Purge Buffered Datapath for UBA
                 05   50    E8  010B   454         BLBS    R0,80$                  ; Branch if success
              5E    04    C0  010E   455         ADDL    #4,SP                   ; Clear previous status from stack
```

```
                06   11  0111   456          BRB     150$                    ; Retry
                50 8ED0  0113   457 80$:      POPL    R0                      ; Get driver status back
             03 50   E8  0116   458 100$:     BLBS    R0,200$                 ; Branch if success
             D9 6E   F5  0119   459 150$:     SOBGTR  (SP),10$                ; Retry if count > 0
                    04  011C   460 200$:     RET                             ; Return with final status in R0
```

```
                                                    K 4
                     011D   462          .SBTTL  BOO$MAP - ROUTINE TO MAP DATA FOR BOO$QIO
                     011D   463
                     011D   464 ;++
                     011D   465 ; FUNCTIONAL DESCRIPTION:
                     011D   466 ;       BOO$MAP IS CALLED TO INITIALIZE THE DATA BASE FOR BOO$QIO TO PERMIT
                     011D   467 ;       IT TO FUNCTION WITH MEMORY MANAGEMENT ENABLED.  AN AREA OF SYSTEM
                     011D   468 ;       PAGE TABLE MUST BE PROVIDED SO THAT THE CONFIGURATION REGISTERS AND
                     011D   469 ;       UNIBUS I/O PAGE CAN BE MAPPED.
                     011D   470 ;
                     011D   471 ; CALLING SEQUENCE:
                     011D   472 ;       CALLG   ARGLIST,BOO$MAP
                     011D   473 ;
                     011D   474 ; INPUT PARAMETERS:
                     011D   475 ;       SVASPT(AP) - SYSTEM VIRTUAL ADDRESS OF THE SYSTEM PAGE TABLE
 00000004            011D   476          SVASPT  =   4
                     011D   477 ;       VABASE(AP) - BASE VIRTUAL ADDRESS OF A 24 PAGE WINDOW TO MAP
                     011D   478 ;                    THE ADAPTER CONFIGURATION REGISTERS AND UNIBUS
 00000008            011D   479          VABASE  =   8
                     011D   480 ;                    I/O PAGE.
                     011D   481 ;       RPB(AP) -    ADDRESS OF RESTART PARAMETER BLOCK (RPB) CONTAINING
                     011D   482 ;                    BOOTSTRAP DEVICE DESCRIPTION.
 0000000C            011D   483          RPB     =   12
                     011D   484 ;
                     011D   485 ; OUTPUT PARAMETERS:
                     011D   486 ;       NONE
                     011D   487 ;
                     011D   488 ;--
                     011D   489
             00FC    011D   490 BOO$MAP::        .WORD   ^M<R2,R3,R4,R5,R6,R7>   ;
          57  0C AC    D0  011F   491          MOVL    RPB(AP),R7              ; GET BASE ADDRESS FOR RPB
          52  04 AC    D0  0123   492          MOVL    SVASPT(AP),R2           ; GET BASE OF SPT
       50 A7    52    D0  0127   493          MOVL    R2,RPB$L_SVASPT(R7)     ; AND SAVE IN DATA BASE
          53  08 AC    D0  012B   494          MOVL    VABASE(AP),R3           ; GET VIRTUAL ADDRESS OF WINDOW
       60 A7    53    D0  012F   495          MOVL    R3,RPB$L_ADPVIR(R7)     ; SET AS ADAPTER VIRTUAL ADDRESS
 54  5C A7    15    09  EF  0133   496          EXTZV   #VA$V_VPN,#VA$S_VPN,RPB$L_ADPPHY(R7),R4 ; GET BASE PFN
             55    08  D0  0139   497          MOVL    #8,R5                   ; SET TO MAP 8 PAGES
    50  53    15    09  EF  013C   498          EXTZV   #VA$V_VPN,#VA$S_VPN,R3,R0       ; GET BASE VIRTUAL PAGE
          51  6240    DE  0141   499          MOVAL   (R2)[R0],R1             ; COMPUTE WORKING SPT POINTER
                20    10  0145   500          BSBB    FILLSPT                 ; FILL SPT TO MAP CONFIGURATION REGS
             55    10    D0  0147   501          MOVL    #16,R5                  ; SET FOR 16 PAGES
 54  54 A7  00001FFF  8F  CB  014A   502          BICL3   #^X1FFF,RPB$L_CSRPHY(R7),R4     ; GET PHY ADDR OF I/O PAGE BASE
          54    54    17  9C  0153   503          ROTL    #<32-9>,R4,R4           ; AND CONVERT TO PAGE NUMBER
                0E    10  0157   504          BSBB    FILLSPT                 ; STORE PTES INTO SPT
       50  54 A7    3C  0159   505          MOVZWL  RPB$L_CSRPHY(R7),R0     ; GET I/O PAGE OFFSET
 58 A7  FFFF3000 E043    9E  015D   506          MOVAB   <^X1000-^XE000>(R0)[R3],RPB$L_CSRVIR(R7) ; SET VIRTUAL CSR ADDR
                04    10  0166   507          RET                             ;
                     0167   508
                     0167   509 ;++
                     0167   510 ; FILLSPT
                     0167   511 ;
                     0167   512 ; INPUTS:
                     0167   513 ;       R1 - POINTER TO CURRENT SPT ENTRY (UPDATED)
                     0167   514 ;       R4 - PFN (UPDATED)
                     0167   515 ;       R5 - COUNT OF PAGES TO FILL (UPDATED)
                     0167   516 ;
                     0167   517 FILLSPT:                                       ;
 81  54  90000000 8F    C9  0167   518          BISL3   #<PTE$M_VALID!PTE$C_KW>,R4,(R1)+ ; STORE A PTE
```

```
                54   D6  016F    519          INCL    R4                      ; ADVANCE TO NEXT PFN
              F3 55   F5  0171    520          SOBGTR  R5,FILLSPT              ; STORE THEM ALL
                      05  0174    521          RSB
```

```
                     0175   523          .SBTTL  BOO$PURDPR - Purge UBA Buffered Datapath
                     0175   524
                     0175   525 ;++
                     0175   526 ; FUNCTIONAL DESCRIPTION:
                     0175   527 ;
                     0175   528 ;       This routine is called by BOOTDRIVR at the end of each boot device
                     0175   529 ;       transfer if the boot device is on the Unibus.  It purges the buffered
                     0175   530 ;       datapath and/or performs other Unibus adapter specific end-action.
                     0175   531 ;
                     0175   532 ;   NOTE: This routine contains processor specific code.
                     0175   533 ;
                     0175   534 ; CALLING SEQUENCE:
                     0175   535 ;
                     0175   536 ;       JSB     BOO$PURDPR
                     0175   537 ;
                     0175   538 ; INPUT PARAMETERS:
                     0175   539 ;
                     0175   540 ;       R3 - Address of UBA adapter configuration register
                     0175   541 ;       EXE$GB_CPUTYPE - Index specifying what CPU we are executing on
                     0175   542 ;       ** Assumes all drivers use DATAPATH 1 **
                     0175   543 ;
                     0175   544 ; OUTPUT PARAMETERS:
                     0175   545 ;
                     0175   546 ;       R0 - LBS -> Success
                     0175   547 ;            LBC -> Failure
                     0175   548 ;
                     0175   549 ;       R1,R2,R4 - Destroyed
                     0175   550 ;       All other registers preserved
                     0175   551 ;
                     0175   552 ;--
                     0175   553
                     0175   554 BOO$PURDPR:
                     0175   555
     50   01   3C   0175   556          MOVZWL  #SS$_NORMAL,R0          ; Assume success
                     0178   557          CPUDISP <<780,100$>,-           ; Dispatch on EXE$GB_CPUTYPE
                     0178   558                  <750,200$>,-
                     0178   559                  <730,300$>,-
                     0178   560                  <790,100$>,-
                     0178   561                  <UV1,170$>>,-           ; Nothing to do for Micro-VAX I
                     0178   562                  ENVIRON=VMB;
                     01AB   563
                     01AB   564 100$:                                    ; CPU type 11/780 and 11/790:
   52   44 A3   DE   01AB   565          MOVAL   UBA$L_DPR+4(R3),R2      ; Get Datapth Register address
62 01   1F   78   01AF   566          ASHL    #UBA$V_DPR_BNE,#1,(R2)  ; Purge datapath
     51   62   D0   01B3   567          MOVL    (R2),R1                 ; Get Datapth register contents
  09 51   1E   E1   01B6   568          BBC     #UBA$V_DPR_XMTER,R1,170$ ; Branch if no error
62 01   1E   78   01BA   569          ASHL    #UBA$V_DPR_XMTER,#1,(R2) ; Clear error in datapath
50   01F4 8F   3C   01BE   570 150$:   MOVZWL  #SS$_PARITY,R0           ; Set failure status
                05   01C3   571 170$:   RSB                             ; Return to caller
                     01C4   572
   52   04 A3   DE   01C4   573 200$:   MOVAL   UBI$L_DPR+4(R3),R2      ; CPU type 11/750, Datapath Register
62 01   00   78   01C8   574          ASHL    #UBI$V_DPR_PUR,#1,(R2)  ; Purge Datapath
     54   0A   D0   01CC   575          MOVL    #UBI$C_PURCNT,R4        ; Get max # of tries for
                01CF   576                                              ; purge done test
     51   62   D0   01CF   577 230$:   MOVL    (R2),R1                 ; Get datapath register contents
  05 51   00   E1   01D2   578          BBC     #UBI$V_DPR_PUR,R1,250$  ; Branch if purge done
        F6 54   F5   01D6   579          SOBGTR  R4,230$                 ; Branch if more tries allowed
```

```
                    04   11  01D9   580          BRB     270$                            ; Return failure status
                E4  51   1F  E1  01DB   581 250$:  BBC     #UBI$V_DPR_ERROR,R1,170$ ; Branch if no purge error
                    62   00  D2  01DF   582 270$:  MCOML   #0,(R2)                      ; Clear datapath error(s)
                         DA  11  01E2   583          BRB     150$                            ; Return with failure status
                             01E4   584
                51      10  A3  D0  01E4   585 300$:  MOVL    UBI$L_SR(R3),R1                 ; Get Unibus Error Summary Register
                             01E8   586                                                  ; Nebula
            51  8001C000  8F  D3  01E8   587          BITL    #<UBI$M_SR_UWE!-                ; Any UB errors? (write error,
                             01EF   588                      UBI$M_SR_MRPE!-             ;       map parity error,
                             01EF   589                      UBI$M_SR_NXM!-              ;       non-existent memory,
                             01EF   590                      UBI$M_SR_UCE>,R1            ; or uncorrected read error.)
                         D2  13  01EF   591          BEQL    170$                            ; Branch if no errors
                             01F1   592 ; ****** QUESTION - Is there anything to do to clear the error status?
                         CB  11  01F1   593          BRB     150$                            ; Return failure status
                             01F3   594
```

```
                01F3    596          .ALIGN  LONG                    ; Alignment needed by some drivers!!!
000001F4        01F4    597 BOO$QIOSIZ=.-BOO$AL_VECTOR               ; Size of boot QIO routine
                01F4    598
000001F4        01F4    599 BOO$DRIVER==.                            ; Start of boot driver (after
                01F4    600                                          ; it's been moved)
                01F4    601                                          ; NOTE:  Boot drivers must be in
                01F4    602                                          ; psect BOOTDRIVR_2
                01F4    603
            00000000    604          .PSECT  BOOTDRIVR_3
                0000    605
00000000        0000    606 BOO$DRIVER_TBL=.                         ; Boot driver table
                0000    607
            00000000    608          .PSECT  BOOTDRIVR_5
                0000    609
00000000        0000    610          .LONG   0                       ; End of boot driver table
                0004    611
            00000000    612          .PSECT  BOOTDRIVR_6
```

```
                     0000   614          .SBTTL  BOO$SELECT - Select boot driver
                     0000   615
                     0000   616 ;++
                     0000   617 ; FUNCTIONAL DESCRIPTION:
                     0000   618 ;
                     0000   619 ;       This routine is called the first time BOO$QIO calls a driver.
                     0000   620 ;       It searches the boot driver table to locate the proper driver.
                     0000   621 ;       The correct linkage is made in BOO$AL_VECTOR.
                     0000   622 ;       RPB$L_IOVECSZ is also stored with the size of BOO$QIO plus
                     0000   623 ;       the size of the driver.  The driver is then jumped to.
                     0000   624 ;
                     0000   625 ; CALLING SEQUENCE:
                     0000   626 ;
                     0000   627 ;       JSB     BOO$SELECT      (Actually called through self-relative
                     0000   628 ;                                vector in BOO$AL_VECTOR+BQO$L_SELECT)
                     0000   629 ;
                     00C0   630 ; INPUT PARAMETERS:
                     0000   631 ;
                     0000   632 ;       R9      Address of the RPB
                     0000   633 ;
                     0000   634 ; OUTPUT PARAMETERS:
                     0000   635 ;
                     0000   636 ;       None
                     0000   637 ;
                     0000   638 ;--
                     0000   639
                     0000   640 BOO$SELECT:
007E 8F    BB        0000   641          PUSHR   #^M<R1,R2,R3,R4,R5,R6>
     5D    10        0004   642          BSBB    BOO$RESELECT                    ; Select the correct driver
007E 8F    BA        0006   643          POPR    #^M<R1,R2,R3,R4,R5,R6>
                     000A   644 ;
                     000A   645 ; Set up driver vector and jump to driver.
                     000A   646 ;
  50   34 A9    D0   000A   647          MOVL    RPB$L_IOVEC(R9),R0              ; Get address of vectors
    08 B040    17   000E   648          JMP     @BQO$L_SELECT(R0)[R0]           ; Jump to driver
```

```
                                0012   650          .SBTTL  BOO$MOVE - Select and move boot driver
                                0012   651
                                0012   652 ;++
                                0012   653 ; FUNCTIONAL DESCRIPTION:
                                0012   654 ;
                                0012   655 ;       This routine is called after VMB is finished with a driver.
                                0012   656 ;       It searches the boot driver table to locate the proper driver.
                                0012   657 ;       The correct linkage is made in BOO$AL_VECTOR and driver moved.
                                0012   658 ;
                                0012   659 ; CALLING SEQUENCE:
                                0012   660 ;
                                0012   661 ;       JSB     BOO$MOVE        (Actually called through self-relative
                                0012   662 ;                                vector in BOO$AL_VECTOR+BQO$L_MOVE)
                                0012   663 ;
                                0012   664 ; INPUT PARAMETERS:
                                0012   665 ;
                                0012   666 ;       R9      Address of the RPB
                                0012   667 ;
                                0012   668 ; OUTPUT PARAMETERS:
                                0012   669 ;
                                0012   670 ;       None
                                0012   671 ;
                                0012   672 ;--
                                0012   673
                                0012   674 BOO$MOVE:
          00FE 8F    BB         0012   675          PUSHR   #^M<R1,R2,R3,R4,R5,R6,R7> ; Save registers
                4B   10         0016   676          BSBB    BOO$RESELECT            ; Select the correct driver
     56   0C B545    9E         0018   677          MOVAB   @BDT$L_ADDR(R5)[R5],R6  ; Address of current position
     54   01F4'CF    9E         001D   678          MOVAB   W^BOO$DRIVER,R4         ; Address of new position
     57   56   54    C3         0022   679          SUBL3   R4,R6,R7                ; Offset
                24   13         0026   680          BEQL    20$                     ; None, so don't move
     64   66   08 A5 28         0028   681          MOVC3   BDT$L_SIZE(R5),(R6),(R4); Move driver
          54   0000'CF 9E       002D   682          MOVAB   W^BOO$AL_VECTOR,R4
               08 A4   57 C2     0032   683          SUBL2   R7,BQO$L_SELECT(R4)     ; Adjust offset
               0C A4   57 C2     0036   684          SUBL2   R7,BQO$L_DRIVRNAME(R4)
                    20 A4 D5     003A   685          TSTL    BQO$L_AUXDRNAME(R4)     ; Is there one?
                       04 13     003D   686          BEQL    10$                     ; No, don;t mess
               20 A4   57 C2     003F   687          SUBL2   R7,BQO$L_AUXDRNAME(R4)
                    1C A4 D5     0043   688 10$:      TSTL    BQO$L_UNIT_INIT(R4)     ; Is there one?
                       04 13     0046   689          BEQL    20$                     ; No, don;t mess
               1C A4   57 C2     0048   690          SUBL2   R7,BQO$L_UNIT_INIT(R4)
                    2C A4 D5     004C   691 20$:      TSTL    BQO$L_UNIT_DISC(R4)     ; Is there one?
                       04 13     004F   692          BEQL    30$                     ; No, don;t mess
               2C A4   57 C2     0051   693          SUBL2   R7,BQO$L_UNIT_DISC(R4)
                    30 A4 D5     0055   694 30$:      TSTL    BQO$L_DEVNAME(R4)       ; Is there one?
                       04 13     0058   695          BEQL    40$                     ; No, don;t mess
               30 A4   57 C2     005A   696          SUBL2   R7,BQO$L_DEVNAME(R4)
          00FE 8F    BA         005E   697 40$:      POPR    #^M<R1,R2,R3,R4,R5,R6,R7>
                05   05         0062   698          RSB
                                0063   699
                                0063   700 BOO$RESELECT:
     55   0000'CF    DE         0063   701          MOVAL   W^BOO$DRIVER_TBL,R5     ; Get address of boot driver table
          53   66 A9 9A         0068   702          MOVZBL  RPB$B_DEVTYP(R9),R3     ; Get value of boot device type
     54   0039'CF    9A         006C   703          MOVZBL  W^EXE$GB_CPUTYPE,R4     ; Get cpu type
     56   01F4'8F    3C         0071   704          MOVZWL  #<BOO$DRIVER-BOO$AL_VECTOR>,R6 ; Compute offset to driver table
                                0076   705 ;
                                0076   706 ; Determine if next driver in table is the correct one.
```

```
                     0076   707 ;
                     0076   708 10$:    CVTWL   BDT$L_CPUTYPE(R5),R0    ; Get cpu type from table
                     0079   709         BEQL    400$                    ; End of table
                     007B   710         BLSS    20$                     ; Driver doesn't care about cpu type
                     007D   711         CMPL    R0,R4                   ; Cpu types match?
                     0080   712         BNEQ    40$                     ; No, try next driver
                     0082   713
                     0082   714 20$:    CVTWL   BDT$L_DEVTYPE(R5),R0    ; Get boot device type from table
                     0086   715         BLSS    30$                     ; Driver doesn't care about device type
                     0088   716         CMPL    R0,R3                   ; Device types match?
                     008B   717         BNEQ    40$                     ; No, try next driver
                     008D   718
                     008D   719 30$:    MOVL    BDT$L_ACTION(R5),R0     ; Get action routine offset from table
                     0091   720         BEQL    60$                     ; No action routine, this is the driver
                     0093   721         JSB     (R5)[R0]                ; Call action routine
                     0096   722         BLBS    R0,60$                  ; Branch if this is the driver
                     0099   723 40$:    ADDL    BDT$L_SIZE(R5),R6       ; Account for this driver's size
                     009D   724         ADDL    #BDT$K_LENGTH,R5        ; Point to next driver entry
                     00A0   725         BRB     10$                     ; Try next driver
                     00A2   726 ;
                     00A2   727 ; Have the right driver.  R5 points to driver table entry. R6 contains
                     00A2   728 ; accumulated offset from IOVEC to the start of the driver.  Update
                     00A2   729 ; pertainent entries in the IOVEC.
                     00A2   730 ;
                     00A2   731 60$:    MOVAL   W^BOO$AL_VECTOR,R4      ; Cover the vector
000001F4 8F          00A7   732         ADDL3   #BOO$QIOSIZ,-           ; Add boot QIO size to
         08 A5       00AD   733                 BDT$L_SIZE(R5),-        ;  driver size
         38 A9       00AF   734                 RPB$L_IOVECSZ(R9)       ;  and store in RPB
      10 A5    56    C1   00B1   735         ADDL3   R6,BDT$L_ENTRY(R5),-    ; Calc offset to driver
         08 A4       00B5   736                 BQO$L_SELECT(R4)        ;  entry point and store in vector
      14 A5    56    C1   00B7   737         ADDL3   R6,BDT$L_DRIVRNAME(R5),-; Calc offset to driver
         0C A4       00BB   738                 BQO$L_DRIVRNAME(R4)     ;  name and store in vector
         1C A4    D4   00BD   739         CLRL    BQO$L_UNIT_INIT(R4)     ; Assume none
      51 1C A5    D0   00C0   740         MOVL    BDT$L_UNIT_INIT(R5),R1  ; Pick up possible UNIT_INIT entry
                  05   00C4   741         BEQL    70$                     ; None specified, default to a RET
1C A4 51    56    C1   00C6   742         ADDL3   R6,R1,BQO$L_UNIT_INIT(R4) ;Calc offset to driver
                     00CB   743                                         ;  UNIT_INIT point and store in vector
         20 A4    D4   00CB   744 70$:    CLRL    BQO$L_AUXDRNAME(R4)     ; Assume none
      51 18 A5    D0   00CE   745         MOVL    BDT$L_AUXDRNAME(R5),R1  ; Pick up possible driver name
                  05   00D2   746         BEQL    80$                     ; None specified, default to a zero
20 A4 51    56    C1   00D4   747         ADDL3   R6,R1,BQO$L_AUXDRNAME(R4) ; Calc offset to driver
                     00D9   748                                         ;  auxiliary name and store in vector
         2C A4    D4   00D9   749 80$:    CLRL    BQO$L_UNIT_DISC(R4)     ; Assume none
      51 20 A5    D0   00DC   750         MOVL    BDT$L_UNIT_DISC(R5),R1  ; Pick up possible UNIT DISC entry
                  05   00E0   751         BEQL    90$                     ; None specified, default to a zero
2C A4 51    56    C1   00E2   752         ADDL3   R6,R1,BQO$L_UNIT_DISC(R4) ; Calc offset to driver
                     00E7   753                                         ;  UNIT_DISC point and store in vector
         30 A4    D4   00E7   754 90$:    CLRL    BQO$L_DEVNAME(R4)       ; Assume none
      51 24 A5    D0   00EA   755         MOVL    BDT$L_DEVNAME(R5),R1    ; Pick up possible device name
                  05   00EE   756         BEQL    100$                    ; None specified, default to a zero
30 A4 51    56    C1   00F0   757         ADDL3   R6,R1,BQO$L_DEVNAME(R4) ; Calc offset to device
                     00F5   758                                         ;  name and store in vector
                  05   00F5   759 100$:   RSB
                     00F6   760
                     00F6   761 ;
                     00F6   762 ; No driver in the driver table accepted this QIO
                     00F6   763 ;
```

```
00  00F6   764 400$:    HALT
    00F7   765
    00F7   766          .END
```

```
$$BASE                          = 00000001
$$DISPL                         = 00000008
$$GENSW                         = 00000001
$$HIGH                          = 00000007
$$LIMIT                         = 00000006
$$LOW                           = 00000001
$$MNSW                          = 00000001
$$MXSW                          = 00000001
BDT$K_LENGTH                    = 00000028
BDT$L_ACTION                      00000004
BDT$L_ADDR                        0000000C
BDT$L_AUXDRNAME                   00000018
BDT$L_CPUTYPE                     00000000
BDT$L_DEVNAME                     00000024
BDT$L_DEVTYPE                     00000002
BDT$L_DRIVRNAME                   00000014
BDT$L_ENTRY                       00000010
BDT$L_SIZE                        00000008
BDT$L_UNIT_DISC                   00000020
BDT$L_UNIT_INIT                   0000001C
BOO$AL_VECTOR                     00000000 RG     02
BOO$DRIVER                      = 000001F4 RG     02
BOO$DRIVER_TBL                  = 00000000 R      03
BOO$GB_UMR_DP                     00000038 RG     02
BOO$GL_UCODE                      00000028 RG     02
BOO$GL_UMR_DIS                    00000024 RG     02
BOO$GL_UMR_TMPL                   00000034 RG     02
BOO$MAP                           0000011D RG     02
BOO$MOVE                          00000012 R      05
BOO$PURDPR                        00000175 R      02
BOO$QIO                           00000046 RG     02
BOO$QIOSIZ                      = 000001F4
BOO$RESELECT                      00000063 R      05
BOO$SELECT                        00000000 R      05
BQO$B_CPUTYPE                   = 00000039
BQO$B_UMR_DP                    = 00000038
BQO$L_AUXDRNAME                 = 00000020
BQO$L_CPUDATA                   = 0000003A
BQO$L_DEVNAME                   = 00000030
BQO$L_DRIVRNAME                 = 0000000C
BQO$L_SELECT                    = 00000008
BQO$L_TENUSEC                   = 0000003E
BQO$L_UBDELAY                   = 00000042
BQO$L_UCODE                     = 00000028
BQO$L_UMR_DIS                   = 00000024
BQO$L_UMR_TMPL                  = 00000034
BQO$L_UNIT_DISC                 = 0000002C
BQO$L_UNIT_INIT                 = 0000001C
BQO$W_VERSION                   = 00000010
BTD$K_MSCCI                     = 00000020
BUF                             = 00000004
COMPUTE_PFN                       00000097 R      02
ERROUT                            ******** X    02
EXE$GB_CPUDATA                    0000003A RG     02
EXE$GB_CPUTYPE                    00000039 RG     02
EXE$GL_TENUSEC                    0000003E RG     02
EXE$GL_UBDELAY                    00000042 RG     02
FILLSPT                           00000167 R      02
FUNC                            = 00000010
INIT_MAPREGS                      0000008C R      02
LBN                             = 0000000C
MBA$L_MAP                       = 00000800
MODE                            = 00000014
NDT$_UBO                        = 00000028
OP$_ACBD                        = 0000006F
OP$_ACBF                        = 0000004F
OP$_ACBG                        = 00004FFD
OP$_ACBH                        = 00006FFD
OP$_ADDD2                       = 00000060
OP$_ADDD3                       = 00000061
OP$_ADDF2                       = 00000040
OP$_ADDF3                       = 00000041
OP$_ADDG2                       = 000040FD
OP$_ADDG3                       = 000041FD
OP$_ADDH2                       = 000060FD
OP$_ADDH3                       = 000061FD
OP$_ADDP4                       = 00000020
OP$_ADDP6                       = 00000021
OP$_ASHP                        = 000000F8
OP$_CLRD                        = 0000007C
OP$_CLRF                        = 000000D4
OP$_CLRG                        = 0000007C
OP$_CLRH                        = 00007CFD
OP$_CMPD                        = 00000071
OP$_CMPF                        = 00000051
OP$_CMPG                        = 000051FD
OP$_CMPH                        = 000071FD
OP$_CMPP3                       = 00000035
OP$_CMPP4                       = 00000037
OP$_CRC                         = 0000000B
OP$_CVTBD                       = 0000006C
OP$_CVTBF                       = 0000004C
OP$_CVTBG                       = 00004CFD
OP$_CVTBH                       = 00006CFD
OP$_CVTDB                       = 00000068
OP$_CVTDF                       = 00000076
OP$_CVTDH                       = 000032FD
OP$_CVTDL                       = 0000006A
OP$_CVTDW                       = 00000069
OP$_CVTFB                       = 00000048
OP$_CVTFD                       = 00000056
OP$_CVTFG                       = 000099FD
OP$_CVTFH                       = 000098FD
OP$_CVTFL                       = 0000004A
OP$_CVTFW                       = 00000049
OP$_CVTGB                       = 000048FD
OP$_CVTGF                       = 000033FD
OP$_CVTGH                       = 000056FD
OP$_CVTGL                       = 00004AFD
OP$_CVTGW                       = 000049FD
OP$_CVTHB                       = 000068FD
OP$_CVTHD                       = 0000F7FD
OP$_CVTHF                       = 0000F6FD
OP$_CVTHG                       = 000076FD
```

```
OP$_CVTHL       = 00006AFD      OP$_POLYG       = 000055FD
OP$_CVTHW       = 000069FD      OP$_POLYH       = 000075FD
OP$_CVTLD       = 0000006E      OP$_SCANC       = 0000002A
OP$_CVTLF       = 0000004E      OP$_SKPC        = 0000003B
OP$_CVTLG       = 00004EFD      OP$_SPANC       = 0000002B
OP$_CVTLH       = 00006EFD      OP$_SUBD2       = 00000062
OP$_CVTLP       = 000000F9      OP$_SUBD3       = 00000063
OP$_CVTPL       = 00000036      OP$_SUBF2       = 00000042
OP$_CVTPS       = 00000008      OP$_SUBF3       = 00000043
OP$_CVTPT       = 00000024      OP$_SUBG2       = 000042FD
OP$_CVTRDL      = 0000006B      OP$_SUBG3       = 000043FD
OP$_CVTRFL      = 0000004B      OP$_SUBH2       = 000062FD
OP$_CVTRGL      = 00004BFD      OP$_SUBH3       = 000063FD
OP$_CVTRHL      = 00006BFD      OP$_SUBP4       = 00000022
OP$_CVTSP       = 00000009      OP$_SUBP6       = 00000023
OP$_CVTTP       = 00000026      OP$_TSTD        = 00000073
OP$_CVTWD       = 0000006D      OP$_TSTF        = 00000053
OP$_CVTWF       = 0000004D      OP$_TSTG        = 000053FD
OP$_CVTWG       = 00004DFD      OP$_TSTH        = 000073FD
OP$_CVTWH       = 00006DFD      PR$_MAPEN       = 00000038
OP$_DIVD2       = 00000066      PR$_POBR        = 00000008
OP$_DIVD3       = 00000067      PR$_SID_TYP730  = 00000003
OP$_DIVF2       = 00000046      PR$_SID_TYP750  = 00000002
OP$_DIVF3       = 00000047      PR$_SID_TYP780  = 00000001
OP$_DIVG2       = 000046FD      PR$_SID_TYP790  = 00000004
OP$_DIVG3       = 000047FD      PR$_SID_TYPUV1  = 00000007
OP$_DIVH2       = 000066FD      PTE$C_KW        = 10000000
OP$_DIVH3       = 000067FD      PTE$M_PFN       = 001FFFFF
OP$_DIVP        = 00000027      PTE$M_VALID     = 80000000
OP$_EDITPC      = 00000038      PUSH_RETRY        000000F3 R      02
OP$_EMODD       = 00000074      RPB             = 0000000C
OP$_EMODF       = 00000054      RPB$B_DEVTYP    = 00000066
OP$_EMODG       = 000054FD      RPB$L_ADPPHY    = 0000005C
OP$_EMODH       = 000074FD      RPB$L_ADPVIR    = 00000060
OP$_MATCHC      = 00000039      RPB$L_CSRPHY    = 00000054
OP$_MNEGD       = 00000072      RPB$L_CSRVIR    = 00000058
OP$_MNEGF       = 00000052      RPB$L_IOVEC     = 00000034
OP$_MNEGG       = 000052FD      RPB$L_IOVECSZ   = 00000038
OP$_MNEGH       = 000072FD      RPB$L_SVASPT    = 00000050
OP$_MOVD        = 00000070      RPB$W_BOOTNDT   = 000000A1
OP$_MOVF        = 00000050      SIZE            = 00000008
OP$_MOVG        = 000050FD      SS$_NORMAL      = 00000001
OP$_MOVH        = 000070FD      SS$_PARITY      = 000001F4
OP$_MOVP        = 00000034      SVASPT          = 00000004
OP$_MOVTC       = 0000002E      UBA$L_DPR       = 00000040
OP$_MOVTUC      = 0000002F      UBA$L_MAP       = 00000800
OP$_MULD2       = 00000064      UBA$M_MAP_VALID = 80000000
OP$_MULD3       = 00000065      UBA$V_DPR_BNE   = 0000001F
OP$_MULF2       = 00000044      UBA$V_DPR_XMTER = 0000001E
OP$_MULF3       = 00000045      UBA$V_MAP_BO    = 00000019
OP$_MULG2       = 000044FD      UBA$V_MAP_DPD   = 00000015
OP$_MULG3       = 000045FD      UBI$C_PURCNT    = 0000000A
OP$_MULH2       = 000064FD      UBI$L_DPR       = 00000000
OP$_MULH3       = 000065FD      UBI$L_MAP       = 00000800
OP$_MULP        = 00000025      UBI$L_SR        = 00000010
OP$_POLYD       = 00000075      UBI$M_SR_MRPE   = 00008000
OP$_POLYF       = 00000055      UBI$M_SR_NXM    = 00010000
```

```
UBI$M_SR_UCE                    = 80000000
UBI$M_SR_UWE                    = 00004000
UBI$V_DPR_ERROR                 = 0000001F
UBI$V_DPR_PUR                   = 00000000
VA$S_BYTE                       = 00000009
VA$S_VPN                        = 00000015
VA$V_BYTE                       = 00000000
VA$V_SYSTEM                     = 0000001F
VA$V_VPN                        = 00000009
VABASE                          = 00000008
VMB_VERSION                     = 0000000D
```

Psect synopsis

PSECT name	Allocation	PSECT No.	Attributes
. ABS .	00000000 (0.)	00 (0.)	NOPIC USR CON ABS LCL NOSHR NOEXE NORD NOWRT NOVEC BYTE
ABS	00000028 (40.)	01 (1.)	NOPIC USR CON ABS LCL NOSHR EXE RD WRT NOVEC BYTE
BOOTDRIVR_1	000001F4 (500.)	02 (2.)	NOPIC USR CON REL LCL NOSHR EXE RD WRT NOVEC LONG
BOOTDRIVR_3	00000000 (0.)	03 (3.)	NOPIC USR CON REL LCL NOSHR EXE RD WRT NOVEC BYTE
BOOTDRIVR_5	00000004 (4.)	04 (4.)	NOPIC USR CON REL LCL NOSHR EXE RD WRT NOVEC BYTE
BOOTDRIVR_6	000000F7 (247.)	05 (5.)	NOPIC USR CON REL LCL NOSHR EXE RD WRT NOVEC BYTE

Performance indicators

Phase	Page faults	CPU Time	Elapsed Time
Initialization	29	00:00:00.09	00:00:00.33
Command processing	108	00:00:00.80	00:00:02.74
Pass 1	627	00:00:23.76	00:00:48.10
Symbol table sort	0	00:00:02.72	00:00:05.54
Pass 2	161	00:00:05.84	00:00:11.03
Symbol table output	28	00:00:00.23	00:00:00.78
Psect synopsis output	3	00:00:00.03	00:00:00.04
Cross-reference output	0	00:00:00.00	00:00:00.00
Assembler run totals	958	00:00:33.47	00:01:08.57

```
The working set limit was 2000 pages.
114533 bytes (224 pages) of virtual memory were used to buffer the intermediate code.
There were 100 pages of symbol table space allocated to hold 1738 non-local and 39 local symbols.
3518 source lines were read in Pass 1, producing 20 object records in Pass 2.
157 pages of virtual memory were used to define 154 macros.
```

+----------------------------+
! Macro library statistics !
+----------------------------+

Macro library name	Macros defined
_255DUA28:[BOOTS.OBJ]BOOTS.MLB;1	0
_255DUA28:[SYS.OBJ]LIB.MLB;1	11
_255DUA28:[SYSLIB]STARLET.MLB;2	8
TOTALS (all libraries)	19

1889 GETS were required to define 19 macros.

There were no errors, warnings or information messages.

```
MACRO/LIS=LIS$:BOOTDRIVR/OBJ=OBJ$:BOOTDRIVR MASD$:[EMULAT.SRC]MISSING/UPDATE=(MASD$:[EMULAT.ENH]MISSING)+MASD$:[BOOTS.SRC]BOOTDRIVR/
```

CONFIG
LIS

BTMEM855
LIS

BTMEM790
LIS

CONFIGURE
LIS

BOOTDEF
LIS

BOOTIO
LIS

CONFIGMN
LIS

BOOTDRIVR
LIS

BTMEM730
LIS

BTMEM750
LIS

BTMEM780
LIS

BOOTBLOCK
LIS