
MMM MMM AAAAAAAAA CCCCCCCCCCC RRRRRRRRRRR 000000000
MMM MMM AAAAAAAAA CCCCCCCCCCC RRRRRRRRRRR 000000000
MMM MMM AAAAAAAAA CCCCCCCCCCC RRRRRRRRRRR 000000000
MMMMMM MMMMMM AAA AAA CCC RRR RRR OOO OOO
MMMMMM MMMMMM AAA AAA CCC RRR RRR OOO OOO
MMMMMM MMMMMM AAA AAA CCC RRR RRR OOO OOO
MMM MMM MMM AAA AAA CCC RRR RRR OOO OOO
MMM MMM MMM AAA AAA CCC RRR RRR OOO OOO
MMM MMM MMM AAA AAA CCC RRR RRR OOO OOO
MMM MMM AAA AAA CCC RRRRRRRRRRR OOO OOO
MMM MMM AAA AAA CCC RRRRRRRRRRR OOO OOO
MMM MMM AAA AAA CCC RRRRRRRRRRR OOO OOO
MMM MMM AAAAAAAAAAAAAAA CCC RRR RRR OOO OOO
MMM MMM AAAAAAAAAAAAAAA CCC RRR RRR OOO OOO
MMM MMM AAAAAAAAAAAAAAA CCC RRR RRR OOO OOO
MMM MMM AAA AAA CCC RRR RRR OOO OOO
MMM MMM AAA AAA CCC RRR RRR OOO OOO
MMM MMM AAA AAA CCC RRR RRR OOO OOO
MMM MMM AAA AAA CCCCCCCCCCC RRR RRR 000000000
MMM MMM AAA AAA CCCCCCCCCCC RRR RRR 000000000
MMM MMM AAA AAA CCCCCCCCCCC RRR RRR 000000000
MMM MMM AAA AAA CCCCCCCCCCC RRR RRR 000000000

FILEID**P2ACT1

```
PPPPPPPP      222222      AAAAAA      CCCCCCCC  TTTTTTTTTT      11
PPPPPPPP      222222      AAAAAA      CCCCCCCC  TTTTTTTTTT      11
PP      PP  22      22  AA      AA  CC              TT        1111
PP      PP  22      22  AA      AA  CC              TT        1111
PP      PP          22  AA      AA  CC              TT          11
PP      PP          22  AA      AA  CC              TT          11
PPPPPPPP          22    AA      AA  CC              TT          11
PPPPPPPP          22    AA      AA  CC              TT          11
PP              22      AAAAAAAAAA  CC              TT          11
PP              22      AAAAAAAAAA  CC              TT          11
PP            22        AA      AA  CC              TT          11          ....
PP            22        AA      AA  CC              TT          11          ....
PP          2222222222  AA      AA    CCCCCCCC      TT        111111        ....
PP          2222222222  AA      AA    CCCCCCCC      TT        111111        ....

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

Table of contents

```
0000     1          .TITLE  MAC$P2ACT1 ACTION ROUTINES FOR PASS 2
0000     2          .IDENT  'V04-000'
0000     3
0000     4 ;
0000     5 ;*****************************************************************************
0000     6 ;*                                                                           *
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0000    24 ;*                                                                           *
0000    25 ;*                                                                           *
0000    26 ;*****************************************************************************
0000    27 ;
0000    28
0000    29 ;++
0000    30 ; FACILITY:     VAX MACRO ASSEMBLER OBJECT LIBRARY
0000    31 ;
0000    32 ; ABSTRACT:
0000    33 ;
0000    34 ; The VAX-11 MACRO assembler translates MACRO-32 source code into object
0000    35 ; modules for input to the VAX-11 LINKER.
0000    36 ;
0000    37 ; ENVIRONMENT:  USER MODE
0000    38 ;
0000    39 ; AUTHOR: Benn Schreiber, CREATION DATE: 25-AUG-78
0000    40 ;
0000    41 ; MODIFIED BY:
0000    42 ;
0000    43 ;       V03-004 MTR0037         Mike Rhodes     16-May-1984
0000    44 ;               Filter object code data values from being written
0000    45 ;               into psects with the absolute attribute, since the
0000    46 ;               object code command records have been removed.
0000    47 ;
0000    48 ;       V03-003 MCN0153         Maria del C. Nasr       15-Feb-1984
0000    49 ;               Eliminate an extra, unnecesary $VPUSH when processing
0000    50 ;               transfer vectors.
0000    51 ;
0000    52 ;       V03-002 MTR0033         Mike Rhodes     22-Apr-1983
0000    53 ;               Allow the removal of the blank psect if it's not referenced.
0000    54 ;
0000    55 ;       V03-001 MTR0031         Mike Rhodes     19-Apr-1983
0000    56 ;               Remove obsolete reference to $MAC_TIRCMDDEF macro.
0000    57 ;
```

```
0000     58 ;       V03.00  MTR0008          Mike Rhodes     15-Mar-1982
0000     59 ;               Modify routine P2$END to test the setting of the "external"
0000     60 ;               error flags FLG$V_EXTERR and FLG$V_EXTWRN, exiting with the
0000     61 ;               more severe status if set.  Else, it will check and set the
0000     62 ;               completion status as in the past, according to the type of
0000     63 ;               assembly errors encountered.  Fixes SPR #11-41651(A).
0000     64 ;
0000     65 ;       V02.09  CNH0039          Chris Hume      7-Oct-1980
0000     66 ;               Closed off a few remaining object record length checking
0000     67 ;               errors.  (IODAT.MAR 02.08, OHDOUT.MAR 02.02)
0000     68 ;
0000     69 ;       V02.08  CNH0036          Chris Hume      14-Jul-1980
0000     70 ;               Closed off some more areas where the assembler was writing
0000     71 ;               object records too long for the linker.  (P2ACT2.MAR 02.11)
0000     72 ;
0000     73 ;       V02.07  CNH0034          Chris Hume      14-May-1980
0000     74 ;               Restrained the assembler from occasionally writing object
0000     75 ;               records too long for the linker.
0000     76 ;
0000     77 ;       V01.06  RN0023           R. Newland      3-Nov-1979
0000     78 ;               New message codes to get error messages from system
0000     79 ;               message file.
0000     80 ;
0000     81 ;       V01.05  RN0007           R. Newland      28-Aug-1979
0000     82 ;               Store signed byte for non-optimised, not PC relative
0000     83 ;               8-bit displacment and deferred displacement
0000     84 ;
0000     85 ;       V01.04  RN0005           R. Newland      13-Aug-1979
0000     86 ;               Remove .ALIGN LONG statements
0000     87 ;
0000     88 ;       V01.03  RN0003           R. Newland      22-May-1979
0000     89 ;               Store signed word for not PC-relative, non-optimised
0000     90 ;               16-bit displacement and deferred displacement
0000     91 ;
0000     92 ;       V01.02  RN0002           R. Newland      01-Feb-1979
0000     93 ;               Changes for Source Update Merge
0000     94 ;--
```

```
                                        .SBTTL  DECLARATIONS
                                ;
                                ; INCLUDE FILES:
                                ;
                                ;
                                ; MACROS:
                                ;
                                        $MAC_SYMBLKDEF                  ;DEFINE SYMBOL BLOCK OFFSETS
                                        $MAC_CTLFLGDEF                  ;DEFINE CONTROL FLAGS
                                        $MAC_ADRMODDEF                  ;DEFINE ADDRESSING MODES
                                        $MAC_OBJCODDEF                  ;DEFINE OBJECT MODULE CODES
                                        $MACMSGDEF                      ; Define message codes
                                        $MAC_GENVALDEF                  ; Define VAX-11 MACRO commom symbols

                                        .PSECT  MAC$RO_CODE_P2,NOWRT,GBL,LONG
```

```
                     0000   114          .SBTTL  P2$STKG STACK GLOBAL, EXTERNAL SYMBOL
                     0000   115
                     0000   116 ;++
                     0000   117 ; FUNCTIONAL DESCRIPTION:
                     0000   118 ;
                     0000   119 ;       EMIT TEXT TO OBJECT FILE TO STACK A GLOBAL SYMBOL.
                     0000   120 ;
                     0000   121 ; INPUTS:
                     0000   122 ;
                     0000   123 ;       R8      POINTS INTO INTERMEDIATE BUFFER
                     0000   124 ;
                     0000   125 ;--
                     0000   126
                     0000   127 P2$STKG::
          56   88   D0  0000   128          MOVL    (R8)+,R6                ;GET SYMBOL BLOCK ADDRESS
                     0003   129          $VPUSH  SYM$L_VAL(R6)           ;PUSH SYMBOL VALUE ONTO STACK
                     000C   130          $OBJ_CHKBYT #TIR$C_STA_GBL      ;EMIT COMMAND FOR LINKER TO STACK GLOBAL
             FFEB'   31  0012   131          BRW     MAC$SYMNAMOUT           ;EMIT SYMBOL NAME AND RETURN
                     0015   132
                     0015   133          .SBTTL  P2$STKS STACK SYMBOL
                     0015   134
                     0015   135 ;++
                     0015   136 ; FUNCTIONAL DESCRIPTION:
                     0015   137 ;
                     0015   138 ;       STACK THE SYBMOL POINTED TO BY THE WORD IN THE INTERMEDIATE
                     0015   139 ;       FILE.  IF THE SYMBOL IS ABSOLUTE IT IS TREATED LIKE A
                     0015   140 ;       'STACK LITERAL'.  IF IT IS EXTERNAL IT IS TREATED LIKE A
                     0015   141 ;       'STACK GLOBAL'.
                     0015   142 ;
                     0015   143 ; INPUTS:
                     0015   144 ;
                     0015   145 ;       R8      POINTER INTO INTERMEDIATE FILE
                     0015   146 ;
                     0015   147 ;--
                     0015   148
                     0015   149 P2$STKS::
             56   68   D0  0015   150          MOVL    (R8),R6                 ;GET SYMBOL BLOCK ADDRESS
                  7E   13  0018   151          BEQL    80$                     ;IF EQL SPECIAL CANCEL COMMAND
                     001A   152                                               ;  FOR BRANCH DESTINATION
07 09 A6           04   E1  001A   153          BBC     #SYM$V_ABS,SYM$W_FLAG(R6),10$ ;BRANCH IF NOT ABSOLUTE SYMBOL
                     001F   154 ;
                     001F   155 ; PRETEND ITS A STACK LITERAL
                     001F   156 ;
          58   05 A6   9E  001F   157          MOVAB   SYM$L_VAL(R6),R8        ;POINT TO SYMBOL VALUE
                0080   31  0023   158          BRW     P2$STRL                 ;AND TREAT LIKE STACK LITERAL
                     0026   159 ;
                     0026   160 ; RELOCATABLE SYMBOL
                     0026   161 ;
15 09 A6           00   E0  0026   162 10$:    BBS     #SYM$V_DEF,SYM$W_FLAG(R6),40$ ;BRANCH IF SYMBOL DEFINED
05 09 A6           06   E0  002B   163          BBS     #SYM$V_LOCAL,SYM$W_FLAG(R6),20$ ;BRANCH IF LOCAL SYMBOL
08 09 A6           03   E0  0030   164          BBS     #SYM$V_EXTRN,SYM$W_FLAG(R6),30$ ;BRANCH IF DECLARED EXTERNAL
                     0035   165 ;
                     0035   166 ; SYMBOL LOCAL AND NOT DEFINED, OR NOT EXTERNAL
                     0035   167 ;
                     0035   168 20$:    $MAC_P2_ERR UNDEFSYM                    ; Report undefined symbol
                     003D   169 ;
                     003D   170 ; TREAT AS GLOBAL SYMBOL
```

```
                     003D   171 ;
          FFC0   31  003D   172 30$:    BRW     P2$STKG                 ;AND TREAT AS STACK GLOBAL
                     0040   173 ;
                     0040   174 ; SYMBOL IS DEFINED
                     0040   175 ;
                     0040   176 40$:    $VPUSH  SYM$L_VAL(R6)           ;STACK SYMBOL VALUE
    54   0C A6   9A 0049   177          MOVZBL  SYM$B_SEG(R6),R4        ;GET SYMBOL SEGMENT
    53   05 A6   9E 004D   178          MOVAB   SYM$L_VAL(R6),R3        ;POINT TO SYMBOL VALUE
       52   04   9A 0051   179          MOVZBL  #4,R2                   ;ASSUME LONGWORD
       51   06   9A 0054   180          MOVZBL  #TIR$C_STA_PL,R1        ;STACK PSECT BASE PLUS LONGWORD
         02 A3   B5 0057   181          TSTW    2(R3)                   ;CAN WE OPTIMIZE?
            19   12 005A   182          BNEQ    60$                     ;IF NEQ NO
            63   B5 005C   183          TSTW    (R3)                    ;
            15   19 005E   184          BLSS    60$                     ;IF LSS CANNOT OPTIMIZE
       52   02   9A 0060   185          MOVZBL  #2,R2                   ;MAKE WORD
       51   05   9A 0063   186          MOVZBL  #TIR$C_STA_PW,R1        ;STACK PSECT BASE PLUS WORD
         01 A3   95 0066   187          TSTB    1(R3)                   ;OPTIMIZE TO BYTE?
            0A   12 0069   188          BNEQ    60$                     ;IF NEQ NO
            63   95 006B   189          TSTB    (R3)                    ;
            06   19 006D   190          BLSS    60$                     ;IF LSS CANNOT OPTIMIZE
       52   01   9A 006F   191          MOVZBL  #1,R2                   ;MAKE BYTE
       51   04   9A 0072   192          MOVZBL  #TIR$C_STA_PB,R1        ;STACK PSECT BASE PLUS BYTE
                     0075   193 ;
                     0075   194 ; R1 -- COMMAND
                     0075   195 ; R4 -- SEGMENT
                     0075   196 ; R3 -- POINTS TO SYMBOL VALUE
                     0075   197 ;
                     0075   198 60$:    $OBJ_CHKBYT R1                  ;STACK COMMAND
            54   D5 007B   199          TSTL    R4                      ;MAKE SURE THAT WE DON'T FIDDLE WITH
            0A   13 007D   200          BEQL    65$                     ;THE ABSOLUTE PSECT.
            07   E0 007F   201          BBS     #SYM$V_REF,-            ;IF THE BLANK PSECT HASN'T BEEN REF'D
02 00000009'EF           0081   202                  PSECT$BLANK+SYM$W_FLAG,65$ ;IT'LL BE REMOVED, DECR THE SEG#
            54   D7 0087   203          DECL    R4                      ;TO PRESERVE THE PSECT ALIGNMENT
                     0089   204 65$:    $OBJ_OUTBYT R4                  ;STACK SEGMENT #
                     008F   205 70$:    $OBJ_OUTBYT (R3)+               ;EMIT VALUE
       F7 52   F5 0095   206          SOBGTR  R2,70$                  ;LOOP FOR ALL BYTES
            05   0098   207 80$:    RSB
                     0099   208
                     0099   209 ;++
                     0099   210 ; FUNCTIONAL DESCRIPTION:
                     0099   211 ;
                     0099   212 ;       EMIT TEXT TO OBJECT FILE TO REDEFINE TRANSFER ADDRESS.
                     0099   213 ;
                     0099   214 ;--
                     0099   215
                     0099   216 P2$REDEF::
    56   88   D0 0099   217          MOVL    (R8)+,R6                ;GET SYMBOL BLOCK ADDRESS
                     009C   218          $OBJ_CHKBYT #TIR$C_OPR_REDEF    ;EMIT REDEFINE COMMAND
       FF5A'   31 00A3   219          BRW     MAC$SYMNAMOUT           ;EMIT SYMBOL NAME AND RETURN
```

```
                     00A6   221          .SBTTL  P2$STKL STACK LITERAL VALUE
                     00A6   222
                     00A6   223 ;++
                     00A6   224 ; FUNCTIONAL DESCRIPTION:
                     00A6   225 ;
                     00A6   226 ;       STACK THE LITERL VALUE SUPPLIED IN THE INTERMEDIATE BUFFER.
                     00A6   227 ;       IF POSSIBLE, IT WILL BE OPTIMIZED TO A BYTE OR WORD.
                     00A6   228 ;
                     00A6   229 ; INPUTS:
                     00A6   230 ;
                     00A6   231 ;       R8      POINTS INTO INTERMEDIATE BUFFER
                     00A6   232 ;
                     00A6   233 ;--
                     00A6   234
                     00A6   235 P2$STKL::
                     00A6   236          $VPUSH  (R8)                    ;STACK THE VALUE
          55   04    9A  00AE   237          MOVZBL  #4,R5                   ;ASSUME LONGWORD VALUE
          54   03    9A  00B1   238          MOVZBL  #TIR$C_STA_LW,R4        ;...
            02 A8    B5  00B4   239          TSTW    2(R8)                   ;CAN WE OPTIMIZE TO WORD?
               13    12  00B7   240          BNEQ    10$                     ;MAYBE--SEE IF NEGATIVE
          55   02    9A  00B9   241          MOVZBL  #2,R5                   ;YES--MAKE WORD VALUE
          54   08    9A  00BC   242          MOVZBL  #TIR$C_STA_UW,R4        ;STACK UNSIGNED WORD
            01 A8    95  00BF   243          TSTB    1(R8)                   ;OPTIMIZE TO BYTE?
               2B    12  00C2   244          BNEQ    20$                     ;IF NEQ NO
          55   01    9A  00C4   245          MOVZBL  #1,R5                   ;YES--MAKE BYTE VALUE
          54   07    9A  00C7   246          MOVZBL  #TIR$C_STA_UB,R4        ;STACK UNSIGNED BYTE
               23    11  00CA   247          BRB     20$
                     00CC   248 ;
                     00CC   249 ; HIGH ORDER WORD IS NON-ZERO
                     00CC   250 ;
02 A8    FFFF 8F     B1  00CC   251 10$:    CMPW    #-1,2(R8)               ;IS HI-ORDER WORD -1?
                     1B  12  00D2   252          BNEQ    20$                     ;IF NE NO--CANNOT OPTIMIZE
                     68  B5  00D4   253          TSTW    (R8)                    ;LOW ORDER WORD NEGATIVE?
                     17  18  00D6   254          BGEQ    20$                     ;IF GE NO--CANNOT OPTIMIZE
          55   02    9A  00D8   255          MOVZBL  #2,R5                   ;YES--OPTIMIZE TO WORD
          54   02    9A  00DB   256          MOVZBL  #TIR$C_STA_SW,R4        ;STACK SIGNED WORD
01 A8      FF 8F     91  00DE   257          CMPB    #-1,1(R8)               ;CAN WE OPTIMIZE TO BYTE?
                     0A  12  00E3   258          BNEQ    20$                     ;IF NE NO
                     68  95  00E5   259          TSTB    (R8)                    ;MAYBE
                     06  18  00E7   260          BGEQ    20$                     ;IF GE CANNOT OPTIMIZE
          55   01    9A  00E9   261          MOVZBL  #1,R5                   ;MAKE BYTE
          54   01    9A  00EC   262          MOVZBL  #TIR$C_STA_SB,R4        ;STACK SIGNED BYTE
                     00EF   263 20$:    $OBJ_CHKBYT R4                  ;EMIT COMMAND
                     00F5   264 30$:    $OBJ_OUTBYT (R8)+               ;EMIT DATA
            F7 55    F5  00FB   265          SOBGTR  R5,30$                  ;LOOP FOR ALL BYTES
                     05  00FE   266          RSB
```

```
                                00FF   268          .SBTTL  P2$BDST BRANCH DESTINATION GENERATION
                                00FF   269
                                00FF   270 ;++
                                00FF   271 ; FUNCTIONAL DESCRIPTION:
                                00FF   272 ;
                                00FF   273 ;       THIS ROUTINE GENERATES BRANCH DESTINATIONS.
                                00FF   274 ;
                                00FF   275 ;
                                00FF   276 ; INPUTS:
                                00FF   277 ;
                                00FF   278 ;       R8 >>   2 BYTES OF MAC$GL_OPSIZE
                                00FF   279 ;               4 BYTES OF 0 OR SYMBOL ID ADDRESS (IF SPECIAL RESOLUTION)
                                00FF   280 ;               1 BYTE OF 0 OR PSECT # (IF SPECIAL RESOLUTION)
                                00FF   281 ;
                                00FF   282 ;--
                                00FF   283
                                00FF   284 P2$BDST::
          0000'CF   68    3C    00FF   285          MOVZWL  (R8),W^MAC$GL_OPSIZE    ;COPY FLAGS
             00 68    0D    E5  0104   286          BBCC    #OPF$V_LASTOPR,(R8),5$  ;CLEAR LAST OPERAND FLAG IN BUFFER
    0000'8F   0000'CF   B1    0108   287 5$:       CMPW    W^MAC$GL_LIST_PTR,#MAC$AB_LST_OP1 ;IN OPERAND FIELD?
                  0B    1B  010F   288          BLEQU   10$                     ;IF LEQU POINTER OK
              0000'CF   9E    0111   289          MOVAB   W^MAC$AB_LST_OP1,-      ;POSITION TO OPERAND
              0000'CF           0115   290                  @^MAC$GL_LIST_PTR
              0000'CF   D4    0118   291          CLRL    W^MAC$GL_MOPNUM
           56   02 A8    D0  011C   292 10$:      MOVL    2(R8),R6                ;GET SYMBOL ADDRESS
                01 A8    95  0120   293          TSTB    1(R8)                   ;SPECIAL PASS 2 RESOLUTION?
                   28    12  0123   294          BNEQ    50$                     ;IF NEQ NO
                   56    D5  0125   295          TSTL    R6                      ;YES--SYMBOL SPECIFIED?
                   24    13  0127   296          BEQL    50$                     ;IF EQL NO
       0C A6       06 A8    91  0129   297          CMPB    6(R8),SYM$B_SEG(R6)     ;YES--SAME PSECT?
                   10    12  012E   298          BNEQ    40$                     ;IF NEQ NO
    0B 09 A6       00    E1  0130   299          BBC     #SYM$V_DEF,SYM$W_FLAG(R6),40$ ;YES--SYMBOL DEFINED?
                                0135   300 ;
                                0135   301 ; SYMBOL IS DEFINED, AND LIVES IN SAME PSECT.  RESOLVE SYMBOL
                                0135   302 ; AND PRETEND OPTIMIZATION.
                                0135   303 ;
    02 A8       05 A6    D0  0135   304          MOVL    SYM$L_VAL(R6),2(R8)     ;SET SYMBOL VALUE
       01 A8       01    90  013A   305          MOVB    #1,1(R8)                ;PRETEND OPTIMIZED
                   0D    11  013E   306          BRB     50$                     ;SKIP SOME
                                0140   307 ;
                                0140   308 ; SYMBOL IN DIFFERENT PSECT OR NOT DEFINED.  TREAT LIKE SYMBOL
                                0140   309 ;
           0160 8F    BB    0140   310 40$:      PUSHR   #^M<R5,R6,R8>           ;SAVE REGISTERS
                88    B5  0144   311          TSTW    (R8)+                   ;POINT TO ID POINTER
                   FECC    30  0146   312          BSBW    P2$STKS                 ;STACK THE SYMBOL
           0160 8F    BA    0149   313          POPR    #^M<R5,R6,R8>           ;RESTORE REGISTERS
             01 A8    95  014D   314 50$:      TSTB    1(R8)                   ;OPTIMIZED?
                09    13  0150   315          BEQL    60$                     ;IF EQL NO
                                0152   316          $VPUSH  2(R8)                   ;YES--STACK TARGET ADDRESS
                                015B   317 60$:      $VPUSH  W^MAC$GL_PC             ;STACK CURRENT PC
           01   68    91  0165   318          CMPB    (R8),#1                 ;ONE BYTE BRANCH DESTINATION?
                59    12  0168   319          BNEQ    120$                    ;IF NE NO
                                016A   320 ;
                                016A   321 ; ONE BYTE BRANCH DESTINATION
                                016A   322 ;
     0000'CF47     D6    016A   323          INCL    W^MAC$AL_VALSTACK[R7]   ;ADD 1 TO PC
          FE8E'    30  016F   324          BSBW    P1$ARITH_SUB            ;COMPUTE BRANCH OFFSET
```

```
                55   0000'CF47   DE  0172   325          MOVAL   W^MAC$AL_VALSTACK[R7],R5;POINT TO RESULT
                          01 A8   95  0178   326          TSTB    1(R8)                   ;OPTIMIZED?
                             33   13  017B   327          BEQL    100$                    ;IF EQL NO
                          02 A5   B5  017D   328          TSTW    2(R5)                   ;YES--CHECK FOR DEST. OUT OF RANGE
                             09   12  0180   329          BNEQ    70$                     ;IF NEQ CHECK NEGATIVE DEST. OUT OF RANGE
                    65    FF80 8F   B3  0182   330          BITW    #'C<^X7F>,(R5)          ;POSITIVE DEST. OUT OF RANGE?
                             17   12  0187   331          BNEQ    80$                     ;IF NEQ YES--REPORT ERROR
                             1D   11  0189   332          BRB     90$                     ;NO--CONTINUE
                                      018B   333 ;
                                      018B   334 ; CHECK NEGATIVE DEST. OUT OF RANGE
                                      018B   335 ;
             53   007F 8F    65   A9  018B   336 70$:     BISW3   (R5),#^X7F,R3           ;HOPEFULLY MAKE -1
                FFFF 8F     02 A5   B1  0191   337          CMPW    2(R5),#-1               ;HI WORD ALL ONES?
                             07   12  0197   338          BNEQ    80$                     ;IF NEQ NO--DEST. OUT OF RANGE
                    FFFF 8F  53   B1  0199   339          CMPW    R3,#-1                  ;YES--LOW WORD AND ^XFF ALL ONES?
                             08   13  019E   340          BEQL    90$                     ;IF EQL YES--OK
                                      01A0   341 ;
                                      01A0   342 ; DEST. OUT OF RANGE
                                      01A0   343 ;
                                      01A0   344 80$:     $MAC_P2_ERR BRDESTRANG          ; Report branch destination out of range
                         50   65   90  01A8   345 90$:     MOVB    (R5),R0                 ;GET DESTINATION OFFSET
                              FE52'  30  01AB   346          BSBW    MAC$STOIM               ;STORE INTO OBJECT FILE
                             0B   11  01AE   347          BRB     110$
                                      01B0   348 ;
                                      01B0   349 ; UN-OPTIMIZABLE BRANCH DESTINATION
                                      01B0   350 ;
                0000'DF      27   90  01B0   351 100$:    MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;PUT QUOTE IN LISTING
                                      01B5   352          $OBJ_CHKBYT #TIR$C_STO_BD       ;STORE BYTE DISPLACED
                                      01BB   353 ;
                                      01BB   354 ; FINISH UP 1-BYTE BRANCH DESTINATION PROCESSING
                                      01BB   355 ;
                                      01BB   356 110$:    $MAC_LIST_BYTE #1               ;SEND ONE BYTE TO LISTING
                                54    11  01C1   357          BRB     180$                    ;
                                      01C3   358 ;
                                      01C3   359 ; TWO-BYTE BRANCH DESTINATION GENERATION
                                      01C3   360 ;
0000'CF47                     02    C0  01C3   361 120$:    ADDL2   #2,W^MAC$AL_VALSTACK[R7];ADD TWO TO PC
                              FE34'  30  01C9   362          BSBW    P1$ARITH_SUB            ;COMPUTE OFFSET
55   0000'CF47                DE  01CC   363          MOVAL   W^MAC$AL_VALSTACK[R7],R5;POINT TO OFFSET RESULT
                          01 A8   95  01D2   364          TSTB    1(R8)                   ;OPTIMIZED OFFSET?
                             2F   13  01D5   365          BEQL    160$                    ;IF EQL NO
                    53    02 A5   B0  01D7   366          MOVW    2(R5),R3                ;YES--CHECK FOR DEST. OUT OF RANGE
                             0D   13  01DB   367          BEQL    130$                    ;IF EQL CHECK FOR FORWARD OUT OF RANGE
                  FFFF 8F    53   B1  01DD   368          CMPW    R3,#-1                  ;NEGATIVE--IS HI WORD ALL ONES?
                             0A   12  01E2   369          BNEQ    140$                    ;IF NEQ NO--RANGE ERROR
                             65   B5  01E4   370          TSTW    (R5)                    ;YES--IS LO WORD NEGATIVE?
                             06   18  01E6   371          BGEQ    140$                    ;IF GEQ NO--RANGE ERROR
                             0C   11  01E8   372          BRB     150$                    ;YES--OK
                                      01EA   373 ;
                                      01EA   374 ; CHECK FORWARD RANGE ERROR
                                      01EA   375 ;
                             65   B5  01EA   376 130$:    TSTW    (R5)                    ;FORWARD DEST. OUT OF RANGE
                             08   18  01EC   377          BGEQ    150$                    ;IF GEQ NO
                                      01EE   378 ;
                                      01EE   379 ; REPORT BRANCH DESTINATION OUT OF RANGE
                                      01EE   380 ;
                                      01EE   381 140$:    $MAC_P2_ERR BRDESTRANG          ; Emit message
```

```
                          01F6   382 ;
                          01F6   383 ; FINISH TWO-BYTE BRANCH DESTINATION PROCESSING
                          01F6   384 ;
          50    85    90  01F6   385 150$:   MOVB    (R5)+,R0                ;GET LOW BYTE
              FE04'     30  01F9   386         BSBW    MAC$STOIM               ;STORE INTO OBJECT FILE
          50    65    90  01FC   387         MOVB    (R5),R0                 ;GET HIGH BYTE
              FDFE'     30  01FF   388         BSBW    MAC$STOIM               ;STORE INTO OBJECT FILE
                75    95  0202   389         TSTB    -(R5)                   ;KEEP R5 POINTING AT TOP OF VALUE STACK
                0B    11  0204   390         BRB     170$                    ;FINISH BRANCH DEST. PROCESSING
                          0206   391 ;
                          0206   392 ; NON-OPTIMIZED TWO BYTE BRANCH DESTINATION
                          0206   393 ;
0000'DF           27    90  0206   394 160$:   MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;STORE QUOTE IN LISTING
                          020B   395         $OBJ_CHKBYT #TIR$C_STO_WD       ;STORE WORD DISPLACED
                          0211   396 ;
                          0211   397 ; FINISH TWO-BYTE BRANCH DESTINATION PROCESSING
                          0211   398 ;
                          0211   399 170$:   $MAC_LIST_BYTE #2               ;SEND TWO BYTES TO LISTING
                          0217   400 ;
                          0217   401 ; FINISH BRANCH DESTINATION PROCESSING
                          0217   402 ;
                    05    0217   403 180$:   RSB                             ; Return
```

```
                     0218   405          .SBTTL  P2$LGLAB LABEL ROUTINE--CHECK FOR PHASE ERRORS
                     0218   406
                     0218   407 ;++
                     0218   408 ; FUNCTIONAL DESCRIPTION:
                     0218   409 ;
                     0218   410 ;       THIS ROUTINE CHECKS THAT THE VALUE FOR THE SYMBOL IS
                     0218   411 ;       THE SAME AS THE CURRENT PC.  IF NOT, AN ERROR MESSAGE
                     0218   412 ;       IS ISSUED.
                     0218   413 ;
                     0218   414 ;--
                     0218   415
                     0218   416 P2$LGLAB::
          56   68    D0  0218   417          MOVL    (R8),R6                 ;POINT TO SYMBOL BLOCK
    05 A6    0000'CF  D1  021B   418          CMPL    W^MAC$GL_PC,SYM$L_VAL(R6) ;PC MATCH SYMBOL VALUE?
                08    13  0221   419          BEQL    10$                     ;IF EQL YES
                      0223   420          $MAC_P2_ERR SYMOUTPHAS          ; No--report phase error
       00 6B    0C    E3  022B   421 10$:     BBCS    #FLG$V_MEBLST,(R11),20$ ;FORCE LABELS TO BE LISTED
                05    022F   422 20$:     RSB
                      0230   423
                      0230   424          .SBTTL  P2$OP   OPCODE GENERATOR
                      0230   425
                      0230   426 ;++
                      0230   427 ; FUNCTIONAL DESCRIPTION:
                      0230   428 ;
                      0230   429 ;       THIS ROUTINE WRITES THE OPCODE TO THE OBJECT AND LISTING
                      0230   430 ;       FILES.
                      0230   431 ; INPUTS:
                      0230   432 ;
                      0230   433 ;       R8 >>   OPCODE VALUE (1 WORD)
                      0230   434 ;
                      0230   435 ;--
                      0230   436
                      0230   437 P2$OP::
0000'CF   0000'CF     9E  0230   438          MOVAB   W^MAC$AB_LST_OPR,W^MAC$GL_LIST_PTR ;MOVE TO OPCODE FIELD
             57       D4  0237   439          CLRL    R7                      ;PREVENT STACK UNDERFLOW
                      0239   440          $VPUSH  (R8)                    ;PUSH OPCODE VALUE
   55   0000'CF47     DE  0241   441          MOVAL   W^MAC$AL_VALSTACK[R7],R5;KEEP R5 POINTING TO TOP OF STACK
          50   01     9A  0247   442          MOVZBL  #1,R0                   ;ASSUME 1 BYTE OPCODE
            01 A8     95  024A   443          TSTB    1(R8)                   ;TWO BYTE OPCODE?
               02     13  024D   444          BEQL    10$                     ;IF EQL NO
               50     D6  024F   445          INCL    R0                      ;YES--EMIT TWO BYTES
                      0251   446 10$:     $MAC_LIST_BYTE R0               ;SEND OPCODE VALUE TO LISTING
            01 A8     95  0254   447          TSTB    1(R8)                   ;TWO BYTE OPCODE?
               05     12  0257   448          BNEQ    20$                     ;IF NEQ YES
     0000'CF   02     C2  0259   449          SUBL2   #2,W^MAC$GL_LIST_PTR    ;TWO SPACES FOR ONE BYTE OPCODE
          50   88     90  025E   450 20$:     MOVB    (R8)+,R0                ;EMIT LOW BYTE OF OPCODE
             FD9C'     30  0261   451          BSBW    MAC$STOIM
          50   68     90  0264   452          MOVB    (R8),R0                 ;TWO BYTE OPCODE?
               03     13  0267   453          BEQL    30$                     ;IF EQL NO
             FD94'     31  0269   454          BRW     MAC$STOIM               ;YES--STORE INTO OBJECT FILE
                  05   026C   455 30$:     RSB                             ;AND RETURN
```

```
                          026D   457          .SBTTL  P2$REF  OPERAND REFERENCE GENERATION
                          026D   458
                          026D   459 ;++
                          026D   460 ; FUNCTIONAL DESCRIPTION:
                          026D   461 ;
                          026D   462 ;       THIS ROUTINE GENERATES OPERAND REFERENCES.  THE VALUE ASSOCIATED
                          026D   463 ;       WITH THE REFERENCE (IF ANY) IS LEFT ON THE VALUE STACK.
                          026D   464 ;
                          026D   465 ; INPUTS:
                          026D   466 ;
                          026D   467 ;       R8 >>   MODE    (1 BYTE)        OPERAND MODE ('E' MODE IF INDEXED)
                          026D   468 ;               IMODE   (1 BYTE)
                          026D   469 ;               REG     (1 BYTE)        OPERAND REGISTER ('E' REG. IF INDEXED)
                          026D   470 ;               IREG
                          026D   471 ;               FLAGS   (1 WORD)
                          026D   472 ;               VALUE   (1 LONGWORD)    ONLY IF OPTIMIZED
                          026D   473 ;
                          026D   474 ;--
                          026D   475
                          026D   476 P2$REF::
0000'CF   04 A8   3C      026D   477          MOVZWL  4(R8),W^MAC$GL_OPSIZE   ;COPY FLAGS
  00 04 A8   0D   E5      0273   478          BBCC    #OPF$V_LASTOPR,4(R8),5$ ;CLEAR LAST OPERAND FLAG
        0000'CF   B1      0278   479 5$:       CMPW    W^MAC$GL_LIST_PTR,-     ;POINTER OK?
        0000'8F           027C   480                          #MAC$AB_LST_OP1
              07   1B      027F   481          BLEQU   10$                     ;IF LEQU OK
        0000'CF   9E      0281   482          MOVAB   W^MAC$AB_LST_OP1,-      ;NO--SET POINTER
        0000'CF           0285   483                          @W^MAC$GL_LIST_PTR
     00 6B   07   E5      0288   484 10$:      BBCC    #FLG$V_EXPOPT,(R11),20$ ;CLEAR OPTIMIZED EXPRESSION FLAG
                          028C   485 20$:
                          028C   486 P2$XREF:
         05 A8   95       028C   487          TSTB    5(R8)                   ;OPTIMIZED?
            0F   13       028F   488          BEQL    10$                     ;IF EQL NO
            57   DD       0291   489          PUSHL   R7                      ;YES--SAVE VALUE STACK POINTER
                 0293     490          $VPUSH  6(R8)                   ;STACK VALUE
     00 6B   07   E3      029C   491          BBCS    #FLG$V_EXPOPT,(R11),10$ ;SET OPTIMIZED EXPRESSION FLAG
        50   68   9A      02A0   492 10$:      MOVZBL  (R8),R0                 ;GET MODE OF REFERENCE
             05   19      02A3   493          BLSS    20$                     ;IF LSS THEN ILLEGAL MODE
        0F   50   91      02A5   494          CMPB    R0,#15                  ;
             0A   15      02A8   495          BLEQ    30$                     ;IF LEQ THEN LEGAL MODE
                          02AA   496 20$:      $MAC_P2_ERR ILLMODE             ; Report mode error
             50   D4      02B2   497          CLRL    R0                      ;USE MODE 0
        53   50   9A      02B4   498 30$:      MOVZBL  R0,R3                   ;SAVE MODE
    52  50   04   78      02B7   499          ASHL    #4,R0,R2                ;SHIFT MODE TO UPPER 4 BITS OF BYTE
      54   02 A8   9A      02BB   500          MOVZBL  2(R8),R4                ;GET REGISTER OF REFERENCE
             05   19      02BF   501          BLSS    40$                     ;IF LSS THEN ILLEGAL REGISTER
        0F   54   91      02C1   502          CMPB    R4,#15                  ;LEGAL REGISTER?
             08   15      02C4   503          BLEQ    50$                     ;IF LEQ YES
                          02C6   504 40$:      $MAC_P2_ERR ILLREGNUM           ; No-report register error
                          02CE   505 50$:
        52   54   88      02CE   506          BISB2   R4,R2                   ;PACK MODE AND REGISTER
                          02D1   507          $VPUSH  R2                      ;AND STORE ONTO VALUE STACK
55   0000'CF47   DE      02D9   508          MOVAL   W^MAC$AL_VALSTACK[R7],R5 ;POINT TO VALUE ON TOP OF STACK
                          02DF   509 ;
                          02DF   510 ; CALL REFERENCE PROCESSING ROUTINE WITH:
                          02DF   511 ;
                          02DF   512 ;       R8      POINTER INTO INTERMEDIATE CODE BUFFER
                          02DF   513 ;       R7      VALUE STACK POINTER
```

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                          02DF    514 ;       R6
                          02DF    515 ;       R5      POINTER TO TOP VALUE ON VALUE STACK (MAC$AL_VALSTACK[R7])
                          02DF    516 ;       R4      REGISTER FOR REFERENCE
                          02DF    517 ;       R2      Number of characters to display operand
                          02DF    518 ;
   52   0335'CF43    90    02DF    519         MOVB    W^REF_SIZE[R3],R2       ; Get characters required
   53   02F5'CF43    D0    02E5    520         MOVL    W^REF_DISP[R3],R3       ;GET DISPATCH ROUTINE ADDRESS
                63    16    02EB    521         JSB     (R3)                    ;DISPATCH TO MODE ROUTINE
        03 6B    07    E5    02ED    522         BBCC    #FLG$V_EXPOPT,(R11),60$ ;BRANCH IF NOT OPTIMIZED REFERENCE
           57    8E    D0    02F1    523         MOVL    (SP)+,R7                ;YES--RESTORE VALUE STACK PTR
                 05    02F4    524 60$:    R^B                                 ; and return
                       02F5    525                                             ;AND RETURN
                       02F5    526
                       02F5    527         .MACRO  REF_PRO ROUTINE
                       02F5    528         .DEBUG  ROUTINE
                       02F5    529         .LONG   ROUTINE
                       02F5    530         .ENDM   REF_PRO
                       02F5    531 REF_DISP:                                   ;OPERAND REFERENCE DISPATCH TABLE
                       02F5    532         REF_PRO REF_0                       ;LITERAL
                       02F9    533         REF_PRO REF_1                       ;IMMEDIATE (PC)+
                       02FD    534         REF_PRO REF_2                       ;DEFERRED IMMEDIATE @(PC)+
                       0301    535         REF_PRO REF_3                       ;POSITION INDEPENDENT (G^)
                       0305    536         REF_PRO REF_4                       ;INDEXED
                       0309    537         REF_PRO REF_5                       ;REGISTER
                       030D    538         REF_PRO REF_6                       ;REGISTER DEFERRED
                       0311    539         REF_PRO REF_7                       ;AUTO DECREMENT
                       0315    540         REF_PRO REF_8                       ;AUTO INCREMENT
                       0319    541         REF_PRO REF_9                       ;DEFERRED AUTO INCREMENT
                       031D    542         REF_PRO REF_A                       ;BYTE DISPLACEMENT
                       0321    543         REF_PRO REF_B                       ;DEFERRED BYTE DISPLACEMENT
                       0325    544         REF_PRO REF_C                       ;WORD DISPLACEMENT
                       0329    545         REF_PRO REF_D                       ;DEFERRED WORD DISPLACEMENT
                       032D    546         REF_PRO REF_E                       ;LONG WORD DISPLACEMENT
                       0331    547         REF_PRO REF_F                       ;DEFERRED LONG WORD DISPLACEMENT
                       0335    548 ;
                       0335    549 ; Taole of characters required to display operand
                       0335    550 ;
                       0335    551 REF_SIZE:
02                     0335    552         .BYTE   2                           ; Literal
03                     0336    553         .BYTE   3                           ; Immediate (PC)+
03                     0337    554         .BYTE   3                           ; Deferred immediate (PC)+
0B                     0338    555         .BYTE   11                          ; Position independent (G^)
02                     0339    556         .BYTE   2                           ; Indexed
02                     033A    557         .BYTE   2                           ; Register
02                     033B    558         .BYTE   2                           ; Register deferred
02                     033C    559         .BYTE   2                           ; Auto decrement
02                     033D    560         .BYTE   2                           ; Auto increment
02                     033E    561         .BYTE   2                           ; Deferred auto increment
05                     033F    562         .BYTE   5                           ; Byte displacement
05                     0340    563         .BYTE   5                           ; Deferred byte displacement
07                     0341    564         .BYTE   7                           ; Word displacment
07                     0342    565         .BYTE   7                           ; Deferred word displacment
0B                     0343    566         .BYTE   11                          ; Long word displacment
0B                     0344    567         .BYTE   11                          ; Deferred word long displacment
```

```
                        0345   569          .SBTTL  ROUTINES CALLED BY P2$REF
                        0345   570
                        0345   571 ;++
                        0345   572 ; FUNCTIONAL DESCRIPTION:
                        0345   573 ;
                        0345   574 ;       THIS ROUTINE PROCESSES LITERAL REFERENCES
                        0345   575 ;
                        0345   576 ;--
                        0345   577
                        0345   578 REF_0:                                        ;LITERAL MODE
              02D0   30 0345   579          BSBW    OPND_CHECK                  ; Check listing space for operand
                57   D7 0348   580          DECL    R7                          ;IGNORE MODE/REG ON STACK
                75   D5 034A   581          TSTL    -(R5)                       ;BACKUP STACK POINTER
          1A 6B   07   E1 034C   582          BBC     #FLG$V_EXPOPT,(R11),30$ ;BRANCH IF NOT OPTIMIZED EXPRESSION
            02 A5   B5 0350   583          TSTW    2(R5)                       ;CHECK FOR LEGAL LITERAL
                05   12 0353   584          BNEQ    10$                         ;IF NEQ THEN TRUNCATION
             3F 65   B1 0355   585          CMPW    (R5),#63                    ;LARGEST LITERAL
                08   1B 0358   586          BLEQU   20$                         ;IF LEQ THEN OK
                        035A   587 10$:     $MAC_P2_ERR DA ATRUNC               ; Error message
             50 65   90 0362   588 20$:     MOVB    (R5),R0                     ;GET BYTE OF DATA
              FC98'  30 0365   589          BSBW    MAC$STOIM                   ;STORE INTO OBJECT FILE
                0B   11 0368   590          BRB     40$
                        036A   591 ;
                        036A   592 ; NOT OPTIMIZED
                        036A   593 ;
        0000'DF   27   90 036A   594 30$:     MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;PUT QUOTE IN LISTING
                        036F   595          $OBJ_CHKBYT #TIR$C_STO_LI           ;STORE LITERAL
                        0375   596 40$:     $MAC_LIST_BYTE #1                   ;LIST THE BYTE
                05   037B   597          RSB
                        037C   598
                        037C   599 ;++
                        037C   600 ; FUNCTIONAL DESCRIPTION:
                        037C   601 ;
                        037C   602 ;       REF_2 PROCESSES ABSOLUTE [@(PC)+] REFERENCES.  REF_1
                        037C   603 ;       PROCESSES IMMEDIATE REFERENCES
                        037C   604 ;
                        037C   605 ;--
                        037C   606
                        037C   607 REF_2:                                        ;ABSOLUTE @(PC)+
     50   009F 8F   3C 037C   608          MOVZWL  #<ADM$_DFRAUTOINC@4>+15,R0;SET MODE/REGISTER
                05   11 0381   609          BRB     IMM
                        0383   610 REF_1:                                        ;IMMEDIATE MODE (PC)+
     50   008F 8F   3C 0383   611          MOVZWL  #<ADM$_REGAUTOINC@4>+15,R0;SET MODE/REGISTER
          65   50   D0 0388   612 IMM:     MOVL    R0,(R5)                     ;SET MODE/REGISTER ON STACK
              FC72'  30 038B   613          BSBW    MAC$STOIM                   ;STORE MODE/REGISTER IN OBJECT CODE
   50       04 A8   9A 038E   614          MOVZBL  4(R8),R0                    ; Get type of reference (byte, word, long)
50 50       01   78 0392   615          ASHL    #1,R0,R0                    ; Convert to number of chars required
          52   50   C0 0396   616          ADDL2   R0,R2                       ; add to initial size
               027C   30 0399   617          BSBW    OPND_CHECK                  ; Check listing space for operand
                        039C   618          $MAC_LIST_BYTE #1                   ;LIST MODE/REGISTER
   01       04 A8   91 03A2   619          CMPB    4(R8),#1                    ;BYTE FORMAT?
                21   12 03A6   620          BNEQ    30$                         ;IF NEQ NO
                        03A8   621 ;
                        03A8   622 ; BYTE FORMAT IMMEDIATE REFERENCE
                        03A8   623 ;
   0B 6B   07   E1 03A8   624          BBC     #FLG$V_EXPOPT,(R11),10$ ;BRANCH IF NOT OPTIMIZED EXPRESSION
              FC51'  30 03AC   625          BSBW    MAC$CK_BYT_TRUN             ;YES--CHECK TRUNCATION
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                50    65   90  03AF   626          MOVB    (R5),R0                 ;GET THE VALUE
                   FC4B'  30  03B2   627          BSBW    MAC$STOIM               ;STORE INTO OBJECT CODE
                      0B  11  03B5   628          BRB     20$
                          03B7   629 ;
                          03B7   630 ; NON-OPTIMIZED BYTE
                          03B7   631 ;
          0000'DF    27   90  03B7   632 10$:     MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;PUT QUOTE INTO LISTING
                          03BC   633          $OBJ_CHKBYT #TIR$C_STO_B        ;STORE BYTE COMMAND
                          03C2   634 20$:     $MAC_LIST_BYTE #1               ;LIST BYTE VALUE
                      05  03C8   635          RSB
                          03C9   636 ;
                          03C9   637 ; NOT BYTE REFERENCE
                          03C9   638 ;
             02    04 A8  91  03C9   639 30$:     CMPB    4(R8),#2                ;WORD FORMAT?
                      1E  12  03CD   640          BNEQ    60$                     ;IF NEQ NO--LONGWORD
             08 6B    07  E1  03CF   641          BBC     #FLG$V_EXPOPT,(R11),40$ ;YES--BRANCH IF NOT OPTIMIZED
                   FC2A'  30  03D3   642          BSBW    MAC$CK_WRD_TRUN         ;OPTIMIZED--CHECK TRUNCATION
                54    02  9A  03D6   643          MOVZBL  #2,R4                   ;SET COUNT
                      19  11  03D9   644          BRB     65$                     ;GO STORE BYTES
                          03DB   645 ;
                          03DB   646 ; NON-OPTIMIZED WORD REFERENCE
                          03DB   647 ;
          0000'DF    27   90  03DB   648 40$:     MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;STORE QUOTE IN LISTING
                          03E0   649          $OBJ_CHKBYT #TIR$C_STO_W        ;STORE WORD COMMAND
                          03E6   650 50$:     $MAC_LIST_BYTE #2               ;LIST WORD
                      05  03EC   651          RSB
                          03ED   652 ;
                          03ED   653 ; LONGWORD FORMAT
                          03ED   654 ;
          16 6B    07   E1  03ED   655 60$:     BBC     #FLG$V_EXPOPT,(R11),80$ ;BRANCH IF NOT OPTIMIZED
                54    04  9A  03F1   656          MOVZBL  #4,R4                   ;GET LOOP COUNT
                          03F4   657 ;
                          03F4   658 ; EMIT VALUE TO OBJECT CODE, 1 BYTE AT A TIME
                          03F4   659 ;
                   54     DD  03F4   660 65$:     PUSHL   R4                      ;SAVE BYTE COUNT
                50    85   90  03F6   661 70$:     MOVB    (R5)+,R0                ;GET NEXT BYTE
                   FC04'  30  03F9   662          BSBW    MAC$STOIM               ;STORE INTO OBJECT CODE
                   F7 54  F5  03FC   663          SOBGTR  R4,70$                  ;LOOP FOR ALL
                54    8E   D0  03FF   664          MOVL    (SP)+,R4                ;RESTORE BYTE COUNT
                55    54   C2  0402   665          SUBL2   R4,R5                   ;ADJUST THE STACK POINTER
                      0E   11  0405   666          BRB     90$
                          0407   667 ;
                          0407   668 ; NON-OPTIMIZED LONGWORD
                          0407   669 ;
          0000'DF    27   90  0407   670 80$:     MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;STORE QUOTE IN LISTING
                          040C   671          $OBJ_CHKBYT #TIR$C_STO_LW       ;STORE LONGWORD COMMAND
                54    04   9A  0412   672          MOVZBL  #4,R4                   ;SET TO LIST 4 BYTES
                          0415   673 90$:     $MAC_LIST_BYTE R4               ;LIST LONGWORD
                      05  041B   674          RSB
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                     041C   676 ;++
                     041C   677 ; FUNCTIONAL DESCRIPTION:
                     041C   678 ;
                     041C   679 ;       STORE POSITION INDEPENDENT REFERENCES.
                     041C   680 ;
                     041C   681 ;--
                     041C   682
                     041C   683 REF_3:
        01F9   30    041C   684          BSBW    OPND_CHECK              ; Check listing space for operand
          57   D7    041F   685          DECL    R7                      ;IGNORE MODE/REGISTER
          75   D5    0421   686          TSTL    -(R5)                   ;BACK R5 UP TOO
   50 6B  07   E1    0423   687          BBC     #FLG$V_EXPOPT,(R11),30$ ;BRANCH IF NOT OPTIMIZED REFERENCE
      53  06   9A    0427   688          MOVZBL  #TIR$C_STA_PL,R3        ;ASSUME LONGWORD
      52  04   9A    042A   689          MOVZBL  #4,R2                   ;...
        02 A5  B5    042D   690          TSTW    2(R5)                   ;CAN WE OPTIMIZE SOME MORE?
          19   12    0430   691          BNEQ    10$                     ;IF NEQ NO
          65   B5    0432   692          TSTW    (R5)                    ;MAYBE--CHECK LOW WORD
          15   19    0434   693          BLSS    10$                     ;IF LSS CANNOT OPTIMIZE
      53  05   9A    0436   694          MOVZBL  #TIR$C_STA_PW,R3        ;CHANGE TO STACK WORD
      52  02   9A    0439   695          MOVZBL  #2,R2                   ;...
        01 A5  95    043C   696          TSTB    1(R5)                   ;WE'RE DOING GOOD--OPTIMIZE TO BYTE?
          0A   12    043F   697          BNEQ    10$                     ;IF NEQ NO
          65   95    0441   698          TSTB    (R5)                    ;MAYBE
          06   19    0443   699          BLSS    10$                     ;IF LSS NO
      53  04   9A    0445   700          MOVZBL  #TIR$C_STA_PB,R3        ;YES--CHANGE TO BYTE
      52  01   9A    0448   701          MOVZBL  #1,R2                   ;...
                     044B   702 10$:      $OBJ_CHKBYT R3                  ;OUTPUT COMMAND
      0000'CF   DD   0451   703          PUSHL   W^MAC$GL_PSECT          ;USE TEMP TO WRITE ADJUSTED SEGMENT #
          0A   13    0455   704          BEQL    15$                     ;DON'T FIDDLE WITH THE ABS PSECT!
          07   E0    0457   705          BBS     #SYM$V_REF,-            ;IF THE BLANK PSECT HASN'T BEEN REF'D
02 00000009'EF          0459   706                  PSECT$BLANK+SYM$W_FLAG,15$ ;IT'LL BE REMOVED, DECR THE SEG#
          6E   D7    045F   707          DECL    (SP)                    ;TO PRESERVE THE PSECT ALIGNMENT
                     0461   708 15$:      $OBJ_OUTBYT (SP)                ;OUTPUT CURRENT PSECT NUMBER
          8E   D5    0467   709          TSTL    (SP)+                   ;AND CLEAN UP THE STACK.
          52   DD    0469   710          PUSHL   R2                      ;SAVE BYTE COUNT
                     046B   711 20$:      $OBJ_OUTBYT (R5)+               ;EMIT ONE BYTE OF VALUE
        F7 52  F5    0471   712          SOBGTR  R2,20$                  ;LOOP FOR ALL
   55   8E  C2    0474   713          SUBL2   (SP)+,R5                 ;ADJUST STACK POINTER
                     0477   714 30$:      $OBJ_CHKBYT #TIR$C_STO_PICR     ;GENERATE POS. IND. REF.
50   46 8F  9A    047D   715          MOVZBL  #^A/F/,R0                ;PRINT 'F'
      FB7C'  30    0481   716          BSBW    MAC$LST_CHAR
50   47 8F  9A    0484   717          MOVZBL  #^A/G/,R0                ;PRINT 'G'
      FB75'  30    0488   718          BSBW    MAC$LST_CHAR
   50   27  9A    048B   719          MOVZBL  #^A/'/,R0                ;PRINT QUOTE
      FB6F'  30    048E   720          BSBW    MAC$LST_CHAR
                     0491   721          $INC_PC                         ;COUNT MODE/REGISTER
                     0495   722          $MAC_LIST_BYTE #4               ;PRINT LONGWORD ON STACK
                05   0498   723          RSB
```

```
                        049C   725 ;++
                        049C   726 ; FUNCTIONAL DESCRIPTION:
                        049C   727 ;
                        049C   728 ;       PROCESS INDEX MODE REFERENCES
                        049C   729 ;
                        049C   730 ;--
                        049C   731
                        049C   732 REF_4:                                       ;INDEXED REFERENCE
          50   01 A8   9A   049C   733         MOVZBL  1(R8),R0                ; Get mode of reference
      52   FE90 CF40   80   04A0   734         ADDB2   W^REF_SIZE[R0],R2       ; and add bytes required
             016F      30   04A6   735         BSBW    OPND_CHECK              ; Check listing space for operand
          50   65     90   04A9   736         MOVB    (R5),R0                 ;GET MODE/REGISTER
             FB51'     30   04AC   737         BSBW    MAC$STOIM               ;STORE INTO OBJECT CODE
                       04AF   738         $MAC_LIST_BYTE #1               ;LIST MODE/REGISTER
          0000'CF      D6   04B5   739         INCL    W^MAC$GL_LIST_PTR       ; Back up over space
       00 6B   28      E2   04B9   740         BBSS    #FLG$V_OPNDCHR,(R11),10$ ; Flag that operand check is done
                       04BD   741 10$:
          68   01 A8   90   04BD   742         MOVB    1(R8),(R8)              ;MOVE MODES
               01 A8   94   04C1   743         CLRB    1(R8)                   ;
        02 A8  03 A8   90   04C4   744         MOVB    3(R8),2(R8)             ;
               03 A8   94   04C9   745         CLRB    3(R8)
   7E  6B  FFFFFF7F 8F   CB   04CC   746         BICL3   #^C<FLG$M_EXPOPT>,(R11),-(SP) ;SAVE OLD EXPOPT FLAG
             FDB5      30   04D4   747         BSBW    P2$XREF                 ;CALL XREF FOR REST OF OPERAND
          6B   8E      C8   04D7   748         BISL2   (SP)+,(R11)             ;SET EXPOPT FLAG IF SET BEFORE
                       05   04DA   749         RSB                             ;ALL DONE
                       04DB   750
                       04DB   751 REF_5:                                       ;REGISTER
                       04DB   752 REF_6:                                       ;REGISTER DEFERRED
                       04DB   753 REF_7:                                       ;AUTODECREMENT
                       04DB   754 REF_8:                                       ;AUTOINCREMENT
                       04DB   755 REF_9:                                       ;AUTOINCREMENT DEFERRED
          013A     30   04DB   756         BSBW    OPND_CHECK              ; Check listing space for operand
   50   65       90   04DE   757         MOVB    (R5),R0                 ;GET MODE/REGISTER
        FB1C'    30   04E1   758         BSBW    MAC$STOIM               ;STORE IN OBJECT CODE
                       04E4   759         $MAC_LIST_BYTE #1               ;LIST MODE/REGISTER
                 05   04EA   760         RSB
```

```
                          04EB   762 ;++
                          04EB   763 ; FUNCTIONAL DESCRIPTION:
                          04EB   764 ;
                          04EB   765 ;       THIS ROUTINE PROCESSES 8-BIT DISPLACEMENT REFERENCES
                          04EB   766 ;
                          04EB   767 ;--
                          04EB   768
                          04EB   769 REF_A:                                       ;8-BIT DISPLACEMENT
                          04EB   770 REF_B:                                       ;8-BIT DEFERRED DISPLACEMENT
            012A   30     04EB   771         BSBW    OPND_CHECK                    ; Check listing space for operand
       50     65   90     04EE   772         MOVB    (R5),R0                       ;GET MODE/REGISTER
          FB0C'   30     04F1   773         BSBW    MAC$STOIM                     ;OUTPUT TO OBJECT CODE
                  30     04F4   774         $MAC_LIST_BYTE #1                     ;LIST MODE/REGISTER
 0F     02 AB   91     04FA   775         CMPB    2(R8),#15                     ;PC RELATIVE REFERENCE?
            2F   12     04FE   776         BNEQ    20$                           ;IF NEQ NO
 1E 6B     07   E1     0500   777         BBC     #FLG$V_EXPCPT,(R11),10$       ;YES--BRANCH IF NOT OPTIMIZED
                  30     0504   778         $VPUSH  W^MAC$GL_PC                   ;OPTIMIZED--STACK PC
            85   D5     050E   779         TSTL    (R5)+                         ;BUMP R5
            65   D6     0510   780         INCL    (R5)                          ;ADD 1 FOR OPERAND
          FAEB'   30     0512   781         BSBW    P1$ARITH_SUB                  ;
            75   D5     0515   782         TSTL    -(R5)                         ;BACK UP MY POINTER
          FAE6'   30     0517   783         BSBW    MAC$CK_SBY_TRUN               ;CHECK FOR TRUNCATION
       50   65   90     051A   784         MOVB    (R5),R0                       ;GET BYTE
          FAE0'   30     051D   785         BSBW    MAC$STOIM                     ;AND STORE IN OBJECT CODE
            27   11     0520   786         BRB     40$
                          0522   787 ;
                          0522   788 ; NON-OPTIMIZED PC-RELATIVE
                          0522   789 ;
0000'DF     27   90     0522   790 10$:    MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;PUT QUOTE INTO LISTING
                          0527   791         $OBJ_CHKBYT #TIR$C_STO_BD             ;STORE BYTE DISPLACED
            1A   11     052D   792         BRB     40$
                          052F   793 ;
                          052F   794 ; NOT PC-RELATIVE
                          052F   795 ;
 0B 6B     07   E1     052F   796 20$:    BBC     #FLG$V_EXPOPT,(R11),30$ ;BRANCH IF NOT OPTIMIZED
          FACA'   30     0533   797         BSBW    MAC$CK_SBY_TRUN               ;YES--CHECK FOR TRUNCATION
       50   65   90     0536   798         MOVB    (R5),R0                       ;GET THE BYTE
          FAC4'   30     0539   799         BSBW    MAC$STOIM                     ;STORE INTO OBJECT CODE
            08   11     053C   800         BRB     40$
                          053E   801 ;
                          053E   802 ; NOT PC-RELATIVE, NOT OPTIMIZED
                          053E   803 ;
0000'DF     27   90     053E   804 30$:    MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;PUT QUOTE INTO LISTING
                          0543   805         $OBJ_CHKBYT #TIR$C_STO_SB             ; Store signed byte
                          0549   806 ;
                          0549   807 ; FINISH PROCESSING
                          0549   808 ;
                          0549   809 40$:    $MAC_LIST_BYTE #1                     ;LIST THE BYTE
                    05    054F   810         RSB
```

```
                     0550   812 ;++
                     0550   813 ; FUNCTIONAL DESCRIPTION:
                     0550   814 ;
                     0550   815 ;       PROCESS 16-BIT DISPLACEMENT AND 16-BIT DEFERRED DISPLACEMENT
                     0550   816 ;       REFERENCES.
                     0550   817 ;
                     0550   818 ;--
                     0550   819
                     0550   820 REF_C:                                    ;16-BIT DISPLACEMENT
                     0550   821 REF_D:                                    ;16-BIT DEFERRED DISPLACEMENT
          00C5   30  0550   822         BSBW    OPND_CHECK                ; Check listing space for operand
     50   65   90  0553   823         MOVB    (R5),R0                   ;GET MODE/REGISTER
          FAA7'  30  0556   824         BSBW    MAC$STOIM                 ;WRITE TO OBJECT CODE
                     0559   825         $MAC_LIST_BYTE #1                 ;LIST MODE/REGISTER
     0F   54   91  055F   826         CMPB    R4,#15                    ;PC-RELATIVE?
          2A   12  0562   827         BNEQ    20$                       ;IF NEQ NO
  19 6B   07   E1  0564   828         BBC     #FLG$V_EXPOPT,(R11),10$   ;YES--BRANCH IF NOT OPTIMIZED
                     0568   829         $VPUSH  W^MAC$GL_PC               ;OPTIMIZED--STACK PC
          85   D5  0572   830         TSTL    (R5)+                     ;BUMP THE POINTER
     65   02   C0  0574   831         ADDL2   #2,(R5)                   ;PLUS SIZE OF OPERAND
          FA86'  30  0577   832         BSBW    P1$ARITH_SUB
          75   D5  057A   833         TSTL    -(R5)                     ;BACK UP POINTER
          FA81'  30  057C   834         BSBW    MAC$CK_SWD_TRUN           ;CHECK FOR TRUNCATION
          14   11  057F   835         BRB     30$                       ;GO EMIT CODE AND EXIT
                     0581   836 ;
                     0581   837 ; PC-RELATIVE, NOT OPTIMIZED
                     0581   838 ;
0000'DF   27   90  0581   839 10$:    MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;PUT QUOTE IN LISTING
                     0586   840         $OBJ_CHKBYT #TIR$C_STO_WD         ;STORE WORD DISPLACED
          22   11  0588   841         BRB     50$
                     058E   842 ;
                     058E   843 ; NOT PC-RELATIVE
                     058E   844 ;
  13 6B   07   E1  058E   845 20$:    BBC     #FLG$V_EXPOPT,(R11),40$   ;BRANCH IF NOT OPTIMIZED
          FA6B'  30  0592   846         BSBW    MAC$CK_SWD_TRUN           ;YES--CHECK TRUNCATION
     50   85   90  0595   847 30$:    MOVB    (R5)+,R0                  ;GET A BYTE
          FA65'  30  0598   848         BSBW    MAC$STOIM                 ;SEND IT TO OBJECT CODE
     50   65   90  059B   849         MOVB    (R5),R0                   ;GET SECOND BYTE
          FA5F'  30  059E   850         BSBW    MAC$STOIM                 ;SEND IT TO OBJECT CODE
          75   95  05A1   851         TSTB    -(R5)                     ;KEEP R5 POINTING TO TO  OF STACK
          0B   11  05A3   852         BRB     50$
                     05A5   853 ;
                     05A5   854 ; NOT PC-RELATIVE, NOT OPTIMIZED
                     05A5   855 ;
0000'DF   27   90  05A5   856 40$:    MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;PUT QUOTE IN LISTING
                     05AA   857         $OBJ_CHKBYT #TIR$C_STO_SW         ;STORE SIGNED WORD
                     05B0   858 50$:    $MAC_LIST_BYTE #2                 ;LIST THE WORD
               05    05B6   859         RSB
```

```
                     05B7   861 ;++
                     05B7   862 ; FUNCTIONAL DESCRIPTION:
                     05B7   863 ;
                     05B7   864 ;       PROCESS 32-BIT DISPLACEMENT AND 32-BIT DEFERRED DISPLACEMENT
                     05B7   865 ;       REFERENCES
                     05B7   866 ;
                     05B7   867 ;--
                     05B7   868
                     05B7   869 REF_E:                                      ;32-BIT DISPLACEMENT
                     05B7   870 REF_F:                                      ;32-BIT DEFERRED DISPLACEMENT
        005E   30    05B7   871          BSBW    OPND_CHECK                  ; Check listing space for operand
     50   65   90    05BA   872          MOVB    (R5),R0                     ;GET MODE/REGISTER
          FA40' 30    05BD   873          BSBW    MAC$STOIM                   ;WRITE TO OBJECT CODE
                     05C0   874          $MAC_LIST_BYTE #1                   ;LIST MODE/REGISTER
     0F   54   91    05C6   875          CMPB    R4,#15                      ;PC-RELATIVE?
          27   12    05C9   876          BNEQ    20$                         ;IF NEQ NO
  16 6B   07   E1    05CB   877          BBC     #FLG$V_EXPOPT,(R11),10$     ;YES--BRANCH IF NOT OPTIMIZED
                     05CF   878          $VPUSH  W^MAC$GL_PC                 ;OPTIMIZED--STACK PC
          85   D5    05D9   879          TSTL    (R5)+                       ;BUMP THE POINTER
     65   04   C0    05DB   880          ADDL2   #4,(R5)                     ;PLUS SIZE OF OPERAND
          FA1F' 30    05DE   881          BSBW    P1$ARITH_SUB
          75   D5    05E1   882          TSTL    -(R5)                       ;BACKUP THE POINTER
          11   11    05E3   883          BRB     30$                         ;GO EMIT CODE AND EXIT
                     05E5   884 ;
                     05E5   885 ; PC-RELATIVE, NOT OPTIMIZED
                     05E5   886 ;
0000'DF   27   90    05E5   887 10$:     MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;PUT QUOTE IN LISTING
                     05EA   888          $OBJ_CHKBYT #TIR$C_STO_LD           ;STORE LONGWORD DISPLACED
          1F   11    05F0   889          BRB     60$
                     05F2   890 ;
                     05F2   891 ; NOT PC-RELATIVE
                     05F2   892 ;
  10 6B   07   E1    05F2   893 20$:     BBC     #FLG$V_EXPOPT,(R11),50$ ;BRANCH IF NOT OPTIMIZED
     53   04   9A    05F6   894 30$:     MOVZBL  #4,R3                       ;SET A LOOP COUNT
     50   85   90    05F9   895 40$:     MOVB    (R5)+,R0                    ;GET NEXT BYTE
          FA01' 30    05FC   896          BSBW    MAC$STOIM                   ;STORE IN OBJECT CODE
        F7 53   F5    05FF   897          SOBGTR  R3,40$                      ;LOOP FOR 4 BYTES
          75   D5    0602   898          TSTL    -(R5)                       ;KEEP R5 POINTING TO TOP OF STACK
          0B   11    0604   899          BRB     60$                         ;AND EXIT
                     0606   900 ;
                     0606   901 ; NOT PC-RELATIVE, NOT OPTIMIZED
                     0606   902 ;
0000'DF   27   90    0606   903 50$:     MOVB    #^A/'/,@W^MAC$GL_LIST_PTR ;PUT QUOTE IN LISTING
                     060B   904          $OBJ_CHKBYT #TIR$C_STO_LW           ;STORE LONGWORD
                     0611   905 60$:     $MAC_LIST_BYTE #4                   ;LIST THE WORD
          05   05    0617   906          RSB
```

```
                                0618   908          .SBTTL  OPND_CHECK
                                0618   909 ;
                                0618   910 ; ++
                                0618   911 ; Functional description:
                                0618   912 ;
                                0618   913 ;       This routine checks that there is space on the current
                                0618   914 ;       listing line to write the next operand
                                0618   915 ;
                                0618   916 ; Inputs:
                                0618   917 ;
                                0618   918 ;       R2 = Number of characters required to write operand
                                0618   919 ;
                                0618   920 ; Outputs:
                                0618   921 ;
                                0618   922 ;       None
                                0618   923 ;
                                0618   924 ;
                                0618   925 OPND_CHECK:
                 33 6B    28    E4   0618   926          BBSC    #FLG$V_OPNDCHK,(R11),30$ ; Branch if check has been performed
0000'CF    00000000'8F    C3    061C   927          SUBL3   #MAC$AB_LST_END, -       ; Compute number of characters still
                      50           0625   928                  W^MAC$GL_LIST_PTR,R0     ; available on line
                 03 6B    27    E1   0626   929          BBC     #FLG$V_UPDFIL,(R11),10$ ; If updating file
                    50    10    C2   062A   930          SUBL2   #AUD$K_SIZE,R0           ; subtract size of audit trail
                                062D   931 10$:
00000000'8F    0000'CF    D1    062D   932          CMPL    W^MAC$GL_LIST_PTR, -     ; First operand?
                                0636   933                  #MAC$AB_LST_OP1
                      08    13   0636   934          BEQL    20$                      ; Yes if EQL
                    52    02    C0   0638   935          ADDL2   #2,R2                    ; Two more characters required for
                                063B   936                                           ; separating spaces
                0000'CF    02    C2   063B   937          SUBL2   #2,W^MAC$GL_LIST_PTR     ; Move pointer back two spaces
                                0640   938 20$:
                    52    50    D1   0640   939          CMPL    R0,R2                    ; Required characters available?
                          0A    18   0643   940          BGEQ    30$                      ; Yes if GEQ
                       F9B8'    30   0645   941          BSBW    MAC$WRTLST               ; No, Write line
0000'CF         0000'CF    9E   0648   942          MOVAB   W^MAC$AB_LST_OP1, -      ; and reset poirter
                                064F   943                  W^MAC$GL_LIST_PTR
                                064F   944 30$:
                          05    064F   945          RSB
```

```
                     0650   947          .SBTTL  P2$END  THE END OF PASS 2
                     0650   948
                     0650   949 ;++
                     0650   950 ; FUNCTIONAL DESCRIPTION:
                     0650   951 ;
                     0650   952 ;       THIS ROUTINE IS CALLED WHEN THE END COMMAND IS ENCOUNTERED IN
                     0650   953 ;       THE INTERMEDIATE FILE.  THE PC IS SET, THE FINAL RECORDS ARE
                     0650   954 ;       WRITTEN OUT TO THE OBJECT MODULE, AND THEN A JMP IS EXECUTED
                     0650   955 ;       TO THE END OF PASS 2.
                     0650   956 ;
                     0650   957 ;--
                     0650   958
                     0650   959 P2$END::
        F9AD'  30    0650   960          BSBW    MAC$SET_PC                  ;UPDATE PC
        F9AA'  30    0653   961          BSBW    MAC$WRTLST                  ;WRITE OUT LISTING
        F9A7'  30    0656   962          BSBW    MAC$FINISH_ASM              ;FINISH ASSEMBLY, WRITE OUT
                     0659   963                                              ; TRACEBACK, DEBUG, AND SYMBOLS
0000'CF   03   9A    0659   964          MOVZBL  #OBJ$C_EOM,W^MAC$GL_RECTYP ;SET END OF MODULE RECORD TYPE
        F99F'  30    065E   965          BSBW    MAC$WRTOBJ                  ;WRITE OUT ANY PREVIOUS RECORD
     50   00   D0    0661   966          MOVL    #OBJ$C_EOM_OK,R0            ;ASSUME MODULE OK
     56   01   D0    0664   967          MOVL    #1,R6                       ;ASSUME SUCCESS
  0E 6B   30   E0    0667   968          BBS     #FLG$V_EXTERR,(R11),5$      ;ANY EXTERNAL FACILITY ERRORS?
  1A 6B   31   E0    066B   969          BBS     #FLG$V_EXTWRN,(R11),8$      ;ANY EXTERNAL FACILTY WARNINGS?
     0000'CF   C9    066F   970          BISL3   W^MAC$GL_ERRCT,-            ;WERE THERE ANY ERRORS?
51   0000'CF         0673   971                  W^MAC$GL_WARNCT,R1          ;OR WARNINGS?
        16   13    0677   972          BEQL    10$                         ;IF EQL NO--GOOD MODULE
     50   02   D0    0679   973 5$:     MOVL    #OBJ$C_EOM_ERR,R0           ;ASSUME SEVERE ERRORS
     56   02   D0    067C   974          MOVL    #2,R6                       ;...
     0000'CF   D5    067F   975          TSTL    W^MAC$GL_ERRCT              ;WERE THERE ERRORS?
        0A   12    0683   976          BNEQ    10$                         ;IF NEQ YES--GO SET STATUS
  06 6B   30   E0    0685   977          BBS     #FLG$V_EXTERR,(R11),10$     ;MAKE SURE ABOUT EXTERNAL ERRORS TOO!
     50   01   D0    0689   978 8$:     MOVL    #OBJ$C_EOM_WRN,R0           ;NO--SET WARNING STATUS
     56   00   D0    068C   979          MOVL    #0,R6                       ;...
0000'CF   56   D0    068F   980 10$:    MOVL    R6,W^MAC$GL_STATUS          ;SAVE STATUS FOR EXITING
                     0694   981          $OBJ_OUTBYT_O R0                    ;STORE STATUS
55   0000'CF   D0    0697   982          MOVL    W^MAC$GL_XFRADR,R5          ;GET TRANSFER ADDRESS
        20   13    069C   983          BEQL    30$                         ;IF EQL NO TRANSFER ADDRESS
                     069E   984 ;
                     069E   985 ; OUTPUT TRANSFER ADDRESS INFORMATION
                     069E   986 ;
  50   0C A5   D0    069E   987          MOVL    SYM$B_SEG(R5),R0            ;GET THE SYMBOL'S PSECT NUMBER.
        0A   13    06A2   988          BEQL    15$                         ;DON'T FIDDLE WITH THE ABSOLUTE PSECT!
        07   E0    06A4   989          BBS     #SYM$V_REF,-                ;IF THE BLANK PSECT IS NOT REFERENCED
02 00000009'EF         06A6   990                  PSECT$BLANK+SYM$W_FLAG,15$ ;IT'LL BE REMOVED SO DECR THE PSECT#
        50   D7    06AC   991          DECL    R0                          ;TO MAINTAIN CORRECT PSECT ALIGNMENT.
                     06AE   992 15$:    $OBJ_OUTBYT_O R0                    ;OUTPUT SYMBOL'S PSECT
  55   05 A5   9E    06B1   993          MOVAB   SYM$L_VAL(R5),R5            ;POINT TO SYMBOL VALUE
     54   04   9A    06B5   994          MOVZBL  #4,R4                       ;SET COUNT
                     06B8   995 20$:    $OBJ_OUTBYT_O (R5)+                 ;OUTPUT BYTE OF THE VALUE
     FA 54   F5    06BB   996          SOBGTR  R4,20$                      ;LOOP FOR 4 BYTES
     0000'CF   D4    06BE   997 30$:    CLRL    W^MAC$GL_XFRADR             ;RESET TRANSFER ADDRESS POINTER
        F93B'  30    06C2   998          BSBW    MAC$WRTOBJ                  ;WRITE OUT FINAL RECORD TO OBJECT FILE
        F938'  31    06C5   999          BRW     W^MAC$PASS_2_END            ;PASS 2 IS COMPLETED
                     06C8  1000
                     06C8  1001          .END
```

```
ADM$_ABSOLUTE  = 00000002
ADM$_BYTE_DISP = 0000000A
ADM$_DFBYTEDISP= 0000000B
ADM$_DFLONGDISP= 0000000F
ADM$_DFRAUTOINC= 00000009
ADM$_DFWORDDISP= 0000000D
ADM$_IMMEDIATE = 00000001
ADM$_INDEX     = 00000004
ADM$_LITERAL   = 00000000
ADM$_LONG_DISP = 0000000E
ADM$_MAXMOD    = 0000000F
ADM$_PIC       = 00000003
ADM$_REGAUTODEC= 00000007
ADM$_REGAUTOINC= 00000008
ADM$_REGISTER  = 00000005
ADM$_RRIND     = 00000006
ADM$_WORD_DISP = 0000000C
AUD$R_SIZE     = 00000010
BLNK           = 00000020
CHR$M_COMMA_CR = 00000020
CHR$M_ILL_CHR  = 00000040
CHR$M_NUM_BER  = 00000010
CHR$M_SPA_MSK  = 00000001
CHR$M_SYM_CH1  = 00000008
CHR$M_SYM_CHR  = 00000004
CHR$M_SYM_DLM  = 00000002
CHR$V_COMMA_CR = 00000005
CHR$V_CVTLWC   = 00000061
CHR$V_ILL_CHR  = 00000006
CHR$V_NOCVT    = 0000007F
CHR$V_NUM_BER  = 00000004
CHR$V_SPA_MSK  = 00000000
CHR$V_SYM_CH1  = 00000003
CHR$V_SYM_CHR  = 00000002
CHR$V_SYM_DLM  = 00000001
CR             = 0000000D
EOM$C_ABORT    = 00000003
EOM$C_ERROR    = 00000002
EOM$C_SUCCESS  = 00000000
EOM$C_WARNING  = 00000001
FF             = 0000000C
FLG$M_ALLCHR   = 00000001
FLG$M_BOL      = 00000002
FLG$M_CHKLPND  = 00100000
FLG$M_COMPEXPR = 00000004
FLG$M_CONT     = 00000008
FLG$M_CRF      = 40000000
FLG$M_CRSEEN   = 00000001
FLG$M_DATRPT   = 00000010
FLG$M_DBGOUT   = 00004000
FLG$M_DLIMSTR  = 00008000
FLG$M_ENDMCH   = 00000020
FLG$M_EVALEXPR = 00000040
FLG$M_EXPOPT   = 00000080
FLG$M_EXTERR   = 00010000
FLG$M_EXTWRN   = 00020000
FLG$M_FIRSTLN  = 00000200
FLG$M_IFSTAT   = 00800000
FLG$M_IIF      = 00400000
FLG$M_INSERT   = 00000100
FLG$M_IRPC     = 20000000
FLG$M_LEXOP    = 00000002
FLG$M_LSTXST   = 00000200
FLG$M_MAC2COL  = 00000800
FLG$M_MACL     = 00000800
FLG$M_MACLTB   = 08000000
FLG$M_MACTXT   = 00010000
FLG$M_MEBLST   = 00001000
FLG$M_MOREARG  = 00002000
FLG$M_MOREINP  = 00000008
FLG$M_NEWPND   = 00000400
FLG$M_NOREF    = 01000000
FLG$M_NTYPEPC  = 00000020
FLG$M_NULCHR   = 00040000
FLG$M_OBJXST   = 00200000
FLG$M_OPNDCHK  = 00000100
FLG$M_OPRND    = 00002000
FLG$M_OPTVFLIDX= 00001000
FLG$M_ORDLST   = 00020000
FLG$M_P2       = 00004000
FLG$M_RPTIRP   = 10000000
FLG$M_SEQFIL   = 02000000
FLG$M_SKAN     = 00008000
FLG$M_SPECOP   = 00000004
FLG$M_SPLALL   = 04000000
FLG$M_STOIMF   = 00040000
FLG$M_SYM2COL  = 00000400
FLG$M_TOCFLG   = 00080000
FLG$M_UPAFLG   = 00000010
FLG$M_UPDFIL   = 00000080
FLG$M_UPMARG   = 00000040
FLG$M_XCRF     = 80000000
FLG$V_ALLCHR   = 00000000
FLG$V_BOL      = 00000001
FLG$V_CHKLPND  = 00000014
FLG$V_COMPEXPR = 00000002
FLG$V_CONT     = 00000003
FLG$V_CRF      = 0000001E
FLG$V_CRSEEN   = 00000020
FLG$V_DATRPT   = 00000004
FLG$V_DBGOUT   = 0000002E
FLG$V_DLIMSTR  = 0000002F
FLG$V_ENDMCH   = 00000005
FLG$V_EVALEXPR = 00000006
FLG$V_EXPOPT   = 00000007
FLG$V_EXTERR   = 00000030
FLG$V_EXTWRN   = 00000031
FLG$V_FIRSTLN  = 00000029
FLG$V_IFSTAT   = 00000017
FLG$V_IIF      = 00000016
FLG$V_INSERT   = 00000008
FLG$V_IRPC     = 0000001D
FLG$V_LEXOP    = 00000021
FLG$V_LSTXST   = 00000009
FLG$V_MAC2COL  = 0000002B
FLG$V_MACL     = 0000000B
FLG$V_MACLTB   = 0000001B
FLG$V_MACTXT   = 00000010
FLG$V_MEBLST   = 0000000C
FLG$V_MOREARG  = 0000002D
FLG$V_MOREINP  = 00000023
FLG$V_NEWPND   = 0000000A
FLG$V_NOREF    = 00000018
FLG$V_NTYPEPC  = 00000025
FLG$V_NULCHR   = 00000032
FLG$V_OBJXST   = 00000015
FLG$V_OPNDCHK  = 00000028
FLG$V_OPRND    = 0000000D
FLG$V_OPTVFLIDX= 0000002C
FLG$V_ORDLST   = 00000011
FLG$V_P2       = 0000000E
FLG$V_RPTIRP   = 0000001C
FLG$V_SEQFIL   = 00000019
FLG$V_SKAN     = 0000000F
FLG$V_SPECOP   = 00000022
FLG$V_SPLALL   = 0000001A
FLG$V_STOIMF   = 00000012
FLG$V_SYM2COL  = 0000002A
FLG$V_TOCFLG   = 00000013
FLG$V_UPAFLG   = 00000024
FLG$V_UPDFIL   = 00000027
FLG$V_UPMARG   = 00000026
FLG$V_XCRF     = 0000001F
HASHSZ         = 0000007F
HYPHEN         = 0000002D
IMM            = 00000388 R      03
INP$K_BUFSIZ   = 000003E8
INT$K_BUFSIZ   = 000013F4
INT$K_BUFWRN   = 00001390
LST$K_BUFSIZ   = 00000086
LST$K_LP_PAGE  = 0000003C
LST$K_TITLE_SIZ= 00000028
MAC$AB_LST_END    ******** X    03
MAC$AB_LST_OP1    ******** X    03
MAC$AB_LST_OPR    ******** X    03
MAC$AL_VALSTACK   ******** X    03
MAC$CHRBYT        ******** X    03
MAC$CK_BYT_TRUN   ******** X    03
MAC$CK_SBY_TRUN   ******** X    03
MAC$CK_SWD_TRUN   ******** X    03
MAC$CK_WRD_TRUN   ******** X    03
MAC$FINISH_ASM    ******** X    03
MAC$GL_ERRCT      ******** X    03
MAC$GL_LIST_PTR   ******** X    03
MAC$GL_MOPNOM     ******** X    03
MAC$GL_OPSIZE     ******** X    03
MAC$GL_PC         ******** X    03
MAC$GL_PSECT      ******** X    03
MAC$GL_RECTYP     ******** X    03
MAC$GL_STATUS     ******** X    03
MAC$GL_WARNCT     ******** X    03
```

```
MAC$GL_XFRADR       ********  X   03      PSC$M_LIB       = 00000002      REF_DISP          000002F5 R      03
MAC$LIST_BYTES      ********  X   03      PSC$M_LONG      = 00004800      REF_E             000005B7 R  D   03
MAC$LST_CHAR        ********  X   03      PSC$M_NOEXE     = FFFFFFBF      REF_F             000005B7 R  D   03
MAC$OUTOBJ          ********  X   03      PSC$M_NOPIC     = FFFFFFFE      REF_SIZE          00000335 R      03
MAC$PASS_2_END      ********  X   03      PSC$M_NORD      = FFFFFF7F      REG$_PC         = 0000000F
MAC$PASS_2_ERR      ********  X   03      PSC$M_NOSHR     = FFFFFFDF      SEMI            = 0000003B
MAC$SET_PC          ********  X   03      PSC$M_NOVEC     = FFFFFDFF      STB$K_PG_MISS   = 0000000A
MAC$STOTM           ********  X   03      PSC$M_NOWRT     = FFFFFEFF      SYM$B_NAME        00000004
MAC$SYMNAMOUT       ********  X   03      PSC$M_OVR       = 00000004      SYM$B_SEG         0000000C
MAC$WRTLST          ********  X   03      PSC$M_PAGE      = 00006400      SYM$B_TOKEN       0000000B
MAC$WRTOBJ          ********  X   03      PSC$M_PIC       = 00000001      SYM$F_DEF       = 00000002
MAC$_BRDESTRANG=    007D9052              PSC$M_QUAD      = 00004C00      SYM$F_REL       = 00000008
MAC$_DATATRUNC  =   007D8800              PSC$M_RD        = 00000080      SYM$F_UNI       = 00000004
MAC$_ILLMODE    =   007D9102              PSC$M_REL       = 00000008      SYM$F_VALIDATE  = 00000010
MAC$_ILLREGNUM  =   007D9122              PSC$M_SHR       = 00000020      SYM$F_WEAK      = 00000001
MAC$_SYMOUTPHAS=    007D91F2              PSC$M_USR       = FFFFFFFD      SYM$K_BLKSIZ      0000000D
MAC$_UNDEFSYM   =   007D9212              PSC$M_VEC       = 00000200      SYM$K_MAXLEN    = 0000001F
MAC_SUBSYS      =   0000007D              PSC$M_WORD      = 00004400      SYM$K_TWOCOL    = 00000010
OBJ$C_EOM       =   00000003              PSC$M_WRT       = 00000180      SYM$L_LINK        00000000
OBJ$C_EOM_ABORT=    00000003              PSC$S_ALIGNMENT=  00000004      SYM$L_VAL         00000005
OBJ$C_EOM_ERR   =   00000002              PSC$V_ALIGNFLG  = 0000000E      SYM$M_ABS       = 00000010
OBJ$C_EOM_OK    =   00000000              PSC$V_ALIGNMENT=  0000000A      SYM$M_ASN       = 00000100
OBJ$C_EOM_WRN   =   00000001              PSC$V_EXE       = 00000006      SYM$M_CRFO      = 00002000
OBJ$K_BUFSIZ    =   00000200              PSC$V_GBL       = 00000004      SYM$M_DEBUG     = 00000020
OPF$M_LASTOPR   =   00002000              PSC$V_LIB       = 00000001      SYM$M_DEF       = 00000001
OPF$M_OPTEXP    =   00001000              PSC$V_OVR       = 00000002      SYM$M_DELMAC    = 00000200
OPF$V_LASTOPR   =   0000000D              PSC$V_PIC       = 00000000      SYM$M_EPT       = 00000200
OPF$V_OPTEXP    =   0000000C              PSC$V_RD        = 00000007      SYM$M_EXTRN     = 00000008
OPND_CHECK          00000618 R      03    PSC$V_REL       = 00000003      SYM$M_GLOBL     = 00000004
P1$ARITH_SUB        ********    X   03    PSC$V_SHR       = 00000005      SYM$M_LOCAL     = 00000040
P2$BDST             000000FF RG     03    PSC$V_VEC       = 00000009      SYM$M_ODBG      = 00000400
P2$END              00000650 RG     03    PSC$V_WRT       = 00000008      SYM$M_REF       = 00000080
P2$LGLAB            00000218 RG     03    PSC$W_FLAG        00000009      SYM$M_RELPSECT  = 00000800
P2$OP               00000230 RG     03    PSC$W_OPTIONS     0000000D      SYM$M_SUPR      = 00004000
P2$REDEF            00000099 RG     03    PSECT$BLANK       ********  X   03    SYM$M_WEAK      = 00000002
P2$REF              0000026D RG     03    RDX$V_BINARY    = 00000000      SYM$M_XCRF      = 00001000
P2$STKG             00000000 RG     03    RDX$V_DECIMAL   = 00000002      SYM$V_ABS       = 00000004
P2$STKL             000000A6 RG     03    RDX$V_DOUBLE    = 00000005      SYM$V_ASN       = 00000008
P2$STKS             00000015 RG     03    RDX$V_FLOAT     = 00000004      SYM$V_CRFO      = 0000000D
P2$XREF             0000028C R      03    RDX$V_GFLOAT    = 00000006      SYM$V_DEBUG     = 00000005
PSC$B_NAME          00000004              RDX$V_HEX       = 00000003      SYM$V_DEF       = 00000000
PSC$B_SEG           0000000C              RDX$V_HFLOAT    = 00000007      SYM$V_DELMAC    = 00000009
PSC$B_UNUSED        0000000B              RDX$V_OCTAL     = 00000001      SYM$V_EPT       = 00000009
PSC$K_BLKSIZ        00000013              REF_0             00000345 R  D   03    SYM$V_EXTRN     = 00000003
PSC$K_NO_OPTNS  =   0000000A              REF_1             00000383 R  D   03    SYM$V_GLOBL     = 00000002
PSC$L_CURLOC        0000000F              REF_2             0000037C R  D   03    SYM$V_LOCAL     = 00000006
PSC$L_LINK          00000000              REF_3             0000041C R  D   03    SYM$V_ODBG      = 0000000A
PSC$L_MAXLGTH       00000005              REF_4             0000049C R  D   03    SYM$V_REF       = 00000007
PSC$M_ABS       =   FFFFFFF7              REF_5             000004DB R  D   03    SYM$V_RELPSECT  = 0000000B
PSC$M_ALIGNFLG  =   00004000              REF_6             000004DB R  D   03    SYM$V_SUPR      = 0000000E
PSC$M_ALLOPTNS  =   000003FF              REF_7             000004DB R  D   03    SYM$V_WEAK      = 00000001
PSC$M_BYTE      =   00004000              REF_8             000004DB R  D   03    SYM$V_XCRF      = 0000000C
PSC$M_CON       =   FFFFFFFB              REF_9             000004DB R  D   03    SYM$W_FLAG        00000009
PSC$M_DEFAULT   =   000001C8              REF_A             000004EB R  D   03    TAB             = 00000009
PSC$M_EXE       =   000000C0              REF_B             000004EB R  D   03    TIR$C_OPR_REDEF = 00000041
PSC$M_GBL       =   00000010              REF_C             00000550 R  D   03    TIR$C_STA_GBL   = 00000000
PSC$M_LCL       =   FFFFFFEF              REF_D             00000550 R  D   03    TIR$C_STA_LW    = 00000003
```

```
TIR$C_STA_PB    = 00000004
TIR$C_STA_PL    = 00000006
TIR$C_STA_PW    = 00000005
TIR$C_STA_SB    = 00000001
TIR$C_STA_SW    = 00000002
TIR$C_STA_UB    = 00000007
TIR$C_STA_UW    = 00000008
TIR$C_STO_B     = 00000025
TIR$C_STO_BD    = 00000017
TIR$C_STO_L     = 00000016
TIR$C_STO_LD    = 00000019
TIR$C_STO_LI    = 0000001A
TIR$C_STO_LW    = 00000016
TIR$C_STO_PICR  = 0000001C
TIR$C_STO_SB    = 00000014
TIR$C_STO_SW    = 00000015
TIR$C_STO_W     = 00000026
TIR$C_STO_WD    = 00000018
X               = 00000010
X1              = 00000033
X2              = 00080000
```

Psect synopsis

PSECT name	Allocation	PSECT No.	Attributes
. ABS .	00000000 (0.)	00 (0.)	NOPIC USR CON ABS LCL NOSHR NOEXE NORD NOWRT NOVEC BYTE
. BLANK .	00000000 (0.)	01 (1.)	NOPIC USR CON REL LCL NOSHR EXE RD WRT NOVEC BYTE
ABS	00000013 (19.)	02 (2.)	NOPIC USR CON ABS LCL NOSHR EXE RD WRT NOVEC BYTE
MAC$RO_CODE_P2	000006C8 (1736.)	03 (3.)	NOPIC USR CON REL GBL NOSHR EXE RD NOWRT NOVEC LONG

Performance indicators

Phase	Page faults	CPU Time	Elapsed Time
Initialization	29	00:00:00.05	00:00:00.59
Command processing	106	00:00:00.40	00:00:02.11
Pass 1	368	00:00:08.51	00:00:32.62
Symbol table sort	1	00:00:00.90	00:00:03.60
Pass 2	182	00:00:02.19	00:00:10.91
Symbol table output	31	00:00:00.16	00:00:00.61
Psect synopsis output	1	00:00:00.02	00:00:00.02
Cross-reference output	0	00:00:00.00	00:00:00.00
Assembler run totals	720	00:00:12.23	00:00:50.46

```
The working set limit was 1650 pages.
71071 bytes (139 pages) of virtual memory were used to buffer the intermediate code.
There were 50 pages of symbol table space allocated to hold 878 non-local and 85 local symbols.
1001 source lines were read in Pass 1, producing 24 object records in Pass 2.
44 pages of virtual memory were used to define 43 macros.
```

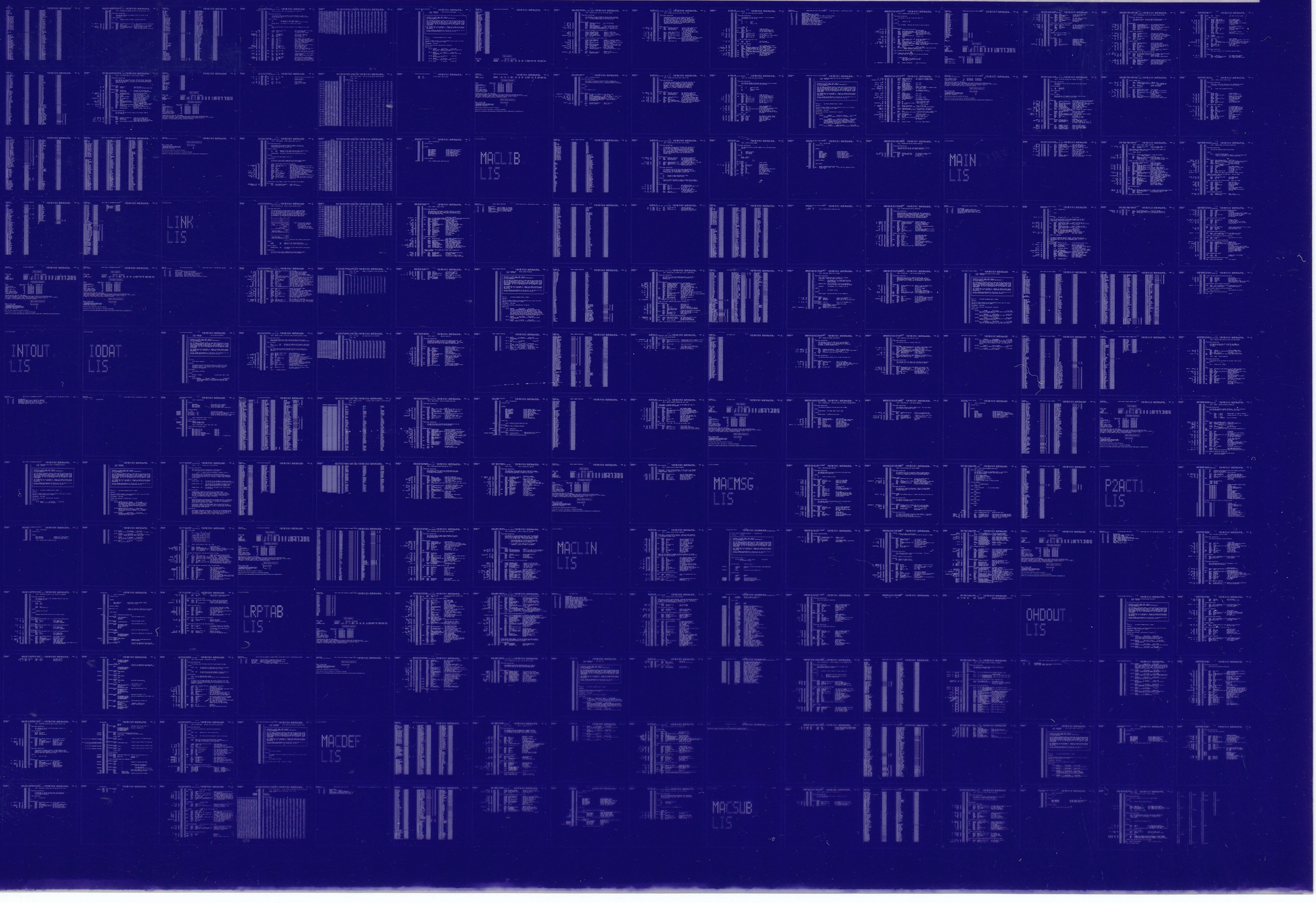
+----------------------------+
! Macro library statistics !
+----------------------------+

Macro library name	Macros defined
_255DUA28:[MACRO.OBJ]MACRO.MLB;1	13
_255DUA28:[SYSLIB]STARLET.MLB;2	4
TOTALS (all libraries)	17

1060 GETS were required to define 17 macros.

There were no errors, warnings or information messages.

```
MACRO/LIS=LIS$:P2ACT1/OBJ=OBJ$:P2ACT1 MSRC$:P2ACT1/UPDATE=(ENH$:P2ACT1)+LIB$:MACRO/LIB
```



MAIL

MAIL
MAP

P2DRVR
LIS

PARSER
LIS

RPTIRP
LIS

SCANER
LIS

TIMER
LIS

MAILCMDS
CLD

P2ACT2
LIS

SYMTAB
LIS