F 5

```
   SSSSSSSSSSSS  DDDDDDDDDDDD        AAAAAAAAA
   SSSSSSSSSSSS  DDDDDDDDDDDD        AAAAAAAAA
   SSSSSSSSSSSS  DDDDDDDDDDDD        AAAAAAAAA
SSS              DDD         DDD  AAA         AAA
SSS              DDD         DDD  AAA         AAA
SSS              DDD         DDD  AAA         AAA
SSS              DDD         DDD  AAA         AAA
SSS              DDD         DDD  AAA         AAA
SSS              DDD         DDD  AAA         AAA
   SSSSSSSSS     DDD         DDD  AAA         AAA
   SSSSSSSSS     DDD         DDD  AAA         AAA
   SSSSSSSSS     DDD         DDD  AAA         AAA
            SSS  DDD         DDD  AAAAAAAAAAAAAAA
            SSS  DDD         DDD  AAAAAAAAAAAAAAA
            SSS  DDD         DDD  AAAAAAAAAAAAAAA
            SSS  DDD         DDD  AAA         AAA
            SSS  DDD         DDD  AAA         AAA
            SSS  DDD         DDD  AAA         AAA
SSSSSSSSSSSS     DDDDDDDDDDDD     AAA         AAA
SSSSSSSSSSSS     DDDDDDDDDDDD     AAA         AAA
SSSSSSSSSSSS     DDDDDDDDDDDD     AAA         AAA
```

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**FILE**ID**MMG

K 13

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MM      MM  MM      MM    GGGGGGGG
MM      MM  MM      MM    GGGGGGGG
MMMM  MMMM  MMMM  MMMM  GG
MMMM  MMMM  MMMM  MMMM  GG
MM  MM  MM  MM  MM  MM  GG
MM  MM  MM  MM  MM  MM  GG
MM      MM  MM      MM  GG
MM      MM  MM      MM  GG
MM      MM  MM      MM  GG  GGGGGG
MM      MM  MM      MM  GG  GGGGGG
MM      MM  MM      MM  GG      GG      ....
MM      MM  MM      MM  GG      GG      ....
MM      MM  MM      MM    GGGGGG        ....
MM      MM  MM      MM    GGGGGG        ....

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
```

```
0000          .TITLE  MMG     PAGE TABLE FORMATTING ROUTINES
0000          .SBTTL  COPYRIGHT NOTICE
0000          .IDENT  'V04-000'
0000    ;
0000    ;****************************************************************************
0000    ;*                                                                          *
0000    ;*  COPYRIGHT (c) 1978, 1980, 1982, 1984 BY                                 *
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0000    ;*  AND  SHOULD  NOT  BE  CONSTRUED AS  A COMMITMENT BY DIGITAL EQUIPMENT   *
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0000    ;*  DIGITAL ASSUMES NO RESPONSIBILITY FOR THE USE  OR  RELIABILITY OF ITS   *
0000    ;*  SOFTWARE ON EQUIPMENT WHICH IS NOT SUPPLIED BY DIGITAL.                 *
0000    ;*                                                                          *
0000    ;*                                                                          *
0000    ;****************************************************************************
0000    ;
```

```
0000         .SBTTL  PROGRAM DESCRIPTION
0000    ;++
0000    ; FACILITY
0000    ;
0000    ;       SYSTEM DUMP ANALYZER
0000    ;
0000    ; ABSTRACT
0000    ;
0000    ;       THIS MODULE CONTAINS ROUTINES RELATING TO FORMATTED
0000    ;       A SPECIFIED PAGE TABLE.
0000    ;
0000    ; ENVIRONMENT
0000    ;
0000    ;       NATIVE MODE, USER MODE
0000    ;
0000    ; AUTHOR
0000    ;
0000    ;       TIM HALVORSEN, JULY 1978
0000    ;
0000    ; MODIFIED BY
0000    ;
0000    ;       V03-001 WMC0001         Wayne Cardoza   19-Aug-1982
0000    ;               Correct the use of MAXPFN to allow the last page.
0000    ;
0000    ;--
```

```
0000    56          .SBTTL  DECLARATIONS
0000    57  ;
0000    58  ;       SYMBOL DEFINTIONS
0000    59  ;
0000    60          $DMPDEF                         ; Dump file definitions
0000    61          $OPDEF                          ; Define opcode equivalences
0000    62          $OPTDEF                         ; Options definitions
0000    63          $PFNDEF                         ; Page frame data definitions
0000    64          $PHDDEF                         ; Process header definitions
0000    65          $PTEDEF                         ; Page table entry definitions
0000    66          $TPADEF                         ; TPARSE definitions
0000    67          $VADEF                          ; Virtual address definitions
0000    68          $WSLDEF                         ; Working set list definitions
```

```
                0000          .SBTTL  STORAGE DEFINTIONS
                0000    ;
                0000    ;       WRITABLE STORAGE DEFINITIONS
                0000    ;
                0000
            00000000          .PSECT  SDADATA,NOEXE,WRT
                0000
                0000    BUFFER:
00000040        0000          .BLKL   16                          ; GETMEM WORK BUFFER
                0040
                0040    SDA$GL_MAXPFN:
00000044        0040          .BLKL   1                           ; VALUE OF MMG$GL_MAXPFN
00000042        0044          MMG$GW_BIGPFN = SDA$GL_MAXPFN + 2
                0044    SDA$AB_STATE:
00000048        0044          .BLKL   1                           ; VALUE OF PFN$AB_STATE
                0048    SDA$AB_TYPE:
0000004C        0048          .BLKL   1                           ; PFN$AB_TYPE
                004C    SDA$AW_REFCNT:
00000050        004C          .BLKL   1                           ; PFN$AW_REFCNT
                0050    SDA$AL_BAK:
00000054        0050          .BLKL   1                           ; PFN$AL_BAK
                0054    SDA$AL_PTE:
00000058        0054          .BLKL   1                           ; PFN$AL_PTE
                0058    SDA$Ax_FLINK:
0000005C        0058          .BLKL   1                           ; PFN$AW_FLINK
                005C    SDA$Ax_BLINK:
00000060        005C          .BLKL   1                           ; PFN$AW_BLINK
                0060    SDA$Ax_WSLX:
00000064        0060          .BLKL   1                           ; WORKING SET INDEX
                0064
            00000000          .PSECT  MMG,EXE,NOWRT
                0000
                0000          .DEFAULT DISPLACEMENT,LONG
```

```
                            0000          .SBTTL  READ-ONLY DATA DEFINITIONS
                            0000
                            0000   ;
                            0000   ;      READ-ONLY DATA DEFINITIONS
                            0000   ;
                            0000
                            0000   PTECTL1:
                            0000          STRING  <!_!XL     !XL !XL    !AD !AD !AD !AD !AD>
                            002F   PTECTL2_WORD:
                            002F          STRING  <!_!XL     !XL !XL    !AD !AD !AD !AD !AD !AD !AD !XB   !XB !6UW   !X
                            008B   PTECTL2_LONG:
                            008B          STRING  <!_!XL     !XL !XL    !AD !AD !AD !AD !AD !AD !AD !XB   !XB !6UW   !X
                            00E7
                            00E7   PROT_TABLE:
              45 4E 4F 4E   00E7          .ASCII  /NONE/
              2A 2A 2A 2A   00EB          .ASCII  /****/
              20 20 57 4B   00EF          .ASCII  /KW  /
              20 20 52 4B   00F3          .ASCII  /KR  /
              20 20 57 55   00F7          .ASCII  /UW  /
              20 20 57 45   00FB          .ASCII  /EW  /
              57 4B 52 45   00FF          .ASCII  /ERKW/
              20 20 52 45   0103          .ASCII  /ER  /
              20 20 57 53   0107          .ASCII  /SW  /
              57 45 52 53   010B          .ASCII  /SREW/
              57 4B 52 53   010F          .ASCII  /SRKW/
              20 20 52 53   0113          .ASCII  /SR  /
              57 53 52 55   0117          .ASCII  /URSW/
              57 45 52 55   011B          .ASCII  /UREW/
              57 4B 52 55   011F          .ASCII  /URKW/
              20 20 52 55   0123          .ASCII  /UR  /
                            0127
                            0127   OWNER_TABLE:
              55 53 45 4B   0127          .ASCII  /KESU/
                            012B
                            012B   TYPE_TABLE:
           53 4E 41 52 54   012B          .ASCII  /TRANS/
           20 58 54 50 47   0130          .ASCII  /GPTX /
           4C 49 46 47 50   0135          .ASCII  /PGFIL/
           20 20 58 54 53   013A          .ASCII  /STX  /
           4F 52 45 5A 44   013F          .ASCII  /DZERO/
           44 49 4C 41 56   0144          .ASCII  /VALID/
           47 41 50 4F 49   0149          .ASCII  /IOPAG/
           20 20 20 20 20   014E          .ASCII  /     /
                            0153
                            0153   LOC_TABLE:
  20 54 53 4C 45 45 52 46   0153          .ASCII  /FREELST /
  20 54 53 4C 59 46 44 4D   015B          .ASCII  /MDFYLST /
  20 54 53 49 4C 44 41 42   0163          .ASCII  /BADLIST /
  20 44 4E 45 50 4C 45 52   016B          .ASCII  /RELPEND /
  20 52 4F 52 52 45 44 52   0173          .ASCII  /RDERROR /
  20 54 55 4F 45 47 41 50   017B          .ASCII  /PAGEOUT /
  20 20 4E 49 45 47 41 50   0183          .ASCII  /PAGEIN  /
  20 20 45 56 49 54 43 41   018B          .ASCII  /ACTIVE  /
                            0193
                            0193   PAGTYP_TABLE:
  20 53 53 45 43 4F 52 50   0193          .ASCII  /PROCESS /
  20 20 4D 45 54 53 59 53   019B          .ASCII  /SYSTEM  /
```

```
        20 20 4C 41 42 4F 4C 47  01A3    163             .ASCII  /GLOBAL  /
        20 20 54 52 57 4C 42 47  01AB    164             .ASCII  /GBLWRT  /
        20 20 4C 42 54 47 50 50  01B3    165             .ASCII  /PPGTBL  /
        20 20 4C 42 54 47 50 47  01BB    166             .ASCII  /GPGTBL  /
        20 20 20 20 20 20 20 20  01C3    167             .ASCII  /        /
        20 20 20 20 20 20 20 20  01CB    168             .ASCII  /        /
                                 01D3    169
                                 01D3    170 MODIFY_TABLE:
                           4D 20 01D3    171             .ASCII  / M/
                                 01D5    172
                                 01D5    173 WSLOCK_TABLE:
                           4C 20 01D5    174             .ASCII  / L/
```

```
                01D7             .SBTTL  INIT_PFN -- INITIALIZE FOR EXAMINING PFN DATA BASE
                01D7     ;---
                01D7     ;
                01D7     ;       INIT_PFN
                01D7     ;
                01D7     ;       THIS ROUTINE MUST BE CALLED BEFORE ANY REFERENCES ARE
                01D7     ;       MADE TO THE PFN DATA BASE.
                01D7     ;
                01D7     ; INPUTS:
                01D7     ;
                01D7     ;       NONE
                01D7     ;
                01D7     ; OUTPUTS:
                01D7     ;
                01D7     ;       R0 = SUCCESS FLAG
                01D7     ;       SDA$A... CELLS ARE INITIALIZED
                01D7     ;
                01D7     ;---
                01D7
                01D7     INIT_PFN::
          0000  01D7             .WORD   0
                01D9
                01D9             REQMEM  @MMG$GL_MAXPFN,SDA$GL_MAXPFN
                01ED             REQMEM  @PFN$AB_STATE,SDA$AB_STATE
                0201             REQMEM  @PFN$AB_TYPE,SDA$AB_TYPE
                0215             REQMEM  @PFN$AW_REFCNT,SDA$AW_REFCNT
                0229             REQMEM  @PFN$AL_BAK,SDA$AL_BAK
                023D             REQMEM  @PFN$AL_PTE,SDA$AL_PTE
                0251             REQMEM  @PFN$Ax_FLINK,SDA$Ax_FLINK
                0265             REQMEM  @PFN$Ax_BLINK,SDA$Ax_BLINK
                0279             REQMEM  @PFN$Ax_WSLX,SDA$Ax_WSLX
            04  028D             RET
```

```
                                 028E              .SBTTL  DISPLAY_PFN     DISPLAY MEMORY MANAGEMENT DATA
                                 028E        ;---
                                 028E        ;
                                 028E        ;       DISPLAY_PFN
                                 028E        ;
                                 028E        ;       THIS ROUTINE IS RESPONSIBLE FOR PRINTING ALL INFORMATION
                                 028E        ;       RELATING TO THE MEMORY MANAGEMENT DATA BASE.
                                 028E        ;
                                 028E        ;  INPUTS:
                                 028E        ;
                                 028E        ;       NONE
                                 028E        ;
                                 028E        ;  OUTPUTS:
                                 028E        ;
                                 028E        ;       NONE
                                 028E        ;
                                 028E        ;---
                                 028E              .ENABL  LSB
                                 028E
                           007C  028E        .ENTRY  DISPLAY_PFN,^M<R2,R3,R4,R5,R6>
                                 0290
         FF42 CF     00     FB   0290              CALLS   #0,INIT_PFN              ; SETUP TO READ PFN DATA
   38 00000000'EF    04     E1   0295              BBC     #OPT$V_SINGLEPFN,OPTIONS,20$     ; BRANCH IF LIST WANTED
                                 029D        ;
                                 029D        ;       DISPLAY A SINGLE SPECIFIED PFN ENTRY
                                 029D        ;
         56    1C AC        D0   029D              MOVL    TPA$L_NUMBER(AP),R6      ; R6 = PFN TO DISPLAY
      00000040'EF    56     D1   02A1              CMPL    R6,SDA$GL_MAXPFN         ; CHECK IF PFN VALID
                     17     1A   02A8              BGTRU   10$                      ; BRANCH IF INVALID PFN
         047C'CF     00     FB   02AA              CALLS   #0,W^PFN_TITLE           ; DISPLAY THE TITLE LINE
         04CF'CF     00     FB   02AF              CALLS   #0,W^SHOW_PFN            ; DISPLAY THE PFN DATA
                                 02B4              SKIP    1
              50     01     D0   02BD              MOVL    #1,R0
                            04   02C0              RET
                                 02C1        10$:
         00000040'EF        DD   02C1              PUSHL   SDA$GL_MAXPFN
                                 02C7              PRINT   1,<Invalid PFN number (maximum is !XL)>
                            04   02D4              RET
                                 02D5        20$:
      52   00000000'EF      D0   02D5              MOVL    SCH$GL_FREECNT,R2        ; ADDRESS OF COUNT ARRAY
      53   00000000'EF      D0   02DC              MOVL    PFN$AL_LOLIMIT,R3        ; ADDRESS OF LOLIMIT ARRAY
      54   00000000'EF      D0   02E3              MOVL    PFN$AL_HILIMIT,R4        ; ADDRESS OF HILIMIT ARRAY
      55   00000000'EF      D0   02EA              MOVL    PFN$AL_HEAD,R5           ; ADDRESS OF LIST HEADS
                                 02F1
   19 00000000'EF    00     E1   02F1              BBC     #OPT$V_FREE,OPTIONS,30$ ; BRANCH IF NO FREE LIST
                                 02F9              SUBHD   <Free page list>
                                 0306              SKIP    PAGE
         03A3'CF     00     FB   030D              CALLS   #0,W^SHOW_PFN_LIST       ; DISPLAY FREE PAGE LIST
                                 0312        30$:
                     82     D5   0312              TSTL    (R2)+
                     83     D5   0314              TSTL    (R3)+
                     84     D5   0316              TSTL    (R4)+
                     85     D5   0318              TSTL    (R5)+
   18 00000000'EF    01     E1   031A              BBC     #OPT$V_MODIFIED,OPTIONS,40$     ; BRANCH IF NO MODIFIED
                                 0322              SUBHD   <Modified page list>
                                 032F              SKIP    PAGE
           A3'AF     00     FB   0336              CALLS   #0,B^SHOW_PFN_LIST       ; DISPLAY MODIFIED PAGE LIST
```

```
                                033A       40$:
                    82    D5    033A                TSTL    (R2)+
                    83    D5    033C                TSTL    (R3)+
                    84    D5    033E                TSTL    (R4)+
                    85    D5    0340                TSTL    (R5)+
       18 00000000'EF     02    E1    0342                BBC     #OPT$V_BAD,OPTIONS,50$  ; BRANCH IF NO BAD LIST
                                034A                SUBHD   <Bad page list>
                                0357                SKIP    PAGE
              A3'AF    00    FB    035E                CALLS   #0,B^SHOW_PFN_LIST       ; DISPLAY BAD PAGE LIST
                                0362       ;
                                0362       ;        PRINT ENTIRE PFN DATA FROM ENTRY 0 TO N
                                0362       ;
                                0362       50$:
       31 00000000'EF     03    E1    0362                BBC     #OPT$V_WHOLEPFN,OPTIONS,70$       ; BRANCH IF NOT WANTED
                                036A                SUBHD   <PFN data base>
 00000000'EF    047C'CF    9E    0377                MOVAB   W^PFN_TITLE,HEADING_ROUTINE       ; SET HEADING ROUTINE
                                0380                SKIP    PAGE
                    56    D4    0387                CLRL    R6                       ; START AT PFN 0
        000004CF'EF    00    FB    0389       60$:     CALLS   #0,SHOW_PFN              ; SHOW PFN IN R6
                    56    D6    0390                INCL    R6                       ; SKIP TO NEXT PFN
        00000040'EF    56    D1    0392                CMPL    R6,SDA$GL_MAXPFN         ; CHECK IF LAST PFN
                    EE    1B    0399                BLEQU   60$                      ; LOOP UNTIL DONE
                                039B       70$:
                                039B                STATUS  SUCCESS
                          04    03A2                RET
                                03A3
                                03A3                .DSABL  LSB
```

```
                                          03A3        .SBTTL  SHOW_PFN_LIST, DISPLAY PFN LIST
                                          03A3  ;---
                                          03A3  ;
                                          03A3  ;     SHOW_PFN_LIST
                                          03A3  ;
                                          03A3  ;     THIS ROUTINE DISPLAYS THE PFN DATA FOR THE FREE,
                                          03A3  ;     MODIFIED AND BAD PAGE LISTS.
                                          03A3  ;
                                          03A3  ; INPUTS:
                                          03A3  ;
                                          03A3  ;     R2 = ADDRESS OF COUNT LONGWORD
                                          03A3  ;     R3 = ADDRESS OF LOLIMIT LONGWORD
                                          03A3  ;     R4 = ADDRESS OF HILIMIT LONGWORD
                                          03A3  ;     R5 = ADDRESS OF LIST HEAD LONGWORD
                                          03A3  ;
                                          03A3  ;---
                                          03A3
                                          03A3        .ENABL  LSB
                                          03A3
                                          03A3  SHOW_PFN_LIST:
                                   0040   03A3        .WORD   ^M<R6>
                                          03A5
                                          03A5        SKIP    1
                                          03AE        GETMEM  (R2),-(SP)                  ; GET LIST COUNT
                           0D 50     E9   03BA        BLBC    R0,10$
                                          03BD        PRINT   1,<Count:          !12SL>
                                          03CA  10$:
                                          03CA        GETMEM  (R3),-(SP)                  ; GET LIST LOLIMIT
                           0D 50     E9   03D6        BLBC    R0,20$
                                          03D9        PRINT   1,<Lolimit:        !12SL>
                                          03E6  20$:
                                          03E6        GETMEM  (R4),-(SP)                  ; GET LIST HILIMIT
                           0D 50     E9   03F2        BLBC    R0,30$
                                          03F5        PRINT   1,<High limit:    !12SL>
                                          0402  30$:
                     7C'AF    00     FB   0402        CALLS   #0,B^PFN_TITLE              ; PRINT HEADING LINE
      00000000'EF  0000047C'EF       9E   0406        MOVAB   PFN_TITLE,HEADING_ROUTINE          ; SET HEADING ROUTINE
                                          0411        GETMEM  (R5),R6                     ; GET LIST HEAD
                           03 50     E8   041D        BLBS    R0,35$
                            0052     31   0420  80$:  BRW     90$
                                          0423  35$:
                              10     12   0423        BNEQ    40$                         ; BRANCH IF NON-EMPTY LIST
                                          0425        PRINT   0,<*** List is empty ***>
                            0040     31   0432        BRW     90$
                                          0435  40$:
                   04CF'CF    00     FB   0435        CALLS   #0,W^SHOW_PFN               ; DISPLAY PFN IN R6
                                          043A        PFN_REFERENCE   -
                                          043A        MOVAW   <@SDA$Ax_FLINK[R6],R1>,-
                                          043A                LONG_OPCODE=MOVAL,-
                                          043A                IMAGE=SDA
                                          0454        GETMEM  (R1)
                           15 50     E9   045D        BLBC    R0,90$                      ; SKIP IF ERROR
                                          0460        PFN_REFERENCE   -
                                          0460        MOVZWL  <R1,R6>,-                   ; SKIP TO NEXT ENTRY IN LIST
                                          0460                LONG_OPCODE=MOVL,-
                                          0460                IMAGE=SDA
                              03     13   0470        BEQL    90$                         ; LOOP UNTIL END OF LIST
```

```
           FFC0  31  0472                BRW     40$
                     0475      90$:
     00000000'EF D4  0475                CLRL    HEADING_ROUTINE          ; CLEAR HEADING ROUTINE ADDRESS
                 04  047B                RET
                     047C
                     047C                .DSABL  LSB
```

```
          047C          .SBTTL  PFN_TITLE, DISPLAY PFN HEADING LINE
          047C     ;---
          047C     ;
          047C     ;        PFN_TITLE
          047C     ;
          047C     ;        DISPLAY THE HEADING LINE FOR THE PFN DATA DISPLAY
          047C     ;
          047C     ;---
          047C
          047C          .ENABLE         LOCAL_BLOCK
          047C
          047C     PFN_TITLE:
    0000  047C          .WORD   0
          047E
          047E          SKIP    1
          0487          PFN_DISP_IF_BIGPFN_THEN
          048F
          048F          ;This code executes if the PFN link arrays are longword arrays.
          048F                  PRINT   0,<  PFN       PTE ADDRESS    BAK        REFCNT      FLINK       BL
          049C                  PRINT   0,<  ----      -----------    --------   ------      -----       --
          04A9          PFN_DISP_ELSE
          04AB
          04AB          ;This code executes if the PFN link arrays are word arrays.
          04AB                  PRINT   0,<PFN      PTE ADDRESS    BAK        REFCNT  FLINK BLINK     TY
          04B8                  PRINT   0,<----     -----------    --------   ------  ----- -----     ----
          04C5          PFN_DISP_ENDIF
          04C5
          04C5          ;End of code that depends on size of PFN link arrays
          04C5          SKIP    1
      04  04CE          RET
          04CF
          04CF          .DISABLE        LOCAL_BLOCK
```

```
                              04CF          .SBTTL  SHOW_PFN, SHOW DATA ON A SINGLE PFN ENTRY
                              04CF     ;---
                              04CF     ;
                              04CF     ;        SHOW_PFN
                              04CF     ;
                              04CF     ;        THIS ROUTINE DISPLAYS THE PFN DATA BASE ASSOCIATED
                              04CF     ;        WITH A SINGLE PAGE FRAME NUMBER.
                              04CF     ;
                              04CF     ; INPUTS:
                              04CF     ;
                              04CF     ;        R6 = PAGE FRAME NUMBER
                              04CF     ;
                              04CF     ; OUTPUTS:
                              04CF     ;
                              04CF     ;        THE ENTRY IS DISPLAYED.
                              04CF     ;
                              04CF     ;---
                              04CF            .ENABL  LSB
                              04CF
                              04CF     SHOW_PFN:
                        0000  04CF            .WORD   0
                              04D1
  51     00000044'FF46    9E  04D1            MOVAB   @SDA$AB_STATE[R6],R1     ; GET PFN STATE
                              04D9            GETMEM  (R1)
                 55 50    E9  04E2            BLBC    R0,70$                    ; SKIP IF ERROR
  50     51    03    00    EF  04E5            EXTZV   #PFN$V_LOC,#PFN$S_LOC,R1,R0
             FC64 CF40    7F  04EA            PUSHAQ  LOC_TABLE[R0]             ; ADDRESS OF STRING
                    07    DD  04EF            PUSHL   #7                        ; LENGTH OF STRING
              7E    51    9A  04F1            MOVZBL  R1,-(SP)
  51     00000048'FF46    9E  04F4            MOVAB   @SDA$AB_TYPE[R6],R1      ; GET PFN TYPE
                              04FC            GETMEM  (R1)
                 32 50    E9  0505            BLBC    R0,70$                    ; SKIP IF ERROR
  50     51    03    00    EF  0508            EXTZV   #PFN$V_PAGTYP,#PFN$S_PAGTYP,R1,R0
             FC81 CF40    7F  050D            PUSHAQ  PAGTYP_TABLE[R0]          ; ADDRESS OF STRING
                    07    DD  0512            PUSHL   #7                        ; LENGTH OF STRING
              7E    51    9A  0514            MOVZBL  R1,-(SP)
                              0517            PFN_REFERENCE   -
                              0517            MOVAW   <@SDA$Ax_BLINK[R6],R1>,-
                              0517            LONG_OPCODE=MOVAL,-
                              0517            IMAGE=SDA
                              0531            GETMEM  (R1)
                 33 50    E9  053A     70$:   BLBC    R0,80$                    ; SKIP IF ERROR
                              053D            PFN_REFERENCE   -
                              053D            MOVZWL  <R1,-(SP)>,-              ; BACKWARD LINK
                              053D            LONG_OPCODE=MOVL,-
                              053D            IMAGE=SDA
                              054D            PFN_REFERENCE   -
                              054D            MOVAW   <@SDA$Ax_FLINK[R6],R1>,-
                              054D            LONG_OPCODE=MOVAL,-
                              054D            IMAGE=SDA
                              0567            GETMEM  (R1)
                 7B 50    E9  0570     80$:   BLBC    R0,90$                    ; SKIP IF ERROR
                              0573            PFN_REFERENCE   -
                              0573            MOVZWL  <R1,-(SP)>,-              ; FORWARD LINK
                              0573            LONG_OPCODE=MOVL,-
                              0573            IMAGE=SDA
  51     0000004C'FF46    3E  0583            MOVAW   @SDA$AW_REFCNT[R6],R1
```

```
                                 058B      GETMEM  (R1)
                    57 50   E9   0594      BLBC    R0,90$                 ; SKIP IF ERROR
                    7E 51   3C   0597      MOVZWL  R1,-(SP)               ; REFERENCE COUNT
      51   00000050'FF46    DE   059A      MOVAL   @SDA$AL_BAK[R6],R1
                                 05A2      GETMEM  (R1),-(SP)             ; BACKING STORE ADDRESS
                    3D 50   E9   05AE      BLBC    R0,90$                 ; SKIP IF ERROR
      51   00000054'FF46    DE   05B1      MOVAL   @SDA$AL_PTE[R6],R1
                                 05B9      GETMEM  (R1),-(SP)             ; ADDRESS OF PAGE TABLE ENTRY
                    26 50   E9   05C5      BLBC    R0,90$                 ; SKIP IF ERROR
                       56   DD   05C8      PUSHL   R6                     ; PFN INDEX
                                 05CA      PFN_DISP_IF_BIGPFN_THEN        ; If greater than 32 Mbytes, then use longwo
                                 05D2
                                 05D2      ;This code executes if the PFN link arrays are longword arrays.
                                 05D2              PRINT   12,<!XL      !XL   !XL   !5UW     !XL !XL    !XB !AD      !XB !
                                 05DF      PFN_DISP_ELSE                  ; Otherwise, use word format
                                 05E1
                                 05E1      ;This code executes if the PFN link arrays are word arrays.
                                 05E1              PRINT   12,<!XW      !XL   !XL   !5UW     !XW !XW    !XB !AD      !XB !
                                 05EE      PFN_DISP_ENDIF
                                 05EE
                                 05EE      ;End of code that depends on size of PFN link arrays
                            04   05EE  90$: RET
                                 05EF
                                 05EF      .DSABL  LSB
```

```
                              05EF         .SBTTL  DISPLAY_SPT_RANGE -- DISPLAY SYSTEM PAGE TABLE W/RANGE
                              05EF   ;---
                              05EF   ;
                              05EF   ;         DISPLAY_SPT_RANGE
                              05EF   ;
                              05EF   ;         THIS ROUTINE FORMATS THE ENTIRE CONTENTS OF THE SYSTEM
                              05EF   ;         PAGE TABLE, OR ANY SUBRANGE THEREOF.
                              05EF   ;
                              05EF   ;    INPUTS:
                              05EF   ;
                              05EF   ;         OPTIONS = OPTIONS FLAGS (RANGE OR LENGTH BITS RELEVANT)
                              05EF   ;         ESP     = START OF PAGE TABLE VA
                              05EF   ;                   (OR, IF LENGTH BIT SET)
                              05EF   ;         ESP     = SIZE OF PAGE TABLE VA
                              05EF   ;         ESP+4   = HIGH LIMIT OF PAGE TABLE VA
                              05EF   ;
                              05EF   ;    OUTPUTS:
                              05EF   ;
                              05EF   ;         NONE
                              05EF   ;
                              05EF   ;---
                              05EF
                        003C  05EF   .ENTRY  DISPLAY_SPT_RANGE,^M<R2,R3,R4,R5>
                              05F1
 50   00000000'EF      9E     05F1           MOVAB   OPTIONS, R0                   ; POINT TO OPTIONS WORD
            52   60    D0     05F8           MOVL    (R0), R2
 51   00000000'EF      D0     05FB   3$:     MOVL    ESP, R1                       ; POINT TO EXPRESSION STACK
         07 52   03    E0     0602           BBS     #OPT$V_RANGE, R2, 10$         ; RANGE SPECIFIED
         11 52   04    E0     0606           BBS     #OPT$V_LENGTH, R2, 20$        ; LENGTH SPECIFIED
                 50    D4     060A   5$:     CLRL    R0                            ; SYNTAX ERROR
                 04    04     060C           RET
                              060D
       54    04  A1    D0     060D   10$:    MOVL    4(R1),R4                      ; R4 = LOWEST ADDRESS
     53    61    54    C3     0611           SUBL3   R4,(R1),R3                    ; R3 = SIZE
        05 60    04    E2     0615           BBSS    #OPT$V_LENGTH,(R0),30$        ; SET A SINGLE BIT FOR RANGE
                 03    11     0619           BRB     30$
                              061B
           53    61    7D     061B   20$:    MOVQ    (R1),R3                       ; R4 = LOWEST ADDRESS
                              061E
     54    01FF  8F    AA     061E   30$:    BICW    #^X1FF,R4                     ; ROUND DOWN
 53   000001FF   8F    C0     0623           ADDL2   #^X1FF,R3
 53     53    F7 8F    78     062A           ASHL    #-9,R3,R3                     ; MAKE NUMBER OF ENTRIES
                 0A    11     062F           BRB     DISP                          ; JOIN COMMON CODE
```

```
                              0631        .SBTTL  DISPLAY_SPT     DISPLAY SYSTEM PAGE TABLE
                              0631  ;---
                              0631  ;
                              0631  ;     DISPLAY_SPT
                              0631  ;
                              0631  ;     THIS ROUTINE FORMATS THE ENTIRE CONTENTS OF THE SYSTEM
                              0631  ;     PAGE TABLE.
                              0631  ;
                              0631  ;  INPUTS:
                              0631  ;
                              0631  ;     NONE
                              0631  ;
                              0631  ;  OUTPUTS:
                              0631  ;
                              0631  ;     NONE
                              0631  ;
                              0631  ;---
                              0631        .ENABL  LSB
                              0631
                        003C  0631  .ENTRY  DISPLAY_SPT,^M<R2,R3,R4,R5>
                              0633
    00 00000000'EF    04   E5 0633        BBCC    #OPT$V_LENGTH,OPTIONS,DISP ; CLEAR IT, IF SET BY /ALL
           FB97 CF    00   FB 063B  DISP: CALLS   #0,INIT_PFN              ; SETUP TO READ PFN DATA
                              0640  ;
                              0640  ;     DISPLAY THE SYSTEM PAGE TABLE
                              0640  ;
    7A 00000000'EF    02   E1 0640        BBC     #OPT$V_SYSTEM,OPTIONS,10$ ; BRANCH IF NOT SELECTED
                              0648        SUBHD   <System page table>
                              0655        SKIP    PAGE
                              065C        GETMEM  @MMG$GL_SYSPHD           ; ADDRESS OF SYSPHD
                    03 50  E8 0669        BLBS    R0,5$                    ;Branch if ok...else
                     00C1  31 066C        BRW     90$                      ;...Return
                       51  DD 066F  5$:   PUSHL   R1
        52    00000000'EF  9E 0671        MOVAB   BUFFER,R2
                              0678        GETMEM  PHD$L_P0BR(R1),(R2),#8   ; GET VIRTUAL SBR,SLR
                    03 50  E8 0687        BLBS    R0,6$                    ; OKAY
                     00A3  31 068A        BRW     90$                      ; BRANCH IF ERROR
                       62  DD 068D  6$:   PUSHL   (R2)                     ; STARTING ADDRESS
        55    80000000 8F  D0 068F        MOVL    #^X80000000,R5           ; STARTING ADDRESS BEING MAPPED
    09 00000000'EF    04   E0 0696        BBS     #OPT$V_LENGTH,OPTIONS,7$; IF RANGE NOT SPECIFIED...
  53     04 A2     18  00  EF 069E        EXTZV   #PHD$V_P0LR,#PHD$S_P0LR,4(R2),R3  ; #ENTRIES
                 54    55  D0 06A4        MOVL    R5,R4                    ; STARTING ADDRESS
           55    54    55  C3 06A7  7$:   SUBL3   R5,R4,R5                 ; OFFSET INTO AREA
      55     55    F9  8F  78 06AB        ASHL    #-7,R5,R5                ; TURN INTO NUMBER OF ENTRIES TO SKIP
                 6E    55  C0 06B0        ADDL    R5,(SP)                  ; UPDATE START ENTRY
                 7E    53  7D 06B3        MOVQ    R3,-(SP)                 ; #ENTRIES,START ADDR
              38'AF    04  FB 06B6        CALLS   #4,B^DUMP_PTE            ; FORMAT PAGE TABLE
    00 00000000'EF    04   E5 06BA        BBCC    #OPT$V_LENGTH,OPTIONS,10$ ; CLEAR IT OUT
                              06C2  ;
                              06C2  ;     DISPLAY THE GLOBAL PAGE TABLE
                              06C2  ;
    66 00000000'EF    00   E1 06C2  10$:  BBC     #OPT$V_GLOBAL,OPTIONS,90$ ; BRANCH IF NOT SELECTED
                              06CA        SUBHD   <Global page table>
                              06D7        SKIP    PAGE
                              06DE        GETMEM  @MMG$GL_SYSPHD,-(SP)     ; ADDRESS OF PROCESS HEADER
                              06EE        GETMEM  @MMG$GL_GPTE,R2          ; ADDRESS OF FIRST GPTE
                    2F 50  E9 06FE        BLBC    R0,90$
```

```
                                0701             GETMEM  @MMG$GL_MAXGPTE                ; ADDRESS OF LAST+1 GPTE
                  1F  50    E9  070E             BLBC    R0,90$
                      52    DD  0711             PUSHL   R2                             ; STARTING ADDRESS OF PAGE TABLE
        06 00000000'EF  04  E0  0713             BBS     #OPT$V_LENGTH,OPTIONS,30$ ; IF RANGE NOT SPECIFIED...
             53   51  52    C3  071B             SUBL3   R2,R1,R3                       ; LENGTH OF PAGE TABLE
                      54    D4  071F             CLRL    R4                             ; FIRST PAGETABLE ENTRY
      55    54    F9  8F    78  0721  30$:       ASHL    #-7,R4,R5                      ; TURN INTO NUMBER OF ENTRIES TO SKIP
                  6E  55    C0  0726             ADDL    R5,(SP)                        ; UPDATE START ENTRY
                  7E  53    7D  0729             MOVQ    R3,-(SP)
              38'AF   04    FB  072C             CALLS   #4,B^DUMP_PTE                  ; FORMAT PAGE TABLE
                                0730  90$:
                                0730             STATUS  SUCCESS
                            04  0737             RET
                                0738
                                0738             .DSABL  LSB
```

```
                              0738          .SBTTL  DUMP_PTE -- FORMAT THE PAGE TABLE
                              0738     ;---
                              0738     ;
                              0738     ;        DUMP_PTE
                              0738     ;
                              0738     ;        THIS ROUTINE FORMATS AND PRINTS A SPECIFIED PAGE
                              0738     ;        TABLE GIVEN ITS ADDRESS AND LENGTH.  THE ADDRESS
                              0738     ;        OF THE PROCESS HEADER MUST ALSO BE GIVEN TO ACCESS
                              0738     ;        THE WORKING SET LIST.
                              0738     ;
                              0738     ; INPUTS:
                              0738     ;
                              0738     ;         4(AP)  = ENTRIES OF PAGE TABLE TO DUMP
                              0738     ;         8(AP)  = STARTING ADDRESS OF REGION BEING MAPPED
                              0738     ;        12(AP)  = STARTING ADDRESS OF PAGE TABLE
                              0738     ;        16(AP)  = ADDRESS OF PROCESS HEADER
                              0738     ;
                              0738     ;        ASSUMES THAT INIT_PFN HAS ALREADY BEEN CALLED.
                              0738     ;
                              0738     ; OUTPUTS:
                              0738     ;
                              0738     ;        THE PAGE TABLE IS FORMATTED AND PRINTED.
                              0738     ;
                              0738     ;---
                              0738
               00000060       0738     SCRATCH_SIZE    = 24*4                          ; 24 LONGWORDS
                              0738
                   07FC       0738     .ENTRY  DUMP_PTE,^M<R2,R3,R4,R5,R6,R7,R8,R9,R10>
                              073A
                              073A             .ENABL  LSB
                              073A
        0A0B'CF    00    FB   073A             CALLS   #0,W^PTE_TITLE          ; PRINT SUB-HEADING LINE
00000000'EF   0A0B'CF    9E   073F             MOVAB   W^PTE_TITLE,HEADING_ROUTINE     ; SET HEADING ROUTINE
                   59    7C   0748             CLRQ    R9                      ; INITIALIZE STATE TO NORMAL
                04 AC    D5   074A             TSTL    4(AP)                   ; CHECK IF ANY TO DUMP
                   01    14   074D             BGTR    10$                     ; BRANCH IF SO
                         04   074F             RET
                              0750     10$:
        5E    A0 AE      9E   0750             MOVAB   -SCRATCH_SIZE(SP),SP    ; RESERVE SPACE FOR FAO PARAMS
            52    5E     D0   0754             MOVL    SP,R2                   ; R2 USED TO STORE PARAMS
                              0757     ;
                              0757     ;       FORMAT THE PAGE TABLE ENTRY
                              0757     ;
        82    08 AC      D0   0757             MOVL    8(AP),(R2)+             ; MAPPING ADDRESS
        82    0C AC      D0   075B             MOVL    12(AP),(R2)+            ; VIRTUAL ADDRESS OF ENTRY
                              075F             TRYMEM  @12(AP)                 ; GET PAGE TABLE ENTRY
             09 50       E8   0769             BLBS    R0,20$                  ; IF ENTRY FOUND
          50    01       D0   076C             MOVL    #1,R0
                02D2     30   076F             BSBW    PTE_STATE               ; SET STATE = 1 (INVALID MEMORY)
                0271     31   0772             BRW     80$                     ; AND SKIP THIS ENTRY
                              0775     20$:
          53    51       D0   0775             MOVL    R1,R3                   ; SAVE PTE IN R3
                09       12   0778             BNEQ    30$                     ; BRANCH IF NOT NULL PAGE
          50    02       D0   077A             MOVL    #2,R0
                02C4     30   077D             BSBW    PTE_STATE               ; SET STATE = 2 (NULL PAGES)
                0263     31   0780             BRW     80$                     ; AND SKIP THIS ENTRY
                              0783     30$:
```

```
             50   D4  0783            CLRL    R0
           02BC   30  0785            BSBW    PTE_STATE                       ; SET STATE TO NORMAL
                      0788
 58   53   15     00  EF  0788        EXTZV   #PTE$V_PFN,#PTE$S_PFN,R3,R8   ; GET PFN IF PRESENT
           54     05  D0  078D        MOVL    #5,R4                         ; TYPE CODE FOR VALID
           82     53  D0  0790        MOVL    R3,(R2)+                      ; STORE PTE IN FAO LIST
           18     18  0793            BGEQ    32$                           ; BRANCH IF NOT VALID
  00000000'EF     58  D1  0795        CMPL    R8,PHYS_PAGES                 ; CHECK IF LEGAL
           0B     18  079C            BGEQ    31$                           ; BRANCH IF INVALID PFN
  00000040'EF     58  D1  079E        CMPL    R8,SDA$GL_MAXPFN              ; CHECK IF WITHIN PFN DATABASE
           1D     1A  07A5            BGTRU   36$                           ; BYPASS PFN LOOKUP IF SO
           1E     11  07A7            BRB     40$                           ; GOOD PFN
                      07A9        31$:
           54     D6  07A9            INCL    R4                            ; TYPE CODE FOR I/O PAGE
           17     11  07AB            BRB     36$                           ; AND INDICATE INVALID PFN
                      07AD        32$:
 54   53   01     16  EF  07AD        EXTZV   #PTE$V_TYP0,#1,R3,R4          ; BRING TYP0 AND TYP1
        03 53     1A  E1  07B2        BBC     #PTE$V_TYP1,R3,34$            ; TOGETHER
           54     02  C8  07B6        BISL    #2,R4                         ; SET HIGH ORDER BIT
                      07B9        34$:
           54     D5  07B9            TSTL    R4                            ; 0 = TRANSITION OR DZERO
           07     12  07BB            BNEQ    36$                           ; BRANCH IF NOT
           58     D5  07BD            TSTL    R8                            ; PFN SHOULD BE 0 FOR DZERO
           06     12  07BF            BNEQ    40$                           ; BRANCH IF TRANSITION
           54     04  D0  07C1        MOVL    #4,R4                         ; TYPE CODE FOR DZERO
                      07C4        36$:
           58     01  CE  07C4        MNEGL   #1,R8                         ; INDICATE NO PFN
                      07C7        ;
                      07C7        ;       R3 = PTE LONGWORD
                      07C7        ;       R4 = PTE TYPE CODE
                      07C7        ;       R8 = PFN OR -1 IF NONE
                      07C7        ;
                      07C7        40$:
           54     05  C4  07C7        MULL2   #5,R4                         ; INDEX INTO TYPE TABLE
           82     05  D0  07CA        MOVL    #5,(R2)+                      ; LENGTH OF STRING
      82   F959 CF44  9E  07CD        MOVAB   TYPE_TABLE[R4],(R2)+          ; ADDRESS OF STRING
                  56  7C  07D3        CLRQ    R6                            ; ASSUME MODIFY/LOCK BITS OFF
        4C 53     1F  E1  07D5        BBC     #PTE$V_VALID,R3,45$           ; BRANCH IF NOT VALID
 57   53   01     1A  EF  07D9        EXTZV   #PTE$V_MODIFY,#1,R3,R7        ; GET MODIFY BIT FROM PTE
        43 58     1F  E0  07DE        BBS     #31,R8,45$                    ; BRANCH IF NO PFN
     3E 08 AC     1F  E0  07E2        BBS     #31,8(AP),45$                 ; BRANCH IF SPT
                      07E7                PFN_REFERENCE    -
                      07E7            MOVAW   <@SDA$Ax_WSLX[R8],R1>,-      ; ADDRESS OF WSLX FIELD
                      07E7                LONG_OPCODE=MOVAL,-
                      07E7                IMAGE=SDA
                      0801            GETMEM  (R1)                          ; GET LONGWORD
        18 50         E9  080A        BLBC    R0,45$                        ; IF NOT FOUND
           51     51  32  080D        CVTWL   R1,R1                         ; EXTEND FIELD
           13     13  0810            BEQL    45$                           ; BRANCH IF NOT A WSL INDEX
      51   10 BC41    DE  0812        MOVAL   @16(AP)[R1],R1                ; ADDRESS OF WSL ENTRY
                      0817            GETMEM  (R1)                          ; GET WSL LONGWORD
 56   51   01     05  EF  0820        EXTZV   #WSL$V_WSLOCK,#1,R1,R6        ; WSL LOCK BIT
                      0825        45$:
 51   53   04     1B  EF  0825        EXTZV   #PTE$V_PROT,#PTE$S_PROT,R3,R1    ; GET PROTECTION CODE
           82     04  D0  082A        MOVL    #4,(R2)+                      ; LENGTH OF STRING
      82   F8B5 CF41  DE  082D        MOVAL   PROT_TABLE[R1],(R2)+          ; PAGE PROTECTION
           82     01  D0  0833        MOVL    #1,(R2)+                      ; SIZE OF MODIFY STRING
      82   F998 CF47   9E  0836            MOVAB   MODIFY_TABLE[R7],(R2)+    ; ADDRESS OF STRING
             82   01   D0  083C            MOVL    #1,(R2)+                  ; SIZE OF WSLOCK STRING
      82   F991 CF46   9E  083F            MOVAB   WSLOCK_TABLE[R6],(R2)+    ; ADDRESS OF STRING
  51    53   02   17   EF  0845            EXTZV   #PTE$V_OWN,#PTE$S_OWN,R3,R1   ; GET PAGE OWNER
             82   01   D0  084A            MOVL    #1,(R2)+                  ; LENGTH OF STRING
      82   F8D5 CF41   9E  084D            MOVAB   OWNER_TABLE[R1],(R2)+     ; ADDRESS OF STRING
          24 58   1F   E1  0853            BBC     #31,R8,50$                ; BRANCH IF PFN VALID
                           0857            $FAOL_S PTECTL1,LIST+RAB$W_RSZ,LINE_DESCR,-SCRATCH_SIZE(FP)
   00000000'EF    00   FB  0871            CALLS   #0,PUT_LINE               ; OUTPUT LINE
                016B   31  0878            BRW     80$                       ; SKIP TO NEXT ENTRY
                           087B        ;
                           087B        ;       FORMAT THE PFN STRUCTURES ASSOCIATED WITH THIS PTE
                           087B        ;
                           087B    50$:
  51     00000048'FF48     9E  087B            MOVAB   @SDA$AB_TYPE[R8],R1
                           0883            GETMEM  (R1)
               5B 50       E9  088C            BLBC    R0,70$                    ; SKIP IF ERROR
  51    51   03   00   EF  088F            EXTZV   #PFN$V_PAGTYP,#PFN$S_PAGTYP,R1,R1   ; GET PAGE TYPE
             82   07   D0  0894            MOVL    #7,(R2)+                  ; LENGTH OF STRING
      82   F8F7 CF41   7E  0897            MOVAQ   PAGTYP_TABLE[R1],(R2)+    ; ADDRESS OF STRING
  51     00000044'FF48     9E  089D            MOVAB   @SDA$AB_STATE[R8],R1
                           08A5            GETMEM  (R1)
               39 50       E9  08AE            BLBC    R0,70$                    ; SKIP IF ERROR
  51    51   03   00   EF  08B1            EXTZV   #PFN$V_LOC,#PFN$S_LOC,R1,R1       ; GET PAGE LOCATION
             82   07   D0  08B6            MOVL    #7,(R2)+                  ; LENGTH OF STRING
      82   F895 CF41   7E  08B9            MOVAQ   LOC_TABLE[R1],(R2)+       ; ADDRESS OF STRING
  51     00000044'FF48     9E  08BF            MOVAB   @SDA$AB_STATE[R8],R1
                           08C7            GETMEM  (R1)                      ; GET STATE FIELD
               17 50       E9  08D0            BLBC    R0,70$                    ; SKIP IF ERROR
             82   51       9A  08D3            MOVZBL  R1,(R2)+
  51     00000048'FF48     9E  08D6            MOVAB   @SDA$AB_TYPE[R8],R1
                           08DE            GETMEM  (R1)                      ; GET TYPE FIELD
               03 50       E8  08E7            BLBS    R0,71$
                00F9       31  08EA    70$:    BRW     80$                       ; SKIP IF ERROR
             82   51       9A  08ED    71$:    MOVZBL  R1,(R2)+
  51     0000004C'FF48     3E  08F0            MOVAW   @SDA$AW_REFCNT[R8],R1
                           08F8            GETMEM  (R1)                      ; COUNT OF PAGE REFERENCES
               E6 50       E9  0901            BLBC    R0,70$                    ; SKIP IF ERROR
             82   51       3C  0904            MOVZWL  R1,(R2)+
  51     00000050'FF48     DE  0907            MOVAL   @SDA$AL_BAK[R8],R1
                           090F            GETMEM  (R1)                      ; BACKING STORE ADDRESS
               CF 50       E9  0918            BLBC    R0,70$                    ; SKIP IF ERROR
             82   51       D0  091B            MOVL    R1,(R2)+
  51     00000054'FF48     DE  091E            MOVAL   @SDA$AL_PTE[R8],R1
                           0926            GETMEM  (R1)                      ; ADDRESS OF PTE
               B8 50       E9  092F            BLBC    R0,70$                    ; SKIP IF ERROR
             82   51       D0  0932            MOVL    R1,(R2)+
                           0935                    PFN_REFERENCE   -
                           0935            MOVAW   <@SDA$Ax_FLINK[R8],R1>,-
                           0935                    LONG_OPCODE=MOVAL,-
                           0935                    IMAGE=SDA
                           094F            GETMEM  (R1)                      ; FORWARD PAGE LIST LINK
               8F 50       E9  0958            BLBC    R0,70$                    ; SKIP IF ERROR
                           095B                    PFN_REFERENCE   -
                           095B            MOVZWL  <R1,(R2)+>,-
                           095B                    LONG_OPCODE=MOVL,-
                           095B                    IMAGE=SDA
```

```
                          096B               PFN_REFERENCE   -
                          096B       MOVAW   <@SDA$Ax_BLINK[R8],R1>,-
                          096B               LONG_OPCODE=MOVAL,-
                          096B               IMAGE=SDA
                          0985       GETMEM  (R1)                       ; BACKWARD PAGE LIST LINK
           55 50    E9    098E       BLBC    R0,80$                     ; SKIP IF ERROR
                          0991               PFN_REFERENCE   -
                          0991       MOVZWL  <R1,(R2)+>,-
                          0991               LONG_OPCODE=MOVL,-
                          0991               IMAGE=SDA
                          09A1                                          ; For larger than 32 Mbytes, use longword fo
                          09A1       PFN_DISP_IF_BIGPFN_THEN            END_BIGPFN_CODE=74$
                          09A9
                          09A9       ;This code executes if the PFN link arrays are longword arrays.
                          09A9               $FAOL_S PTECTL2_LONG,LIST+RAB$W_RSZ,LINE_DESCR,-SCRATCH_SIZE(FP)
                          09C3                                          ; Otherwise, use word format
                          09C3       PFN_DISP_ELSE                      ELSE_CODE=74$ , COMMON_CODE=77$
                          09C5
                          09C5       ;This code executes if the PFN link arrays are word arrays.
                          09C5               $FAOL_S PTECTL2_WORD,LIST+RAB$W_RSZ,LINE_DESCR,-SCRATCH_SIZE(FP)
                          09DF       PFN_DISP_ENDIF          COMMON_CODE=77$
                          09DF
                          09DF       ;End of code that depends on size of PFN link arrays
 00000000'EF     00    FB 09DF       CALLS   #0,PUT_LINE                ; OUTPUT LINE
                          09E6   ;
                          09E6       SKIP TO NEXT PAGE TABLE ENTRY
                          09E6   ;
                          09E6   80$:
      5E    60 AE      9E 09E6       MOVAB   SCRATCH_SIZE(SP),SP        ; DEALLOCATE FAO SPACE
         0C AC   04    C0 09EA       ADDL2   #4,12(AP)                  ; NEXT PTE
08 AC  00000200 8F     C0 09EE       ADDL2   #512,8(AP)                 ; INCREMENT MAPPING ADDRESS
            04 AC      D7 09F6       DECL    4(AP)                      ; DECREMENT REPEAT COUNT
               03      15 09F9       BLEQ    90$                        ; EXIT IF DONE
             FD52      31 09FB       BRW     10$
                          09FE   90$:
               50      D4 09FE       CLRL    R0
             0041      30 0A00       BSBW    PTE_STATE                  ; TERMINATE CURRENT STATE
                          0A03       STATUS  SUCCESS
                       04 0A0A       RET
                          0A0B
                          0A0B       .DSABL  LSB
                          0A0B
                          0A0B   ;
                          0A0B       SUBROUTINE TO PRINT THE SUB-HEADING LINE
                          0A0B   ;
                          0A0B
                          0A0B       .ENABLE         LOCAL_BLOCK
                          0A0B
                          0A0B   PTE_TITLE:
                     0000 0A0B       .WORD   0
                          0A0D
                          0A0D       SKIP    1
                          0A16       PFN_DISP_IF_BIGPFN_THEN            ; For larger than 32 Mbytes, use longword fo
                          0A1E
                          0A1E       ;This code executes if the PFN link arrays are longword arrays.
                          0A1E               PRINT   0,-
                          0A1E               <!_ ADDRESS        SVAPTE    PTE      TYPE  PROT  BITS PAGTYP    LOC S
         0A2B        PFN_DISP_ELSE                   ; Otherwise, use word format
         0A2D
         0A2D        ;This code executes if the PFN link arrays are word arrays.
         0A2D                PRINT   0,-
         0A2D                <!  ADDRESS         SVAPTE     PTE       TYPE  PROT  BITS PAGTYP     LOC S
         0A3A        PFN_DISP_ENDIF
         0A3A
         0A3A        ;End of code that depends on size of PFN link arrays
         0A3A        SKIP    1
    04   0A43        RET
         0A44
         0A44        .DISABLE        LOCAL_BLOCK
```

```
                      0A44   813          .SBTTL  PTE_STATE        SET STATE OF PTE DISPLAY
                      0A44   814 ;---
                      0A44   815 ;
                      0A44   816 ;        PTE_STATE
                      0A44   817 ;
                      0A44   818 ;        SET STATE OF RUNNING SCAN OF PAGE TABLE AND PRINT ANY
                      0A44   819 ;        STATUS MESSAGES FROM THE PREVIOUS STATE.
                      0A44   820 ;
                      0A44   821 ;   INPUTS:
                      0A44   822 ;
                      0A44   823 ;        R0  =   REQUESTED NEW STATE
                      0A44   824 ;        R9  =   CURRENT STATE
                      0A44   825 ;        R10 =   REPITITION COUNT IN SAME STATE
                      0A44   826 ;
                      0A44   827 ;   OUTPUTS:
                      0A44   828 ;
                      0A44   829 ;        R9  =   NEW STATE
                      0A44   830 ;        R10 =   UPDATED REPITITION COUNT
                      0A44   831 ;
                      0A44   832 ;---
                      0A44   833
                      0A44   834          .ENABL  LSB
                      0A44   835
                      0A44   836 PTE_STATE:
   59     50    D1    0A44   837          CMPL    R0,R9                   ; CHECK IF ALREADY IN STATE
          03    12    0A47   838          BNEQ    10$                     ; BRANCH IF NOT
          5A    D6    0A49   839          INCL    R10                     ; INCREMENT REPITITION COUNT
                05    0A4B   840          RSB
                      0A4C   841 10$:
          50    DD    0A4C   842          PUSHL   R0                      ; SAVE NEW STATE
   01     59    D1    0A4E   843          CMPL    R9,#1                   ; CHECK IF BYPASSING BAD MEMORY
          23    12    0A51   844          BNEQ    20$                     ; BRANCH IF NOT
                      0A53   845          SKIP    1
          5A    DD    0A5C   846          PUSHL   R10
                      0A5E   847          PRINT   1,<!_-------- !UL ENTRIES NOT IN MEMORY>
                      0A6B   848          SKIP    1
          26    11    0A74   849          BRB     80$
                      0A76   850 20$:
   02     59    D1    0A76   851          CMPL    R9,#2                   ; CHECK IF SKIPPING NULL PAGES
          21    12    0A79   852          BNEQ    80$                     ; BRANCH IF NOT
                      0A7B   853          SKIP    1
          5A    DD    0A84   854          PUSHL   R10
                      0A86   855          PRINT   1,<!_-------- !UL NULL PAGE!%S>
                      0A93   856          SKIP    1
                      0A9C   857 80$:
          59  8ED0    0A9C   858          POPL    R9                      ; SET NEW STATE
   5A     01    D0    0A9F   859          MOVL    #1,R10                  ; INITIALIZE REPITITION COUNTER
                05    0AA2   860          RSB
                      0AA3   861
                      0AA3   862          .DSABL  LSB
```

```
                                          0AA3   864
                                          0AA3   865          .END
```

```
ARGS                = 00000001              PTE$S_PFN           = 00000015
BUFFER                00000000 R    02      PTE$S_PROT          = 00000004
DISP                  0000063B R    03      PTE$V_MODIFY        = 0000001A
DISPLAY_PFN           0000028E RG   03      PTE$V_OWN           = 00000017
DISPLAY_SPT           00000631 RG   03      PTE$V_PFN           = 00000000
DISPLAY_SPT_RANGE     000005EF RG   03      PTE$V_PROT          = 0000001B
DUMP_PTE              00000738 RG   03      PTE$V_TYP0          = 00000016
ESP                   ********   X  03      PTE$V_TYP1          = 0000001A
GETMEM                ********   X  03      PTE$V_VALID         = 0000001F
HEADING_ROUTINE       ********   X  03      PTECTL1               00000000 R    03
INIT_PFN              000001D7 RG   03      PTECTL2_LONG          0000008B R    03
LINE_DESCR            ********   X  03      PTECTL2_WORD          0000002F R    03
LIST                  ********   X  03      PTE_STATE             00000A44 R    03
LOC_TABLE             00000153 R    03      PTE_TITLE             00000A0B R    03
MMG$GL_GPTE           ********   X  03      PUT_LINE              ********   X  03
MMG$GL_MAXGPTE        ********   X  03      RAB$W_RSZ             ********   X  03
MMG$GL_MAXPFN         ********   X  03      REQMEM                ********   X  03
MMG$GL_SYSPHD         ********   X  03      SCH$GL_FREECNT        ********   X  03
MMG$GW_BIGPFN       = 00000042 R    02      SCRATCH_SIZE        = 00000060
MODIFY_TABLE          000001D3 R    03      SDA$AB_STATE          00000044 R    02
MSG$_SUCCESS          ********   X  03      SDA$AB_TYPE           00000048 R    02
NEW_PAGE              ********   X  03      SDA$AL_BAK            00000050 R    02
OPT$V_BAD           = 00000002              SDA$AL_PTE            00000054 R    02
OPT$V_FREE          = 00000000              SDA$AW_REFCNT         0000004C R    02
OPT$V_GLOBAL        = 00000000              SDA$AX_BLINK          0000005C R    02
OPT$V_LENGTH        = 00000004              SDA$AX_FLINK          00000058 R    02
OPT$V_MODIFIED      = 00000001              SDA$AX_WSLX           00000060 R    02
OPT$V_RANGE         = 00000003              SDA$GL_MAXPFN         00000040 R    02
OPT$V_SINGLEPFN     = 00000004              SET_HEADING           ********   X  03
OPT$V_SYSTEM        = 00000002              SHOW_PFN              000004CF R    03
OPT$V_WHOLEPFN      = 00000003              SHOW_PFN_LIST         000003A3 R    03
OPTIONS               ********   X  03      SKIP_LINES            ********   X  03
OWNER_TABLE           00000127 R    03      SYS$FAOL              ********  GX  03
PAGTYP_TABLE          00000193 R    03      TPA$L_NUMBER        = 0000001C
PFN$AB_STATE          ********   X  03      TRYMEM                ********   X  03
PFN$AB_TYPE           ********   X  03      TYPE_TABLE            0000012B R    03
PFN$AL_BAK            ********   X  03      WSL$V_WSLOCK        = 00000005
PFN$AL_HEAD           ********   X  03      WSLOCK_TABLE          000001D5 R    03
PFN$AL_HILIMIT        ********   X  03
PFN$AL_LOLIMIT        ********   X  03
PFN$AL_PTE            ********   X  03
PFN$AW_REFCNT         ********   X  03
PFN$AX_BLINK          ********   X  03
PFN$AX_FLINK          ********   X  03
PFN$AX_WSLX           ********   X  03
PFN$S_LOC           = 00000003
PFN$S_PAGTYP        = 00000003
PFN$V_LOC           = 00000000
PFN$V_PAGTYP        = 00000000
PFN_TITLE             0000047C R    03
PHD$L_P0BR          = 000000C8
PHD$S_P0LR          = 00000018
PHD$V_P0LR          = 00000000
PHYS_PAGES            ********   X  03
PRINT                 ********   X  03
PROT_TABLE            000000E7 R    03
PTE$S_OWN           = 00000002
```

```
                                             +----------------+
                                             ! Psect synopsis !
                                             +----------------+

PSECT name                      Allocation          PSECT No.  Attributes
----------                      ----------          ---------  ----------
.  ABS  .                       00000000  (     0.)  00 (  0.)  NOPIC   USR   CON   ABS   LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
$ABS$                           00000000  (     0.)  01 (  1.)  NOPIC   USR   CON   ABS   LCL NOSHR   EXE   RD     WRT NOVEC BYTE
SDADATA                         00000064  (   100.)  02 (  2.)  NOPIC   USR   CON   REL   LCL NOSHR NOEXE   RD     WRT NOVEC BYTE
MMG                             00000AA3  (  2723.)  03 (  3.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC BYTE
LITERALS                        00000462  (  1122.)  04 (  4.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC BYTE

                                           +------------------------+
                                           ! Performance indicators !
                                           +------------------------+

Phase                     Page faults   CPU Time       Elapsed Time
-----                     -----------   --------       ------------
Initialization                     30   00:00:00.03    00:00:01.48
Command processing                112   00:00:00.43    00:00:03.01
Pass 1                            353   00:00:07.85    00:00:26.11
Symbol table sort                   0   00:00:00.97    00:00:05.81
Pass 2                            163   00:00:02.21    00:00:09.83
Symbol table output                11   00:00:00.06    00:00:00.33
Psect synopsis output               3   00:00:00.02    00:00:00.02
Cross-reference output              0   00:00:00.00    00:00:00.00
Assembler run totals              674   00:00:11.57    00:00:46.59

The working set limit was 1500 pages.
76303 bytes (150 pages) of virtual memory were used to buffer the intermediate code.
There were 50 pages of symbol table space allocated to hold 875 non-local and 96 local symbols.
865 source lines were read in Pass 1, producing 41 object records in Pass 2.
31 pages of virtual memory were used to define 29 macros.

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

Macro library name                        Macros defined
------------------                        --------------
_$255$DUA28:[SDA.OBJ]SDALIB.MLB;1                   9
_$255$DUA28:[SYS.OBJ]LIB.MLB;1                      9
_$255$DUA28:[SYSLIB]STARLET.MLB;2                   8
TOTALS (all libraries)                             26

1055 GETS were required to define 26 macros.

There were no errors, warnings or information messages.

MACRO/LIS=LIS$:MMG/OBJ=OBJ$:MMG MSRC$:MMG/UPDATE=(ENH$:MMG)+EXECML$/LIB+LIB$:SDALIB/LIB
```

0352 AH-BT13A-SE
VAX/VMS V4.0

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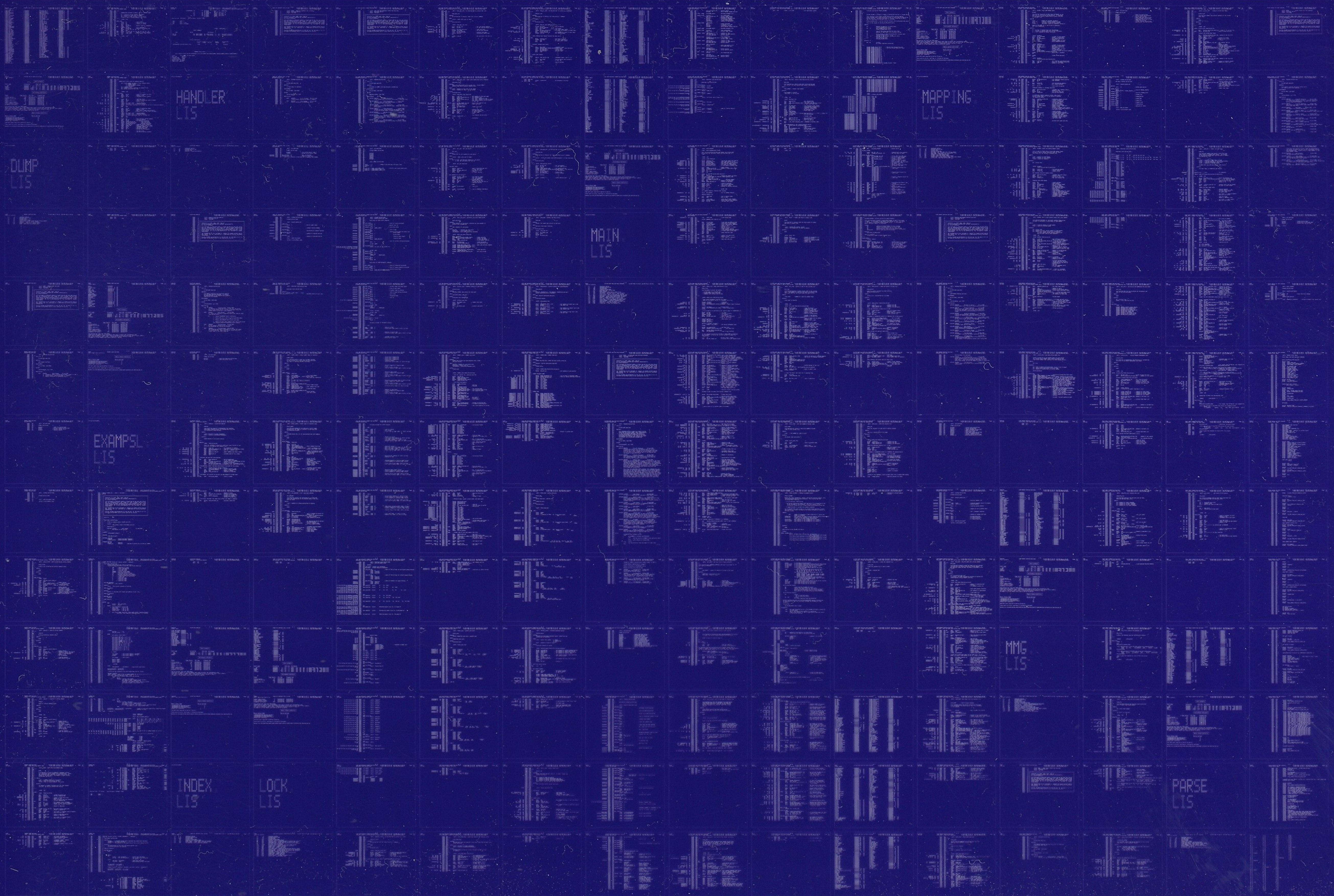

HANDLER
LIS

MAPPING
LIS

DUMP
LIS

MAIN
LIS

EXAMPSL
LIS

MMG
LIS

INDEX
LIS

LOCK
LIS

PARSE
LIS