```
LLL                 IIIIIIIII     BBBBBBBBBBBB     RRRRRRRRRRRR     TTTTTTTTTTTTTTT  LLL
LLL                 IIIIIIIII     BBBBBBBBBBBB     RRRRRRRRRRRR     TTTTTTTTTTTTTTT  LLL
LLL                 IIIIIIIII     BBBBBBBBBBBB     RRRRRRRRRRRR     TTTTTTTTTTTTTTT  LLL
LLL                    III        BBB         BBB  RRR         RRR        TTT        LLL
LLL                    III        BBB         BBB  RRR         RRR        TTT        LLL
LLL                    III        BBB         BBB  RRR         RRR        TTT        LLL
LLL                    III        BBB         BBB  RRR         RRR        TTT        LLL
LLL                    III        BBB         BBB  RRR         RRR        TTT        LLL
LLL                    III        BBB         BBB  RRR         RRR        TTT        LLL
LLL                    III        BBBBBBBBBBBB     RRRRRRRRRRRR           TTT        LLL
LLL                    III        BBBBBBBBBBBB     RRRRRRRRRRRR           TTT        LLL
LLL                    III        BBBBBBBBBBBB     RRRRRRRRRRRR           TTT        LLL
LLL                    III        BBB         BBB  RRR   RRR              TTT        LLL
LLL                    III        BBB         BBB  RRR   RRR              TTT        LLL
LLL                    III        BBB         BBB  RRR   RRR              TTT        LLL
LLL                    III        BBB         BBB  RRR      RRR           TTT        LLL
LLL                    III        BBB         BBB  RRR      RRR           TTT        LLL
LLL                    III        BBB         BBB  RRR      RRR           TTT        LLL
LLLLLLLLLLLLLLL     IIIIIIIII     BBBBBBBBBBBB     RRR         RRR        TTT        LLLLLLLLLLLLLLL
LLLLLLLLLLLLLLL     IIIIIIIII     BBBBBBBBBBBB     RRR         RRR        TTT        LLLLLLLLLLLLLLL
LLLLLLLLLLLLLLL     IIIIIIIII     BBBBBBBBBBBB     RRR         RRR        TTT        LLLLLLLLLLLLLLL
```

```
LL              IIIIII    BBBBBBBB      SSSSSSSS    IIIIII      GGGGGGGG  NN      NN    AAAAAA    LL
LL              IIIIII    BBBBBBBB      SSSSSSSS    IIIIII      GGGGGGGG  NN      NN    AAAAAA    LL
LL                II      BB      BB  SS              II      GG          NN      NN  AA      AA  LL
LL                II      BB      BB  SS              II      GG          NN      NN  AA      AA  LL
LL                II      BB      BB  SS              II      GG          NNNN    NN  AA      AA  LL
LL                II      BB      BB  SS              II      GG          NNNN    NN  AA      AA  LL
LL                II      BBBBBBBB      SSSSSS        II      GG          NN  NN  NN  AA      AA  LL
LL                II      BBBBBBBB      SSSSSS        II      GG          NN  NN  NN  AA      AA  LL
LL                II      BB      BB          SS      II      GG  GGGGGG  NN    NNNN  AAAAAAAAAA  LL
LL                II      BB      BB          SS      II      GG  GGGGGG  NN    NNNN  AAAAAAAAAA  LL
LL                II      BB      BB          SS      II      GG      GG  NN      NN  AA      AA  LL
LL                II      BB      BB          SS      II      GG      GG  NN      NN  AA      AA  LL
LLLLLLLLLL      IIIIII    BBBBBBBB    SSSSSSSS      IIIIII      GGGGGG    NN      NN  AA      AA  LLLLLLLLLL
LLLLLLLLLL      IIIIII    BBBBBBBB    SSSSSSSS      IIIIII      GGGGGG    NN      NN  AA      AA  LLLLLLLLLL

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
```

```
LIB
Sym

$SF
DUM
LIB
LIB
LIB
OLD
SFS
SFS
SFS
SFS
SFS
SFS
SFS
SFS
SFS
SFS
SIG
SYS

PSE
----

$AB
_LI

Pha
---
Ini
Com
Pas
Sym
Pas
Sym
Pse
Cro
Ass

The
129
The
517
10
```

Table of contents

```
0000     1         .TITLE  LIB$SIGNAL - Condition Handling Facility SIGNAL and STOP
0000     2         .IDENT  /1-018/                 ; File: LIBSIGNAL.MAR  Edit: ACG0183
0000     3
0000     4 ;
0000     5 ;*****************************************************************************
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0000    25 ;*                                                                           *
0000    26 ;*****************************************************************************
0000    27 ;
0000    28
0000    29 ;++
0000    30 ; FACILITY:     Condition Handling
0000    31 ;
0000    32 ; ABSTRACT:
0000    33 ;
0000    34 ;       The Condition Handling Facility supports the exception
0000    35 ;       handling mechanisms needed by each of the common languages.
0000    36 ;       It provides the programmer with some control over fixup,
0000    37 ;       reporting, and flow of control on errors.  It provides
0000    38 ;       subsystem and application writers with the ability to
0000    39 ;       override system messages in order to give a more suitable
0000    40 ;       application oriented interface.
0000    41 ;
0000    42 ;       The CHF includes procedures to allow higher level language
0000    43 ;       users to change the hardware enables, and to establish and
0000    44 ;       revert condition handlers. This module includes procedures
0000    45 ;       to signal exceptions (LIB$SIGNAL and LIB$STOP).  The
0000    46 ;       facility also includes a procedure to unwind the stack
0000    47 ;       from a handler to its establisher (SYS$SET_UNWIND).
0000    48 ;
0000    49 ;       To understand CHF more fully, refer to its functional
0000    50 ;       specification and to the STARLET exception routine (EXCEPTION).
0000    51 ;
0000    52 ;
0000    53 ; ENVIRONMENT:  Any access mode--normally user mode
0000    54 ;               AST reentrant
0000    55 ;
0000    56 ; AUTHOR: Peter F. Conklin, CREATION DATE: 12-Nov-76
```

```
0000     58          .SBTTL  Modification History
0000     59 ;
0000     60 ; MODIFIED BY:
0000     61 ;
0000     62 ;  Peter F. Conklin, 27-Jan-78 VERSION 01
0000     63 ; 01     -  Original, based on CHF Rev 4 spec.
0000     64 ; 02     -  Changed to Rev 5 spec.
0000     65 ; 03     -  Exit with "no handler" or "access violation" if bad stack.
0000     66 ; 04     -  Copy signal args; add PSL and PC.
0000     67 ; 05     -  Reformat stack to mimic EXCEPTION exactly.
0000     68 ; 06     -  Change to PSECT LIB$CODE
0000     69 ; 07     -  Use $GETJPI, SYS$EXCMSG, SS$_NOHANDLER
0000     70 ;               support last chance handler,
0000     71 ;               STOP forces severe at every handler call.
0000     72 ; 08     - Change name to SYS$EXCMSG.  TNH 24-Jan-78
0000     73 ; 09     - Remember EXCVEC address.
0000     74 ; 10     - Continue from STOP now vectors to a Panic EXIT.
0000     75 ; 11     - Change name of OWN PSECT to LIB$DATA.
0000     76 ; 12     - Use G^ addressing in call to SYS$UNWIND.  JMT 28-Feb-78
0000     77 ; 13     - Make OWN be PIC.  TNH 27-June-78
0000     78 ; 1-014 - Reformatted version number to have three digits in the
0000     79 ;          edit number field.  JBS 16-NOV-78
0000     80 ; 1-015 - Add "_" to the PSECT directives.  JBS 21-DEC-78
0000     81 ; 1-016 - Make sure that SP stays below needed information.
0000     82 ;          SPR 11-24926  SBL 13-July-1979
0000     83 ; 1-017 - Remove restriction that the stack frame must be in P1 space.
0000     84 ;          SBL 22-May-1980
0000     85 ; 1-018 - ACG0183: Andrew C. Goldstein  30-Dec-1980  15:44
0000     86 ;          Complete rewrite, to correct stack management bugs in
0000     87 ;          building of signal vectors, and to use SYS$SRCHANDLER entry
0000     88 ;          to the EXEC's handler search logic, eliminating duplicated
0000     89 ;          condition handler search algorithms.
0000     90 ;--
```

```
                     92          .SBTTL  DECLARATIONS
                     93
                     94 ;
                     95 ; EXTERNAL REFERENCES:
                     96 ;
                     97          .DSABL  GBL
                     98
                     99          .EXTRN  SYS$SRCHANDLER
                    100
                    101 ;
                    102 ; INCLUDE FILES:
                    103 ;
                    104          $LIBDEF                         ;Library status defs
                    105          $SFDEF                          ;Stack frame offsets
                    106
                    107 ;
                    108 ; MACROS:
                    109 ;
                    110
                    111 ;
                    112 ; This macro defines the formals to a procedure
                    113 ;
                    114
                    115          .MACRO  $FORMAL LIST
                    116 $$FORMAL=0
                    117          .IRP    L,<LIST>
                    118 $$FORMAL=$$FORMAL+4
                    119 L=$$FORMAL
                    120          .ENDM
                    121          .ENDM   $FORMAL
                    122
                    123 ;
                    124 ; EQUATED SYMBOLS:
                    125 ;
                    126 ;        NONE
                    127 ;
                    128 ; OWN STORAGE:
                    129 ;
                    130 ;        NONE
                    131 ;
                    132
                    133          .PSECT  _LIB$CODE,PIC,SHR,NOWRT,LONG
```

```
                        135          .SBTTL  LIB$STOP -  Stop execution via signalling
                        136 ;++
                        137 ; FUNCTIONAL DESCRIPTION:
                        138 ;
                        139 ;       This procedure is called whenever it is impossible
                        140 ;       to continue execution and no recovery is possible.
                        141 ;       It signals the exception. It always forces the
                        142 ;       severity code of severe_error on each call to
                        143 ;       a handler. Handler requests to continue are
                        144 ;       treated as an error and produce a panic exit.
                        145 ;       This procedure is guaranteed to never return.
                        146 ;
                        147 ;
                        148 ; CALLING SEQUENCE:
                        149 ;
                        150 ;       CALL LIB$STOP (
                        151 ;
                        152 ;       CONDITON_VALUE.rlc.v,   standard signal name
                        153 ;
                        154 ;       {ARGS.rl.v})            additional FAO parameters for message
                        155 ;                               (stop adds PC and PSL to end)
                        156 ;
                        157 ; INPUT PARAMETERS:
                        158 ;
                        159 ;       NONE
                        160 ;
                        161 ; IMPLICIT INPUTS:
                        162 ;
                        163 ;       NONE
                        164 ;
                        165 ; OUTPUT PARAMETERS:
                        166 ;
                        167 ;       NONE
                        168 ;
                        169 ; IMPLICIT OUTPUTS:
                        170 ;
                        171 ;       NONE
                        172 ;
                        173 ; COMPLETION CODES:
                        174 ;
                        175 ;       NONE
                        176 ;
                        177 ; SIDE EFFECTS:
                        178 ;
                        179 ;       Never returns
                        180 ;
                        181 ;--
                        182
                        183          $FORMAL <-
                        184 CONDITION_VALUE-                 ;signal code
                        185          >                      ; {parameters}
                        186
   0000                 187          .ENTRY  LIB$STOP,0              ;No registers (assumed below)
02   DD                 188          PUSHL   #2                      ;Set code for STOP
0E   11                 189          BRB     SIGNAL                  ;Go do the signallling
```

```
                     0006   191          .SBTTL  LIB$SIGNAL -  Signal Exceptional Condition
                     0006   192 ;++
                     0006   193 ; FUNCTIONAL DESCRIPTION:
                     0006   194 ;
                     0006   195 ;       This procedure is called whenever it is necessary
                     0006   196 ;       to indicate an exceptional condition and the procedure
                     0006   197 ;       can not return a status code. If a handler returns
                     0006   198 ;       with a continue code, LIB$SIGNAL returns with
                     0006   199 ;       all registers including R0 and R1 preserved.  Thus,
                     0006   200 ;       LIB$SIGNAL can also be used to plant performance and
                     0006   201 ;       debugging traps in any code.  If no handler is found,
                     0006   202 ;       or all resignal, a catch-all handler is CALLed.
                     0006   203 ;
                     0006   204 ; CALLING SEQUENCE:
                     0006   205 ;
                     0006   206 ;       CALL LIB$SIGNAL (
                     0006   207 ;
                     0006   208 ;       CONDITION_VALUE.rlc.v,  standard signal name
                     0006   209 ;
                     0006   210 ;       {ARGS.rl.v})            additional FAO parameters for message
                     0006   211 ;                               (signal adds PC and PSL to end)
                     0006   212 ;
                     0006   213 ; INPUT PARAMETERS:
                     0006   214 ;
                     0006   215 ;       NONE
                     0006   216 ;
                     0006   217 ; IMPLICIT INPUTS:
                     0006   218 ;
                     0006   219 ;       NONE
                     0006   220 ;
                     0006   221 ; OUTPUT PARAMETERS:
                     0006   222 ;
                     0006   223 ;       NONE
                     0006   224 ;
                     0006   225 ; IMPLICIT OUTPUTS:
                     0006   226 ;
                     0006   227 ;       NONE
                     0006   228 ;
                     0006   229 ; COMPLETION CODES:
                     0006   230 ;
                     0006   231 ;       NONE
                     0006   232 ;
                     0006   233 ; SIDE EFFECTS:
                     0006   234 ;
                     0006   235 ;       If a handler unwinds, then control will not return.
                     0006   236 ;       A handler could also modify R0/R1 and change the
                     0006   237 ;       flow of control.  If neither is done, then all
                     0006   238 ;       registers are preserved.
                     0006   239 ;
                     0006   240 ;--
                     0006   241
                0000 0006   242          .ENTRY  LIB$SIGNAL,0            ;No registers (assumed below)
             01   DD 0008   243          PUSHL   #1                      ;Set code for SIGNAL
             08   11 000A   244          BRB     SIGNAL                  ;go do the signalling
```

```
                        246          .SBTTL  SIGNAL -  Internal Routine to Signal Exceptions
                        247 ;++
                        248 ; FUNCTIONAL DESCRIPTION:
                        249 ;
                        250 ;       This routine is used by LIB$STOP and LIB$SIGNAL to do
                        251 ;       the actual exception signaling. It converts the call frame
                        252 ;       and argument list into mechanism and signal vectors.
                        253 ;       It then jumps to the EXEC's common condition handler
                        254 ;       search routine.
                        255 ;
                        256 ;
                        257 ; CALLING SEQUENCE:
                        258 ;
                        259 ;       PUSHL   #code           ;1=SIGNAL, 2=STOP
                        260 ;       BR      SIGNAL
                        261 ;
                        262 ; INPUT PARAMETERS:
                        263 ;
                        264 ;       AP points to the arg list
                        265 ;
                        266 ; IMPLICIT INPUTS:
                        267 ;
                        268 ;       NONE
                        269 ;
                        270 ; OUTPUT PARAMETERS:
                        271 ;
                        272 ;       NONE
                        273 ;
                        274 ; IMPLICIT OUTPUTS:
                        275 ;
                        276 ;       NONE
                        277 ;
                        278 ; COMPLETION CODES:
                        279 ;
                        280 ;       NONE
                        281 ;
                        282 ; SIDE EFFECTS:
                        283 ;
                        284 ;       If a handler unwinds, then control will not return.
                        285 ;       A handler could also modify R0/R1 and change the flow
                        286 ;       of control. If neither is done, then all registers
                        287 ;       are preserved.
                        288 ;
                        289 ;--
                        290
                        291 ;
                        292 ; The following is a dummy signal argument list that is
                        293 ; used if the call has no arguments. This dummy list
                        294 ; has just one argument, in particular the signal code.
                        295 ;
                        296
                        297 DUMMY_SIG_ARG:
0015825C 00000001       298          .LONG   1,LIB$_SIGNO_ARG        ;dummy arg list
```

```
0014   300 ;+
0014   301 ; The code for the signal routine is straightforward
0014   302 ; and consists of the following three parts:
0014   303 ;
0014   304 ;       evaporate the call stack
0014   305 ;       format the handler argument list
0014   306 ;       jump to common handler search routine
0014   307 ;
0014   308 ; The only peculiar algorithm has to do with evaporating
0014   309 ; the call frame. This is needed so that the format of
0014   310 ; the stack is the same whether the signal was an
0014   311 ; explicit call to signal or was a hardware detected
0014   312 ; exception. The latter has no frame because the hardware
0014   313 ; pushes the PSL, the PC, and some arguments. The exception
0014   314 ; handler in the system adds a reason code to identify the
0014   315 ; exception and then goes into a duplicate of this code.
0014   316 ;
0014   317 ; The algorithm to evaporate the frame is different for
0014   318 ; the cases of being called by CALLG or CALLS. In the latter
0014   319 ; case, the arguments also must be evaporated (by incorporation
0014   320 ; into the signal vector). In the former case, the argument
0014   321 ; list must be copied in order to allow
0014   322 ; the handler to alter the severity and resignal. At the
0014   323 ; same time, the caller's PSL and PC are appended to
0014   324 ; the list for consistency with the hardware detected
0014   325 ; exceptions. In both cases, the only trick in the algorithm
0014   326 ; is to ensure that SP stays below any information on the
0014   327 ; stack, and to allow for various number of parameters
0014   328 ; including the 0 to 3 byte stack alignment on call.
0014   329 ;-
```

```
                                0014   331 SIGNAL:
                         03     BB 0014   332         PUSHR   #^M<R0,R1>              ;save user's R1'R0
                3F 06 AD 0D     E1 0016   333         BBC     #SF$V_CALLS,SF$W_SAVE_MASK(FP),40$
                                001B   334                                             ;go handle CALLG call
                                001B   335
                                001B   336 ;
                                001B   337 ; Here on a CALLS with the stack:
                                001B   338 ;
                                001B   339 ;       (SP) = -12(FP) = caller's R0
                                001B   340 ;              -08(FP) = caller's R1
                                001B   341 ;              -04(FP) = code for LIB$STOP or LIB$SIGNAL
                                001B   342 ;               00(FP) = 0 (this incarnation's handler)
                                001B   343 ;               04(FP) = CALL frame mask and caller's PSW
                                001B   344 ;               08(FP) = caller's AP
                                001B   345 ;               12(FP) = caller's FP
                                001B   346 ;               16(FP) = caller's PC
                                001B   347 ;                 ...  = 0 to 3 bytes of alignment filler
                                001B   348 ;               00(AP) = number of arguments
                                001B   349 ;               04(AP)++ arguments to SIGNAL
                                001B   350 ;
                                001B   351
                      08 AD     DD 001B   352         PUSHL   SF$L_SAVE_AP(FP)        ;save caller's AP
                         7E     DC 001E   353         MOVPSL  -(SP)                   ;save PSL
                   6E    04 AD  B0 0020   354         MOVW    SF$W_SAVE_PSW(FP),(SP)  ;update with caller's PSW
                      10 AD     DD 0024   355         PUSHL   SF$L_SAVE_PC(FP)        ;save caller's PC
                   5D    0C AD  D0 0027   356         MOVL    SF$L_SAVE_FP(FP),FP     ;restore caller's FP
                                002B   357                                             ;the stack frame is now officially gone
                      51    6C  9A 002B   358 5$:     MOVZBL  (AP),R1                 ;get number of args
                            09  12 002E   359         BNEQU   10$                     ;branch if some
                   6C    DD AF  D0 0030   360         MOVL    DUMMY_SIG_ARG+4,(AP)    ;use dummy if none
                         7C 01  D0 0034   361         MOVL    #1,-(AP)                ;make room and count as one arg
                            F2  11 0037   362         BRB     5$                      ;proceed
                                0039   363
                   50    F8 AC  9E 0039   364 10$:     MOVAB   -8(AP),R0               ;point to top of signal vector
                6C    51    02  C1 003D   365         ADDL3   #2,R1,(AP)              ;add PC & PSL to argument count
                   F4 AC    8C  D0 0041   366 20$:     MOVL    (AP)+,-12(AP)           ;copy args into signal vector
                      F9 51  F4  0045   367         SOBGEQ  R1,20$
                                0048   368
                         7C     8E 7D 0048   369         MOVQ    (SP)+,-(AP)             ;put away PSL'PC pair
                         5C     8E D0 004B   370         MOVL    (SP)+,AP                ;restore caller's AP
                   70    08 AE  D0 004E   371         MOVL    8(SP),-(R0)             ;store code for SIGNAL/STOP
                         70     6E 7D 0052   372         MOVQ    (SP),-(R0)              ;store caller's R1'R0
                         5E     50 D0 0055   373         MOVL    R0,SP                   ;clean off unused space
                                4E 11 0058   374         BRB     80$                     ;go join common code
```

```
                     005A   376 ;
                     005A   377 ; Here on a CALLG
                     005A   378 ;
                     005A   379 ;
                     005A   380 ; At this point the stack is:
                     005A   381 ;
                     005A   382 ;       (SP) = -12(FP) = caller's R0
                     005A   383 ;              -08(FP) = caller's R1
                     005A   384 ;              -04(FP) = code for LIB$STOP or LIB$SIGNAL
                     005A   385 ;               00(FP) = 0 (this incarnation's handler)
                     005A   386 ;               04(FP) = CALL frame mask and caller's PSW
                     005A   387 ;               08(FP) = caller's AP
                     005A   388 ;               12(FP) = caller's FP
                     005A   389 ;               16(FP) = caller's PC
                     005A   390 ;                 ...    0 to 3 bytes of alignment filler
                     005A   391 ;
                     005A   392 ; NOTE: In the computation below, SP is set two long words lower
                     005A   393 ; then seems obviously needed. The two longword bias is necessary to
                     005A   394 ; guarantee that SP is not being set above the current location of
                     005A   395 ; the saved R0'R1 for the case of the smallest possible argument list.
                     005A   396 ;
                     005A   397
          50   5D   D0  005A   398 40$:    MOVL    FP,R0                   ;point to current frame
               5D   10  005D   399         BSBB    OLD_SP                  ;calculate pre-CALL SP into R0
          51   6C   9A  005F   400 50$:    MOVZBL  (AP),R1                 ;get arg count
               06   12  0062   401         BNEQU   60$                     ;proceed if not empty
       5C   A5 AF   9E  0064   402         MOVAB   DUMMY_SIG_ARG,AP        ;use default if empty
               F5   11  0068   403         BRB     50$                     ;and try again
                    006A   404
          51   51   CE  006A   405 60$:    MNEGL   R1,R1                   ;compute variable part of vector
     5E   E0 A041   DE  006D   406         MOVAL   -32(R0)[R1],SP          ;set SP to final value
        51   FC AD   D0  0072   407         MOVL    -4(FP),R1               ;save code for SIGNAL/STOP
    08 AE   F4 AD   7D  0076   408         MOVQ    -12(FP),8(SP)           ;put R1'R0 in correct place
    10 AE   51   D0  007B   409         MOVL    R1,16(SP)               ;store code in vector
    04 AE   08 AD   D0  007F   410         MOVL    SF$L_SAVE_AP(FP),4(SP)  ;save caller's AP for a moment
               6E   DC  0084   411         MOVPSL  (SP)                    ;save PSL for a moment
        6E   04 AD   B0  0086   412         MOVW    SF$W_SAVE_PSW(FP),(SP)  ;change PSL to caller's
               10 AD   DD  008A   413         PUSHL   SF$L_SAVE_PC(FP)        ;save caller's PC for a moment
        5D   0C AD   D0  008D   414         MOVL    SF$L_SAVE_FP(FP),FP     ;shift FP back to caller's FP
```

```
                        0091   416 ;
                        0091   417 ; At this point, the extra frame created by the CALL to us
                        0091   418 ; has been removed. We can now proceed to build the signal
                        0091   419 ; and mechanism vectors and the final arg list.
                        0091   420 ;
                        0091   421
      70    8E    7D    0091   422          MOVQ    (SP)+,-(R0)             ;move caller's PSL'PC to vector
      51    6C    9A    0094   423          MOVZBL  (AP),R1                 ;get arg count
   70    6C41    D0    0097   424 70$:      MOVL    (AP)[R1],-(R0)          ;copy args to signal vector
      F9 51    F5    009B   425          SOBGTR  R1,70$                  ; top down
      51    6C    9A    009E   426          MOVZBL  (AP),R1                 ;get arg count
70    51    02    C1    00A1   427          ADDL3   #2,R1,-(R0)             ;signal count is 2+arg count
      5C    8E    D0    00A5   428          MOVL    (SP)+,AP                ;change AP to caller's AP
                        00A8   429                                          ;CALLS entry joins here
      7E    03    CE    00A8   430 80$:      MNEGL   #3,-(SP)                ;initialize depth
            5D    DD    00AB   431          PUSHL   FP                      ;initialize frame
            04    DD    00AD   432          PUSHL   #4                      ;set mechanism vector length
            6E    9F    00AF   433          PUSHAB  (SP)                    ;2nd arg is mechanism vector
         1C AE    9F    00B1   434          PUSHAB  28(SP)                  ;1st arg is signal vector
            02    DD    00B4   435          PUSHL   #2                      ;two arguments
                        00B6   436
                        00B6   437 ;
                        00B6   438 ;  At this point the stack is all set for a call to any handler:
                        00B6   439 ;
                        00B6   440 ;       00(SP) = 2
                        00B6   441 ;       04(SP) = signal vector address          ( 36(SP) )
                        00B6   442 ;       08(SP) = mechanism vector address       ( 12(SP) )
                        00B6   443 ;       12(SP) = mechanism vector length (4)    \
                        00B6   444 ;       16(SP) = mechanism vector frame (FP)     |
                        00B6   445 ;       20(SP) = mechanism vector depth (-3)     | mechanism
                        00B6   446 ;       24(SP) = mechanism vector caller's R0    |
                        00B6   447 ;       28(SP) = mechanism vector caller's R1   /
                        00B6   448 ;       32(SP) = code for LIB$STOP or LIB$SIGNAL
                        00B6   449 ;       36(SP) = 2+number of caller's args      \
                        00B6   450 ;       40(SP)++ copy of caller's signal args   | signal
                        00B6   451 ;         ...    caller's return PC             |   args
                        00B6   452 ;         ...    caller's PSL                  /
                        00B6   453 ;
                        00B6   454 ;       The next higher location on the stack is the
                        00B6   455 ;       value of the caller's SP just before the CALL.
                        00B6   456 ;
                        00B6   457 ; AP and FP have been restored to the caller's values.
                        00B6   458 ;
                        00B6   459
00000000'GF    17       00B6   460          JMP     G^SYS$SRCHANDLER        ;go find a handler
```

```
                                00BC    462          .SBTTL  OLD_SP -  Internal Routine to Calculate Old SP
                                00BC    463 ;++
                                00BC    464 ; FUNCTIONAL DESCRIPTION:
                                00BC    465 ;
                                00BC    466 ;       This routine is called to calculate what SP was before
                                00BC    467 ;       a particular CALLG that resulted in a specific stack
                                00BC    468 ;       frame.  RESTRICTION: CALLS not handled.
                                00BC    469 ;
                                00BC    470 ; CALLING SEQUENCE:
                                00BC    471 ;
                                00BC    472 ;       NONE
                                00BC    473 ;
                                00BC    474 ; INPUT PARAMETERS:
                                00BC    475 ;
                                00BC    476 ;       R0 = address of stack frame in question
                                00BC    477 ;
                                00BC    478 ; IMPLICIT INPUTS:
                                00BC    479 ;
                                00BC    480 ;       NONE
                                00BC    481 ;
                                00BC    482 ; OUTPUT PARAMETERS:
                                00BC    483 ;
                                00BC    484 ;       R0 = value of SP before CALL in question
                                00BC    485 ;
                                00BC    486 ; IMPLICIT OUTPUTS:
                                00BC    487 ;
                                00BC    488 ;       NONE
                                00BC    489 ;
                                00BC    490 ; COMPLETION CODES:
                                00BC    491 ;
                                00BC    492 ;       NONE
                                00BC    493 ;
                                00BC    494 ; SIDE EFFECTS:
                                00BC    495 ;
                                00BC    496 ;       R1 is clobbered
                                00BC    497 ;
                                00BC    498 ;--
                                00BC    499
                                00BC    500
                                00BC    501
                                00BC    502 OLD_SP:
                    02    0E    EF    00BC    503          EXTZV   #SF$V_STACKOFFS,#SF$S_STACKOFFS,-
                  7E    06 A0         00BF    504                  SF$W_SAVE_MASK(R0),-(SP) ;get stack offset
51    06 A0         0C    00    EF    00C2    505          EXTZV   #SF$V_SAVE_MASK,#SF$S_SAVE_MASK,SF$W_SAVE_MASK(R0),R1
                                      00C8    506                                                  ;get register mask
                    50    14    C0    00C8    507          ADDL2   #SF$L_SAVE_REGS,R0           ;standard frame
                    50    8E    C0    00CB    508          ADDL2   (SP)+,R0                     ;SP correction
                      03  51    E9    00CE    509 10$:     BLBC    R1,20$                       ;if register bit set,
                    50    04    C0    00D1    510          ADDL2   #4,R0                        ; count the register
      51    51    FF    8F    78    00D4    511 20$:     ASHL    #-1,R1,R1                    ;discard bit
                          F3    12    00D9    512          BNEQU   10$                          ;loop until all done
                                05    00DB    513          RSB                                  ;return
                                      00DC    514
                                      00DC    515
                                      00DC    516
                                      00DC    517          .END
```

```
$$FORMAL        = 00000004
DUMMY_SIG_ARG     0000000C R      02
LIB$SIGNAL        00000006 RG     02
LIB$STOP          00000000 RG     02
LIB$_SIGNO_ARG  = 0015825C
OLD_SP            000000BC R      02
SF$L_SAVE_AP    = 00000008
SF$L_SAVE_FP    = 0000000C
SF$L_SAVE_PC    = 00000010
SF$L_SAVE_REGS  = 00000014
SF$S_SAVE_MASK  = 0000000C
SF$S_STACKOFFS  = 00000002
SF$V_CALLS      = 0000000D
SF$V_SAVE_MASK  = 00000000
SF$V_STACKOFFS  = 0000000E
SF$W_SAVE_MASK  = 00000006
SF$W_SAVE_PSW   = 00000004
SIGNAL            00000014 R      02
SYS$SRCHANDLER    ******** X      00
```

+----------------+
! 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
_LIB$CODE	000000DC (220.)	02 (2.)	PIC USR CON REL LCL SHR EXE RD NOWRT NOVEC LONG

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

Phase	Page faults	CPU Time	Elapsed Time
Initialization	30	00:00:00.02	00:00:01.15
Command processing	109	00:00:00.31	00:00:02.08
Pass 1	140	00:00:01.54	00:00:05.53
Symbol table sort	0	00:00:00.07	00:00:00.07
Pass 2	94	00:00:00.70	00:00:02.87
Symbol table output	3	00:00:00.02	00:00:00.02
Psect synopsis output	2	00:00:00.02	00:00:00.02
Cross-reference output	0	00:00:00.00	00:00:00.00
Assembler run totals	380	00:00:02.69	00:00:11.74

The working set limit was 1050 pages.
12999 bytes (26 pages) of virtual memory were used to buffer the intermediate code.
There were 10 pages of symbol table space allocated to hold 124 non-local and 10 local symbols.
517 source lines were read in Pass 1, producing 16 object records in Pass 2.
10 pages of virtual memory were used to define 9 macros.

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

Macro library name                   Macros defined
------------------                   --------------
_$255$DUA28:[SYSLIB]STARLET.MLB;2              5

268 GETS were required to define 5 macros.

There were no errors, warnings or information messages.

MACRO/ENABLE=SUPPRESSION/DISABLE=(GLOBAL,TRACEBACK)/LIS=LIS$:LIBSIGNAL/OBJ=OBJ$:LIBSIGNAL MSRC$:LIBSIGNAL/UPDATE=(ENH$:LIBSIGNAL)
```

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VAX/VMS V4.0

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