





(1)	50	DECLARATIONS
(2)	79	PURGWS - Purge Working Set
(4)	206	PURGWSSCN - Scan Working Set to Purge Pages

```

0000 1      .TITLE SYSPURGWS - Purge Working Set System Service
0000 2      .IDENT 'V04-000'
0000 3      :
0000 4      :*****
0000 5      :
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0000 23     :
0000 24     :*****
0000 25     :
0000 26     :
0000 27     :++
0000 28     : FACILITY:
0000 29     :
0000 30     : ABSTRACT:
0000 31     :
0000 32     : ENVIRONMENT:
0000 33     :
0000 34     : AUTHOR: PETER H. LIPMAN      , CREATION DATE: 22-MAY-78
0000 35     :
0000 36     : MODIFIED BY:
0000 37     :
0000 38     : V03-003 TCM0001      Trudy C. Matthews      1-Apr-1983
0000 39     : Change references to working set fields in PHD so that
0000 40     : they are used as unsigned words.
0000 41     :
0000 42     : V03-002 WMC0001      Wayne Cardoza      10-Mar-1983
0000 43     : Change use of MMG$RECOM2 to individual calls.
0000 44     :
0000 45     : V03-001 LJK0194      Lawrence J. Kenah      31-Jan-1983
0000 46     : Insure that simplifying assumption remains valid while
0000 47     : removing global pages from working set.
0000 48     :--

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0000 50      .SBTTL  DECLARATIONS
0000 51      :
0000 52      : INCLUDE FILES:
0000 53      :
0000 54      $IPLDEF      ;Processor priority levels
0000 55      $MMGDEF     ; Offsets from FP into scratch area
0000 56      $PCBDEF     ;Process control block definitions
0000 57      $PFNDEF     ;Page frame number data base definitions
0000 58      $PHDDEF     ;Process header definitions
0000 59      $PRDEF      ;Processor register definitions
0000 60      $PSLDEF     ;Processor status long word definitions
0000 61      $PTEDEF     ;Page table entry definitions
0000 62      $SSDEF      ;System status code definitions
0000 63      $WSLDEF     ;Working set list definitions
0000 64      :
0000 65      : MACROS:
0000 66      :
0000 67      :
0000 68      :
0000 69      : EQUATED SYMBOLS:
0000 70      :
0000 71      : Offset from AP
0000 72      :
00000004 0000 73      INADR      = 4      ;Offset to input range
0000 74      :
0000 75      : OWN STORAGE:
0000 76      :
0000 77      .LIST  MEB

```

```

0000 79      .SBTTL  PURGWS - Purge Working Set
0000 80      :++
0000 81      : FUNCTIONAL DESCRIPTION:
0000 82      :
0000 83      :
0000 84      : CALLING SEQUENCE:
0000 85      :
0000 86      :     CALLG  ARGLIST,G^SYSSPURGWS
0000 87      :
0000 88      :
0000 89      : INPUT PARAMETERS:
0000 90      :
0000 91      :     INADR(AP) = Address of 2 long words the 1st of which specifies
0000 92      :                 the starting virtual address to purge, the 2nd specifies
0000 93      :                 the ending virtual address to purge (inclusive).
0000 94      :
0000 95      : IMPLICIT INPUTS:
0000 96      :     NONE
0000 97      :
0000 98      : OUTPUT PARAMETERS:
0000 99      :
0000 100     :     R0 = System status code
0000 101     :
0000 102     : IMPLICIT OUTPUTS:
0000 103     :
0000 104     :     NONE
0000 105     :
0000 106     : COMPLETION CODES:
0000 107     :
0000 108     :     SSS_NORMAL           ;Successful completion
0000 109     :     SSS_ACCVIO         ;Access violation
0000 110     :
0000 111     : SIDE EFFECTS:
0000 112     :     NONE
0000 113     :
0000 114     :--
0000 115     :
0000 116     :*****
0000 117     :
0000 118     :***** THE FOLLOWING CODE MAY BE PAGED *****
0000 119     :
0000 120     :.PSECT  YSEXEPAGED
0000 121     :
0000 122     :*****
0000 123     :
0000 124     :.ENTRY  EXESPURGWS,^M<R2,R3,R4,R5,R6,R7,R8>
0000 125     :
0000 126     :MOVAB  B^MMG$PURGWSPAG,R6      ;Address of purge subroutine
0000 127     :SUBL   S^#-MMG$C_LENGTH,SP   ;Reserve scratch area
0000 128     :MOVL  INADR(AP),R2          ;Get address range parameter
0000 129     :BEQL  20$                  ;Branch if none specified
0000 130     :IFNORD #8,(R2),20$        ;Branch if not readable by caller
0000 131     :PROBER #0,#8,(R2)
0000 132     :BEQL  20$
0000 133     :MOVQ  (R2),R2                ;R2 = STARTVA, R3 = ENDVA
0000 134     :CLRL  B^MMG$S_SAVRETADR(FP) ;Init return range
0000 135     :CLRL  B^MMG$S_CALLEDIPL(FP) ;Init called IPL

```

```

00000000 120
00000000 121
00000000 122
00000000 123
01FC 0000 124
0002 125
56 3B AF 9E 0002 126
SE 1C C2 0006 127
52 04 AC D0 0009 128
28 13 000D 129
000F 130
62 08 00 0C 000F 130
22 13 0013
52 62 7D 0015 131
F4 AD D4 0018 132
F8 AD D4 0018 133

```

```

02 50 DC 001E 134      MOVPSL R0          ;Get Processor Status
FC AD 16 EF 0020 135      EXTZV  #PSLSV PRVMOD,#PSLSS PRVMOD,- ;Set access mode
      50      0023 136      RO,B^MMGSL MAXACMODE(FP) ;from caller's mode
      0026 137      SETIPL #IPLS_ASTDEL ;Raise to ASTDEL
12 02 DA 0026 138      MTPR - #IPLS_ASTDEL,S^#PRS IPL
      FFD4' 30 0029 138      BSBW  MMG$CREDEL ;Common code for range handling
      50 DD 002C 139      PUSHL R0
      FFCE' 30 002E 140      BSBW  MMG$RETRANGE
02 50 E9 0031 141      BLBC  RO,10$
      50 BA 0034 142      POPR  R0
      04 0036 143 10$:      RET ;Exit from service
      0037 144      :
      0037 145      : No input address range was specified, or the caller could not read it.
      0037 146      :
50 0C 3C 0037 147 20$:      MOVZWL #SS$_ACCVIO,R0 ;Return error if no input range
      04 003A 148      RET

```

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003B 150 :++
003B 151 : FUNCTIONAL DESCRIPTION:
003B 152 :
003B 153 :
003B 154 : CALLING SEQUENCE:
003B 155 :
003B 156 :     BSBW     MMG$PURGWSPAG
003B 157 :
003B 158 :
003B 159 : INPUT PARAMETERS:
003B 160 :
003B 161 :     R0 = ACCESS MODE TO CHECK AGAINST PAGE OWNER
003B 162 :     R2 = VIRTUAL ADDRESS (LOW 9 BITS = 0)
003B 163 :     R4 = PCB ADDRESS
003B 164 :     R5 = PROCESS HEADER ADDRESS - P1 OR SYSTEM SPACE
003B 165 :     R6 = COUNT - 1 OF PAGES REMAINING TO BE DELETED INCLUDING THIS ONE
003B 166 :     R7 = +^X200 IF GOING FORWARD IN ADDRESS SPACE
003B 167 :         = -^X200 IF GOING BACKWARDS IN ADDRESS SPACE
003B 168 :     IPL = ASTLVL
003B 169 :
003B 170 : IMPLICIT INPUTS:
003B 171 :     NONE
003B 172 :
003B 173 : OUTPUT PARAMETERS:
003B 174 :
003B 175 :     R0 = STATUS CODE
003B 176 :     R2 = Address of last page processed
003B 177 :     R6 = Count of pages remaining ( - 1) to process
003B 178 :
003B 179 : IMPLICIT OUTPUTS:
003B 180 :     NONE
003B 181 :
003B 182 : COMPLETION CODES:
003B 183 :
003B 184 :     SSS_NORMAL                ;SUCCESSFUL RETURN
003B 185 :
003B 186 : SIDE EFFECTS:
003B 187 :     NONE
003B 188 :
003B 189 : --
003B 190 :
003B 191 : *****
003B 192 : *****
003B 193 : ***** THE FOLLOWING CODE MAY BE PAGED *****
003B 194 : *****
0000003B 195 :     .PSECT Y$EXEPAGED
003B 196 : *****
003B 197 : *****
003B 198 :
MMG$PURGWSPAG:
003B 200 :     MOVL     #1,R8                ;Purging general pages
003B 201 :     JSB     MMG$PURGWSSCN        ;Scan working set to purge the pages
003B 202 :     CLRL    R6                    ;End of range
003B 203 :     MOVZWL  #SS$_NORMAL,R0       ;Successful completion
003B 204 :     RSB

```

```

58 01 D0
00000003'EF 16
56 D4
50 01 3C
05 0049

```



```
004A 206 .SBTTL PURGWSSCN - Scan Working Set to Purge Pages
004A 207 :++
004A 208 : FUNCTIONAL DESCRIPTION:
004A 209 :
004A 210 : This routine is called to do a scan of the working set list
004A 211 : for pages in the specified virtual address range and delete those
004A 212 : pages from the working set list.
004A 213 :
004A 214 : CALLING SEQUENCE:
004A 215 :
004A 216 : BSBW MMG$PURGWSSCN
004A 217 :
004A 218 : INPUT PARAMETERS:
004A 219 :
004A 220 : R0 = Access mode in low byte, flags in rest
004A 221 : R2 = STARTVA
004A 222 : R4 = Process Control Block
004A 223 : R5 = Process Header Address (P1 space ok)
004A 224 : R6 = Number of pages - 1 remaining in range of pages
004A 225 : R7 = +^X200 if going forward in the address space
004A 226 : = -^X200 if going backwards in the address space
004A 227 : R8 = 0 if scanning only for global pages in the specified range
004A 228 : Used by MMG$DELPAG when a GLOBAL page is found in the range
004A 229 : = 1 if scanning for any pages in the specified range
004A 230 : Used by the $PURGWS System Service
004A 231 :
004A 232 : IMPLICIT INPUTS:
004A 233 :
004A 234 : NONE
004A 235 :
004A 236 : OUTPUT PARAMETERS:
004A 237 :
004A 238 : R0,R2 PRESERVED
004A 239 : R8 = RESOURCE TO WAIT FOR ON A FAILED GLOBAL SCAN
004A 240 :
004A 241 : IMPLICIT OUTPUTS:
004A 242 :
004A 243 : NONE
004A 244 :
004A 245 : COMPLETION CODES:
004A 246 :
004A 247 : NONE
004A 248 :
004A 249 : SIDE EFFECTS:
004A 250 :
004A 251 : NONE
004A 252 :
004A 253 :--
```

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004A 255 :
004A 256 : *****
004A 257 :
004A 258 : ***** THE FOLLOWING CODE MUST BE RESIDENT *****
004A 259 :
0000 260 : .PSECT $MMGCOD
0000 261 :
0000 262 : *****
0000 263 :
0000 264 : .ENABL LSB
0000 265 :
00BF 31 0000 266 PURGWS_EMPTY:
0000 267 BRW 80$ ;No pages to be purged
0003 268
0003 269 MMG$PURGWSSCN::
0003 270 DSBINT #IPL$_SYNCH ;Save called IPL, raise to SYNCH
7E 12 DB 0003 MFPR S^#PRS_IPL,-(SP)
12 08 DA 0006 MTPR #IPL$_SYNCH,S^#PRS_IPL
0009 271 ;no swapping while scanning the WSL
51 0C A5 3C 0009 272 MOVZWL PHD$W_WSLOCK(R5),R1 ;Start scanning with locked pages
000D 273 ;if this is a GLOBAL scan
7E 34 A4 3C 000D 274 MOVZWL PCBSW_GPGCNT(R4),-(SP) ;Count of GLOBAL pages in WSL
10 58 E9 0011 275 BLBC R8,5$ ;Branch if scanning for GLOBAL pages
51 0E A5 3C 0014 276 MOVZWL PHD$W_WSDYN(R5),R1 ;Don't consider the locked pages
0018 277 ;when scanning for all page types
53 6E 36 A4 A0 0018 278 ADDW PCBSW_PPGCNT(R4),(SP) ;Calculate number of WSL entries
51 51 08 A5 A3 001C 279 SUBW3 PHD$W_WSLIST(R5),R1,R3 ;Number of entries in locked area
6E 53 A2 0021 280 SUBW R3,(SP) ;Entry count = GPGCNT + PPGCNT - Locked
0024 281 5$: BEQL PURGWS_EMPTY ;Branch if no entries to scan
0026 282 PUSH R #^M<R0,R2> ;Save STARTVA, access mode
53 08 57 1F E0 0028 283 BBS #31,R7,10$ ;Branch if going backwards
50 52 F7 8F 78 002C 284 ASHL #-9,R2,R3 ;Low virtual page number
50 53 56 C1 0031 285 ADDL3 R6,R3,R0 ;High virtual page number
0035 286 BRB 20$
50 52 F7 8F 78 0037 287 10$: ASHL #-9,R2,R0 ;High virtual page number
53 50 56 C3 003C 288 SUBL3 R6,R0,R3 ;Low virtual page number
0040 289 20$: PUSH R #^M<R0,R3> ;Push high VPN, low VPN
0042 290 :
0042 291 : 0(SP) = High virtual page number
0042 292 : 4(SP) = Low virtual page number
0042 293 : 8(SP) = Access mode
0042 294 : 12(SP) = Saved STARVA
0042 295 : 16(SP) = Count of pages to scan for
0042 296 : 20(SP) = Saved caller's IPL
0042 297 :
52 6541 D0 0042 298 24$: MOVL (R5)[R1],R2 ;Fetch next WSLE
68 52 E9 0046 299 BLBC R2,60$ ;Branch if not valid
07 58 E9 0049 300 BLBC R8,26$ ;Branch if just scanning for GLOBALS
52 30 93 004C 301 BITB #<WSL$M_WSLOCK ! WSL$M_PFNLOCK>,R2 ;All page types,
09 13 004F 302 BEQL 28$ ;but no locked ones
59 11 0051 303 BRB 50$
02 52 03 01 EC 0053 304 26$: CMPV #WSL$V_PAGTYP,#WSL$S_PAGTYP,R2,#PFNSC GLOBAL ;GLOBAL page?
57 19 0058 305 BLSS 60$ ;Branch if not
50 52 F7 8F 78 005A 306 28$: ASHL #-9,R2,R0 ;Get virtual page number
0B 19 005F 307 BLSS 32$ ;If system address, then discard it.
0061 308 ;It is a page table page which is not
0061 309 ;locked in the working set.

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04 AE 50 D1 0061 310      CMPL      R0,4(SP)      ;Above the low address?
      45 19 0065 311      BLSS      50$      ;Branch if no
6E 50 D1 0067 312      CMPL      R0,(SP)   ;Below the high address?
      40 14 006A 313      BGTR      50$      ;Branch if no
      51 DD 006C 314      32$: PUSHL     R1      ;Save the working set list index
      FF 30 006E 315      BSBW     MMG$SVAPTECHK ;Get the SVAPTE in R3
51 6E DO 0071 316      MOVL     (SP),R1   ;Recover WSLX
52 30 93 0074 317      BITB     #<WSL$M_WSLOCK ! WSL$M_PFNLOCK>,R2 ;Is this entry locked?
      2B 13 0077 318      BEQL     35$      ;Branch if not
50 63 50 OC AE 9A 0079 319      MOVZBL  <8+4>(SP),R0 ;Get access mode to check
      02 17 ED 007D 320      CMPZV   #PTESV_OWN,#FTESV_OWN,(R3),R0 ;Legal to unlock the page?
      26 19 0082 321      BLSS     40$      ;Branch if not, just skip it.
      58 DD 0084 322      PUSHL   R8      ;Save registers
      53 DD 0086 323      PUSHL   R3      ;altered by unlock WSLE logic
      FF 30 0088 324      BSBW     MMG$SULKGBLWSLE ;Unlock WSLE for GLOBAL page
      43 50 E9 008B 325      BLBC     R0,100$  ;Error status should not be returned
51 0108 8F BA 008E 326      POPR     #^M<R3,R8> ;Recover saved registers
      OE A5 3C 0092 327      MOVZWL  PHDSW_WSDYN(R5),R1 ;New WSLX for this page
      0096 328
      0096 329 ; R0 is available as scratch for the following calculation
      0096 330
50 52 6541 CD 0096 331      XORL3   (R5)[R1],R2,R0 ;Insure that PTE located by R1 and
50 50 F7 8F 78 009B 332      ASHL     #-9,R0,R0   ; contents of R2 differ only in flag bits
      33 12 00A0 333      BNEQ     110$      ;Step out of line if disagreement
      6E D7 00A2 334      DECL     (SP)      ;Continue scanning from original wslx
      FF 30 00A4 335      35$: BSBW     MMG$FREWSLX ;Delete working set list entry
      1F 50 E9 00A7 336      BLBC     R0,90$    ;Branch if need to wait for page file
      02 BA 00AA 337      40$: POPR     #^M<R1> ;Recover WSLX to continue scan from
      10 AE D7 00AC 338      50$: DECL     16(SP) ;Count another page found
      0C 15 00AF 339      BLEQ     70$      ;Branch if no more to look for
      51 D6 00B1 340      60$: INCL     R1      ;Step to next entry
12 A5 51 B1 00B3 341      CMPW    R1,PHDSW_WSLAST(R5) ;Are we at the end?
      89 1B 00B7 342      BLEQU   24$      ;Branch if more
      00B9 343
      00B9 344 ; Did not find the calculated number of pages in the working set.
      00B9 345
      00B9 346
      FEFF 00B9 BUG_CHECK WSLPAGCNT,FATAL ;Working set list page count error
      0004 00BB .WORD ^XFÉFF
      08 C0 00BD 347      70$: ADDL     #2*4,SP ;Clean off page numbers
      05 BA 00C0 348      POPR     #^M<R0,R2> ;Restore R0 = access mode, R2 = STARTVA
      5E 04 C0 00C2 349      80$: ADDL     #1*4,SP ;Clean off page count
      00C5 350      ENBINT ;Restore caller's IPL
      12 8E DA 00C5 351      MTPR    (SP)+,S^#PRS_IPL ;and exit to it
      05 00C8 352      RSB
      00C9 353 ; FREWSLX needed to allocate page file and couldn't
      00C9 354
      DE 58 E8 00C9 355      90$: BLBS     R8,40$ ;Leave it in working set if $PURGWS
      58 51 DO 00CC 356      MOVL     R1,R8 ;Resource to wait for
      EC 11 00CF 357      BRB     70$ ;Go back
      00D1 358
      00D1 359 ; Error in unlocking a locked global page or
      00D1 360 ; in freeing page from the working set list.
      00D1 361
      FEFF 00D1 362      100$: BUG_CHECK PURGWSSCN,FATAL
      .WORD ^XFÉFF

```

```

0004' 00D3          .IIF IDN <FATAL>,<FATAL> , .WORD          BUG$_PURGWSSCN!4
      00D5          363
      00D5          364 ; The first dynamic working set list entry does not agree with the contents
      00D5          365 ; of other registers. The operation must be restarted at a place in the
      00D5          366 ; working set list appropriate to the type of operation in progress.
      00D5          367
SE    04    CO    00D5          368 110$:  ADDL    #4,SP          ;Discard current WSLX
      F6 58    E8    00D8          369          BLBS    R8,100$        ;Shouldn't be here except for globals
51   OC A5    3C    00DB          370          MOVZWL PHD$W_WSLOCK(R5),R1 ;Start at the top of the list again
      FF60    31    00DF          371 120$:  BRW    24$          ;... and also at the top of the loop
      00E2          372
      00E2          373          .DSABL  LSB
      00E2          374
      00E2          375          .END

```

```

BUGS_PURGWSSCN      ***** X 03
BUGS_WSLPAGCNT      ***** X 03
EXESPURGWS          00000000 RG 02
INADR               = 00000004
IPLS_ASTDEL         = 00000002
IPLS_SYNCH          = 00000008
MMGSCREDEL          ***** X 02
MMGSC_LENGTH        = FFFFFFFE4
MMGSFREWSLX         ***** X 03
MMGSL_CALLEDIPL     = FFFFFFFF8
MMGSL_MAXACMODE     = FFFFFFFFC
MMGSL_SAVRETADR     = FFFFFFFF4
MMGSPURGWSPAG       0000003B R 02
MMGSPURGWSSCN       00000003 RG 03
MMGSRETRANGE        ***** X 02
MMGSSVAPTECHK       ***** X 03
MMGSULKGBLWSLE     ***** X 03
PCBSW_GPGCNT        = 00000034
PCBSW_PPGCNT        = 00000036
PFNSC_GLOBAL        = 00000002
PHDSW_WSDYN         = 0000000E
PHDSW_WSLAST        = 00000012
PHDSW_WSLIST        = 00000008
PHDSW_WSLOCK        = 0000000C
PRS_IPL             = 00000012
PSLSS_PRVMOD        = 00000002
PSLSV_PRVMOD        = 00000016
PTESS_OWN           = 00000002
PTESV_OWN           = 00000017
PURGWS_EMPTY        00000000 R 03
SSS_ACCVIO          = 0000000C
SSS_NORMAL          = 00000001
WSLSM_PFNLOCK       = 00000010
WSLSM_WSLOCK        = 00000020
WSLSS_PAGTYP        = 00000003
WSLSV_PAGTYP        = 00000001
    
```

-----  
! Psect synopsis !  
-----

PSECT name	Allocation	PSECT No.	Attributes
. ABS .	00000000 ( 0.)	00 ( 0.)	NOPIC USR CON ABS LCL NOSHR NOEXE NORD NOWRT NOVEC BYTE
\$ABSS	00000000 ( 0.)	01 ( 1.)	NOPIC USR CON ABS LCL NOSHR EXE RD WRT NOVEC BYTE
Y\$EXEPAGED	0000004A ( 74.)	02 ( 2.)	NOPIC USR CON REL LCL NOSHR EXE RD WRT NOVEC BYTE
\$MMGCOD	000000E2 ( 226.)	03 ( 3.)	NOPIC USR CON REL LCL NOSHR EXE RD WRT NOVEC BYTE

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

Phase	Page faults	CPU Time	Elapsed Time
Initialization	29	00:00:00.07	00:00:00.42
Command processing	119	00:00:00.58	00:00:01.25
Pass 1	301	00:00:08.83	00:00:17.51

Symbol table sort	0	00:00:01.42	00:00:03.36
Pass 2	82	00:00:01.77	00:00:04.50
Symbol table output	6	00:00:00.05	00:00:00.09
Psect synopsis output	2	00:00:00.03	00:00:00.06
Cross-reference output	0	00:00:00.00	00:00:00.00
Assembler run totals	541	00:00:12.75	00:00:27.21

The working set limit was 1200 pages.  
50979 bytes (100 pages) of virtual memory were used to buffer the intermediate code.  
There were 50 pages of symbol table space allocated to hold 932 non-local and 19 local symbols.  
375 source lines were read in Pass 1, producing 18 object records in Pass 2.  
22 pages of virtual memory were used to define 21 macros.

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

Macro library name	Macros defined
-----	-----
_\$255\$DUA28:[SYS.OBJ]LIB.MLB;1	12
-\$255\$DUA28:[SYSLIB]STARLET.MLB;2	6
TOTALS (all libraries)	18

1053 GETS were required to define 18 macros.

There were no errors, warnings or information messages.

MACRO/LIS=LIS\$:SYSPURGWS/OBJ=OBJ\$:SYSPURGWS MSRC\$:SYSPURGWS/UPDATE=(ENH\$:SYSPURGWS)+EXECMLS/LIB

0387 AH-BT13A-SE  
VAX/VMS V4.0

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The image displays a grid of 144 terminal windows, arranged in 12 rows and 12 columns. Each window shows a different system utility or its output. Several windows are labeled with utility names:

- SYSPURGWS LIS
- SYSPUTMSG LIS
- SYSPCNTRL LIS
- SYSQIOFDT LIS
- SYSQIOREQ LIS
- SYSRUNDOWN LIS
- SYSRDBRES LIS
- SYRTSLST LIS

The other windows contain various system messages, command-line prompts, and data lists, typical of a VAX/VMS environment.