```
R0001   SECTION 1  DISPATCHER

R0002           ENTRY TO THE INTERPRETER. INTPRT SETS LOC TO THE FIRST  INSTRUCTION, BANKSET TO THE BBANK OF THE
R0004   OBJECT INTERPRETIVE PROGRAM, AND INTBIT15 TO THE BIT15 CONTENTS OF FBANK. INTERPRETIVE PROGRAMS MAY BE IN
R0006   VIRTUALLY ALL BANKS PRESENT UNDER ANY SUPER-BANK SETTING, WITH THE RESTRICTION THAT PROGRAMS IN HIGH BANKS
R0008   (BIT15 OF FBANK = 1) DO NOT REFER TO LOWBANKS, AND VICE-VERSA. THE INTERPRETER DOES NOT SWITCH SUPERBANKS.
R0010   E-BANK SWITCHING OCCURS WHENEVER GENERAL ERASABLE (100 - 3777) IS ADDRESSED.
 0012                              6006                    BLOCK   03

 0013   REF   1                                            COUNT   03/INTER

 00135                             6006  0 0003 1  INTPRET  REINT
 0014                              6007  0 0006 1           EXTEND                  SET LOC TO THE WORD FOLLOWING THE TC.
 0015   REF   7  LAST 1075         6010  22 164 1           QXCH    LOC

 0016   REF  15  LAST 1075         6011  3 0006 1   +2      CA      BBANK           INTERPRETIVE BRANCHES FINISH HERE.
 0017   REF   2  LAST 1075         6012  54 165 1           TS      BANKSET
 0018   REF  43  LAST  987         6013  7 4674 1           MASK    BIT15           GET 15TH BIT FOR INDEXABLE ADDRESSES.
 0019   REF   5  LAST   67         6014  54 115 0           TS      INTBIT15

 0020   REF   8  LAST 1075         6015  54 023 1           TS      EDOP            MAKE SURE NO INSTRUCTIONS LEFT OVER

 0021   REF   1                    6016  1 6037 1           TCF     NEWOPS          PICK UP OP CODE PAIR AND BEGIN.
 0022   REF  16  LAST 1077         6017  22 006 1  INTRSM   LXCH    BBANK           RESUME SUSPENDED INTERPRETIVE JOB
 0023   REF 226  LAST  891         6020  1 6011 0           TCF     INTPRET +3
R0024           DLOAD LOADS MPAC, MPAC +1, LEAVING ZERO IN MPAC +2.

 0025                              6021  0 0006 1  DLOAD    EXTEND
 0026   REF   1                    6022  5 0116 1           INDEX   ADDRWD
 0027                              6023  3 0001 0           DCA     0               LOAD DP C(C(ADDRWD)) INTO MPAC,MPAX +1
 0028   REF 289  LAST  891         6024  52 155 1  SLOAD2   DXCH    MPAC
 0029   REF 209  LAST 1071         6025  3 4714 1           CAF     ZERO            ZERO MPAC +2
```

P0030 AT THE END OF MOST INSTRUCTIONS, CONTROL IS GIVEN TO DANZIG TO DISPATCH THE NEXT OPERATION.

```
0032  REF 290  LAST 1077    6026  54 156 1            TS    MPAC +2      AND DECLARE DP MODE

0033  REF   4  LAST  533    6027  54 163 1  NEWMODE   TS    MODE         PROLOGUE FOR MODE-CHANGING INSTRUCTIONS.

0034  REF   3  LAST 1077    6030  3 0165 0  DANZIG   CA    BANKSET      SET BBANK BEFORE TESTING NEWJOB SO THAT
0035  REF  17  LAST 1077    6031  54 006 0           TS    BBANK        IT MAY BE SAVED DIRECTLY BY CHANJOB.

0036  REF   9  LAST 1077    6032  10 023 1  NOIBNKSW CCS   EDOP         SEE IF AN ORDER CODE IS LEFT OVER FROM
0037  REF   1                6033  1 6046 1           TCF   OPJUMP       THE LAST PAIR RETRIEVED.  IF SO, EXECUTE.
A0038                                                                  EDOP IS SET TO ZERO ON ITS RE-EDITING.

0039  REF   5  LAST  828    6034  10 067 1           CCS   NEWJOB       SEE IF A JOB OF HIGHER PRIORITY IS
0040  REF   1                6035  1 5063 0           TCF   CHANG2       PRESENT, AND IF SO, CHANGE JOBS.

0041  REF   8  LAST 1077    6036  24 164 1           INCR  LOC          ADVANCE THE LOCATION COUNTER.
R0042          ITRACE (1) REFERS TO ANEWOPS8.
0043  REF   9  LAST 1078    6037  50 164 1  NEWOPS   INDEX LOC          ENTRY TO BEGIN BY PICKING OP CODE PAIR.
0044                         6040  3 0000 1           CA    0            MAY BE AN OPCODE PAIR OR A STORE CODE.
0045  REF 276  LAST 1073    6041  10 000 0           CCS   A            TEST SIGN AND GET DABS(A).
0046  REF   1                6042  1 6331 1           TCF   DOSTORE      PROCESS STORE CODE.

0047                         6043   00177 0  LOW7     OCT   177

0048  REF  10  LAST 1078    6044  54 023 1           TS    EDOP         OP CODE PAIR.  LEAVE THE OTHER IN EDOP
0049  REF   6  LAST  365    6045  7 6043 1           MASK  LOW7         WHERE  CCS EDOP  WILL HONOR IT NEXT.

0050  REF  13  LAST  372    6046  54 020 1  OPJUMP   TS    CYR          LOWWD ENTERS HERE IF A RIGHT-HAND OP
0051  REF  14  LAST 1078    6047  10 020 1           CCS   CYR          CODE IS TO BE PROCESSED.  TEST PREFICES.
0052  REF   1                6050  1 6216 0           TCF   OPJUMP2      TEST SECOND PREFIX BIT.

0053  REF   1                6051  1 6712 1           TCF   EXIT         +0 OP CODE IS EXIT.
```

```
P0054          PROCESS ADDRESSES WHICH MAY BE DIRECT, INDEXED, OR REFERENCE THE PUSHDOWN LIST.

0058  REF  74  LAST 1059    6052  7 4712 0  ADDRESS  MASK    BIT1     SEE IF ADDRESS IS INDEXED. CYR CONTAINED
0057  REF 277  LAST 1078    6053  10 000 0           CCS     A        400XX, SO BIT 1 IS NOW AS IT WAS IN CYR.
0058  REF   1                6054  1 6115 0           TCF     INDEX    FORM INDEXED ADDRESS.

0059  REF  10  LAST 1078    6055  50 164 1  DIRADRES INDEX   LOC      LOOK AHEAD TO NEXT WORD TO SEE IF
0060                        6056  4 0001 1  OCT40001 CS      1        ADDRESS IS GIVEN.
0061  REF 278  LAST 1079    6057  10 000 0           CCS     A
0062  REF   1                6060  1 6164 0           TCF     PUSHUP   IF NOT.

0063                        6061   77773 1  NEG4     DEC     -4

0064  REF  11  LAST 1079    6062  24 164 1           INCR    LOC      IF SO, TO SHOW WE PICKED UP A WORD.
0065  REF   2  LAST 1077    6063  54 116 0           TS      ADDRWD
```

```
P0066           FINAL DIGESTION OF DIRECT ADDRESSES OF OP CODES WITH 01 PREFIX IS DONE HERE. IN EACH CASE, THE
R0068   REQUIRED 12-BIT SUB-ADDRESS IS LEFT IN ADDRWD, WITH ANY REQUIRED E OR F BANK SWITCHING DONE. ADDRESSES LESS
R0070   THAN 45D ARE TAKEN TO BE RELATIVE TO THE WORK AREA. THE OP CODE IS NOW IN BITS 1-5 OF CYR WITH BIT 14 = 1.
 0072   REF   1                 6064  6 6220 1          AD      -ENDVAC         SEE IF ADDRESS RELATIVE TO WORK AREA.
 0073   REF 279  LAST 1079      6065  10 000 0          CCS     A
 0074   REF   1                 6066  6 7712 1          AD      -ENDERAS        IF NOT, SEE IF IN GENERAL ERASABLE.
 0075   REF   1                 6067  1 6074 0          TCF     IERASTST

 0076   REF  18  LAST  840      6070  3 0120 1  NETZERO CA      FIXLOC          IF SO, LEAVE THE MODIFIED ADDRESS IN
 0077   REF   3  LAST 1079      6071  26 116 0          ADS     ADDRWD          ADDRWD AND DISPATCH.
 0078   REF  15  LAST 1078      6072  50 020 0  ITR15   INDEX   CYR             THIS INDEX MAKES THE NEXT INSTRUCTION
 0079   REF   1                 6073  7 6242 1          7       INDJUMP -1      TCF INDJUMP + OP, EDITING CYR.

 0080                           6074  0 0006 1  IERASTST EXTEND
 0081   REF   1                 6075  6 6105 0          BZMF    GEADDR          GO PROCESS GENERAL-ERASABLE ADDRESS.

 0082   REF  13  LAST 1075      6076  7 4747 0          MASK    LOW10           FIXED BANK ADDRESS. RESTORE AND ADD B15.
 0083   REF  14  LAST 1080      6077  6 4747 1          AD      LOW10           SWITCH BANKS AND LEAVE SUBADDRESS IN
 0084   REF   4  LAST 1080      6100  56 116 1          XCH     ADDRWD          ADDRWD FOR OPERAND RETRIEVAL. (THIS
 0085   REF   6  LAST 1077      6101  6 0115 1          AD      INTBIT15        METHOD PRECLUDES USE OF THE LAST
 0086   REF  11  LAST 1075      6102  54 004 1          TS      FBANK           LOCATION IN EACH FBANK.)
 0087   REF  16  LAST 1080      6103  50 020 0  ITR12   INDEX   CYR
 0088   REF   2  LAST 1080      6104  7 6242 1          7       INDJUMP -1

 0089   REF   8  LAST 1071      6105  7 4373 0  GEADDR  MASK    LOW8
 0090   REF   3  LAST  372      6106  6 4744 1          AD      OCT1400
 0091   REF   5  LAST 1080      6107  56 116 1          XCH     ADDRWD
 0092   REF  46  LAST 1071      6110  54 003 0          TS      EBANK
 0093   REF  17  LAST 1080      6111  50 020 0  ITR10   INDEX   CYR
 0094   REF   3  LAST 1080      6112  7 6242 1          7       INDJUMP -1
```

P0095 THE FOLLOWING ROUTINE PROCESSES INTERPRETIVE INDEXED ADDRESSES. AN INTERPRETER INDEX REGISTER MAY
R0097 CONTAIN THE ADDRESS OF ANY ERASABLE REGISTER (0-42 BEING RELATIVE TO THE VAC AREA) OR ANY INTERPRETIVE PROGRAM
R0099 BANK, OR ANY INTEGER IN THAT RANGE.

```
0100  REF   1                 6113  3 7702 0  DODLOAD* CAF   DLOAD*      STODL* COMES HERE TO PROCESS LOAD ADR.
0101  REF  18  LAST 1080      6114  54 020 1            TS    CYR         (STOVL* ENTERS HERE).

0102  REF  19  LAST 1080      6115  3 0120 1  INDEX     CA    FIXLOC      SET UP INDEX LOCATION.
0103  REF   1                 6116  54 130 1            TS    INDEXLOC
0104  REF  12  LAST 1079      6117  24 164 1            INCR  LOC         (ADDRESS ALWAYS GIVEN).
0105  REF  13  LAST 1081      6120  50 164 1            INDEX LOC
0106                          6121  4 0000 0            CS    0
0107  REF 280  LAST 1080      6122  10 000 0            CCS   A           INDEX 2 IF ADDRESS STORED COMPLEMENTED.
0108  REF   2  LAST 1081      6123  24 130 0            INCR  INDEXLOC
0109                          6124  16 125 0            NOOP

0110  REF   6  LAST 1080      6125  54 116 0            TS    ADDRWD      14 BIT ADDRESS TO ADDRWD.
0111  REF   2  LAST  129      6126  7 7711 0            MASK  HIGH4       IF ADDRESS GREATER THAN 2K, ADD INTBIT15
0112                          6127  0 0006 1            EXTEND
0113  REF   1                 6130  1 6133 1            BZF   INDEX2
0114  REF   7  LAST 1080      6131  3 0115 1            CA    INTBIT15
0115  REF   7  LAST 1081      6132  26 116 0            ADS   ADDRWD

0116  REF   3  LAST 1081      6133  50 130 0  INDEX2    INDEX INDEXLOC
0117  REF  48  LAST  882      6134  4 0046 1            CS    X1
0118  REF   8  LAST 1081      6135  26 116 0            ADS   ADDRWD      DO AUGMENT, IGNORING AND CORRECTING OVF.

0119  REF   5  LAST  737      6136  7 7713 1            MASK  HIGH9       SEE IF ADDRESS IS IN WORK AREA.
0120                          6137  0 0006 1            EXTEND
0121  REF   1                 6140  1 6153 1            BZF   INDWORK
0122  REF   3  LAST 1081      6141  7 7711 0            MASK  HIGH4       SEE IF IN FIXED BANK.
0123                          6142  0 0006 1            EXTEND
0124  REF   1                 6143  1 6155 1            BZF   INDERASE

0125  REF   9  LAST 1081      6144  3 0116 1            CA    ADDRWD      IN FIXED - SWITCH BANKS AND CREATE
0126  REF  12  LAST 1080      6145  54 004 1            TS    FBANK       SUB-ADDRESS.
0127  REF  15  LAST 1080      6146  7 4747 0            MASK  LOW10
0128  REF   1                 6147  6 4700 1            AD    2K
0129  REF  10  LAST 1081      6150  54 116 0            TS    ADDRWD
0130  REF  19  LAST 1081      6151  50 020 0  ITR11     INDEX CYR
0131  REF   4  LAST 1080      6152  3 6242 0            3     INDJUMP -1

0132  REF  20  LAST 1081      6153  3 0120 1  INDWORK   CA    FIXLOC      MAKE ADDRWD RELATIVE TO WORK AREA.
0133  REF   1                 6154  1 6161 0            TCF   ITR13 -1

0134  REF   4  LAST 1080      6155  3 4744 1  INDERASE  CA    OCT1400
0135  REF  11  LAST 1081      6156  56 116 1            XCH   ADDRWD
0136  REF  47  LAST 1080      6157  54 003 0            TS    EBANK
0137  REF   9  LAST 1080      6160  7 4373 0            MASK  LOW8
0138  REF  12  LAST 1081      6161  26 116 0  -1        ADS   ADDRWD
```

```
0139   REP  20  LAST 1081     6162  50 020 0  ITR13    INDEX  CYR
0140   REP   5  LAST 1081     6163  3 6242 0            3      INDJUMP -1
```

```
P0141          PUSH-UP ROUTINES. WHEN NO OPERAND ADDRESS IS GIVEN, THE APPROPRIATE OPERAND IS TAKEN FROM THE PUSH-DOWN
R0143  LIST. IN MOST CASES THE MODE OF THE RESULT (VECTOR OR SCALAR) OF THE LAST ARITHMETIC OPERATION PERFORMED
R0145  IS THE SAME AS THE TYPE OF OPERAND DESIRED (ALL ADD/SUBTRACT ETC.). EXCEPTIONS TO THIS GENERAL RULE ARE LISTED
R0147  BELOW (NOTE THAT IN EVERY CASE THE MODE REGISTER IS LEFT INTACT)'

R0148          1. VXSC AND V/SC WANT THE OPPOSITE TYPE OF OPERAND, E.G., IF THE LAST OPERATION YIELDED A VECTOR
R0150  RESULT, VXSC WANTS A SCALAR.

R0151          2. THE LOAD CODES SHOULD LOAD THE ACCUMULATOR INDEPENDENT OF THE RESULT OF THE LAST OPERATION. THIS
R0153  INCLUDES VLOAD, DLOAD, TLOAD, PDDL, AND PDVL (NO PUSHUP WITH SLOAD).

R0154          3. SOME ARITHMETIC OPERATIONS REQUIRE A STANDARD TYPE OF OPERAND REGARDLESS OF THE PREVIOUS OPERATION.
R0156  THIS INCLUDES SIGN WANTING DP AND TAD REQUIRING TP.

0157  REP   1                  6164  3 4374 0  PUSHUP  CAF   OCT23          IF THE LOW 5 BITS OF CYR ARE LESS THAN
0158  REP  21  LAST 1082       6165  7 0020 1          MASK  CYR            20, THIS OP REQUIRES SPECIAL ATTENTION.
0159  REP   1                  6166  6 6171 0          AD    -OCT10         (NO -0).
0160  REP 281  LAST 1081       6167  10 000 0          CCS   A
0161  REP   1                  6170  1 6202 0          TCF   REGUP          FOR ALL CODES GREATER THAN OCT 7.

0162                           6171   77767 1  -OCT10  OCT   -10

0163  REP   2  LAST 1020       6172  6 6061 0          AD    NEG4           WE NOW HAVE 7 - OP CODE(MOD4). SEE IF
0164  REP 282  LAST 1083       6173  10 000 0          CCS   A              THE OP CODE (MOD4) IS THREE (REVERSE).
0165  REP 283  LAST 1083       6174  50 000 1          INDEX A              NO - THE MODE IS DEFINITE. PICK UP THE
0166  REP   1                  6175  4 6213 0          CS    NO.WDS
0167  REP   2  LAST 1083       6176  1 6204 0          TCF   REGUP +2

0168  REP   5  LAST 1078       6177  50 163 0          INDEX MODE           FOR VXSC AND V/SC WE WANT THE REQUIRED
0169  REP   1                  6200  4 6211 1          CS    REVCNT         PUSHLOC DECREMENT WITHOUT CHANGING THE
0170  REP   3  LAST 1083       6201  1 6204 0          TCF   REGUP +2       MODE AT THIS TIME.

0171  REP   6  LAST 1083       6202  50 163 0  REGUP   INDEX MODE           MOST ALL OP CODES PUSHUP HERE.
0172  REP   2  LAST 1083       6203  4 6213 0          CS    NO.WDS
0173  REP   1                  6204  26 168 1  +2      ADS   PUSHLOC
0174  REP  13  LAST 1081       6205  54 116 0          TS    ADDRWD
0175  REP  22  LAST 1083       6206  50 020 0  ITR14   INDEX CYR
0176  REP   6  LAST 1082       6207  7 6242 1          7     INDJUMP -1     (THE INDEX MAKES THIS A TCF.)

0177                           6210   00002 0          OCT   2              REVERSE PUSHUP DECREMENT. VECTOR TAKES 2
0178                           6211   00006 1  REVCNT  OCT   6              WORDS, SCALAR TAKES 6.
0179                           6212   00006 1          OCT   6
0180                           6213   00002 0  NO.WDS  OCT   2              CONVENTIONAL DECREMENT IS 6 WORDS VECTOR
0181                           6214   00003 1  OCTAL3  OCT   3              2 IN DP, AND 3 IN TP.
0182                           6215   00006 1          OCT   6
```

```
P0183           TEST THE SECOND PREFIX BIT TO SEE IF THIS IS A MISCELLANEOUS OR A UNARY/SHORT SHIFT OPERATION.

 0185   REF  23  LAST 1083     6216  10 020 1  OPJUMP2  CCS    CYR          TEST SECOND PREFIX BIT.
 0186   REF   1                6217  1 6232 0           TCF    OPJUMP3      TEST THIRD BIT TO SEE IF UNARY OR SHIFT.

 0187                          6220   77722 0  -ENDVAC  DEC    -45

R0188           THE FOLLOWING ROUTINE PROCESSES ADDRESSES OF SUFFIX CLASS 10. THEY ARE BASICALLY WORK AREA ADDRESSES
R0190   IN THE RANGE 0 - 52, ERASABLE ECADR CONSTANTS FROM 100 - 3777, AND FCADRS ABOVE THAT. ALL 15 BITS ARE AVAILABLE
R0192   IN CONTRAST TO SUFFIX 1, IN WHICH ONLY THE LOW ORDER 14 ARE AVAILABLE.

 0193   REF  14  LAST 1081     6221  24 164 1  15BITADR INCR   LOC          (ENTRY HERE FROM STCALL).
 0194   REF  15  LAST 1084     6222  50 164 1           INDEX  LOC          PICK UP ADDRESS WORD.
 0195                          6223  3 0000 1           CA     0
 0196   REF   5  LAST   67     6224  54 117 1           TS     POLISH       WE MAY NEED A SUBADDRESS LATER.

 0197   REF   1                6225  3 4750 1           CAF    LOW7+2K      THESE INSTRUCTIONS ARE IN BANK 1.
 0198   REF  13  LAST 1081     6226  54 004 1           TS     FBANK
 0199   REF  24  LAST 1084     6227  7 0020 1           MASK   CYR
 0200   REF 284  LAST 1083     6230  50 000 1  ITR7     INDEX  A
 0201   REF   1                6231  1 6303 0           TCF    MISCJUMP
```

```
P0202           COMPLETE THE DISPATCHING OF UNARY AND SHORT SHIFT OPERATIONS.

 0203  REF  14  LAST 1084     6232  54 004 1  OPJUMP3  TS      FBANK     CALL IN BANK 0 (BITS 11-15 OF A ARE 0.)
R0204            ITRACE (6) REFERS TO &OPJUMP38.
 0205  REF  25  LAST 1084     6233  10 020 1           CCS     CYR       TEST THIRD PREFIX BIT.
 0206  REF 285  LAST 1084     6234  50 000 1           INDEX   A         THE DECREMENTED UNARY CODE IS IN BITS
 0207  REF   1                6235  1 2000 1           TCF     UNAJUMP   1-4 OF A (ZERO, EXIT, HAS BEEN DETECTED)

 0208  REF   7  LAST 1083     6236  10 163 1           CCS     MODE      ITS A SHORT SHIFT CODE. SEE IF PRESENT
 0209  REF   1                6237  1 2017 1           TCF     SHORTT    SCALAR OR VECTOR.
 0210  REF   2  LAST 1085     6240  1 2017 1           TCF     SHORTT
 0211  REF   1                6241  1 2121 0           TCF     SHORTV    CALLS THE APPROPRIATE ROUTINE.
 0212  REF   1                4364                FBANKMSK EQUALS BANKMASK
 0213  REF  22  LAST  299     6242   00122 0  LVBUF    ADRES   VBUF
```

P0214 THE FOLLOWING IS THE JUMP TABLE FOR OP CODES WHICH MAY HAVE INDEXABLE ADDRESSES OR MAY PUSH UP.

0216	REP	1		6243	1 6454 0	INDJUMP	TCF	VLOAD	00 - LOAD MPAC WITH A VECTOR.
0217	REP	1		6244	1 7040 0		TCF	TAD	01 - TRIPLE PRECISION ADD TO MPAC.
0218	REP	1		6245	1 7624 1		TCF	SIGN	02 - COMPLEMENT MPAC (V OR SC) IF X NEG.
0219	REP	1		6246	1 7350 1		TCF	VXSC	03 - VECTOR TIMES SCALAR.
0220	REP	1		6247	1 6652 1		TCF	CGOTO	04 - COMPUTED GO TO.
0221	REP	2	LAST 398	6250	1 6437 0		TCF	TLOAD	05 - LOAD MPAC WITH TRIPLE PRECISION.
0222	REP	1		6251	1 6021 0		TCF	DLOAD	06 - LOAD MPAC WITH A DP SCALAR.
0223	REP	1		6252	1 7573 0		TCF	V/SC	07 - VECTOR DIVIDED BY SCALAR.
0224	REP	1		6253	1 6450 1		TCF	SLOAD	10 - LOAD MPAC IN SINGLE PRECISION.
0225	REP	1		6254	1 6567 1		TCF	SSP	11 - SET SINGLE PRECISION INTO X.
0226	REP	1		6255	1 6472 1		TCF	PDDL	12 - PUSH DOWN MPAC AND RE-LOAD IN DP.
0227	REP	1		6256	1 7303 1		TCF	MXV	13 - MATRIX POST-MULTIPLIED BY VECTOR.
0228	REP	1		6257	1 6526 1		TCF	PDVL	14 - PUSH DOWN AND VECTOR LOAD.
0229	REP	1		6260	1 6575 1		TCF	CCALL	15 - COMPUTED CALL.
0230	REP	1		6261	1 7306 1		TCF	VXM	16 - MATRIX PRE-MULTIPLIED BY VECTOR.
0231	REP	1		6262	1 7565 1		TCF	TSLC	17 - NORMALIZE MPAC (SCALAR ONLY).
0232	REP	1		6263	1 7543 0		TCF	DMPR	20 - DP MULTIPLY AND ROUND.
0233	REP	1		6264	1 7546 0		TCF	DDV	21 - DP DIVIDE BY.
0234	REP	1		6265	1 7552 0		TCF	BDDV	22 - DP DIVIDE INTO.
0235	REP	1		6266	1 7570 0		TCF	GSHIFT	23 - GENERAL SHIFT INSTRUCTION.
0236	REP	1		6267	1 6720 0		TCF	VAD	24 - VECTOR ADD.
0237	REP	1		6270	1 6716 0		TCF	VSU	25 - VECTOR SUBTRACT.
0238	REP	1		6271	1 7005 1		TCF	BVSU	26 - VECTOR SUBTRACT FROM.
0239	REP	1		6272	1 7300 1		TCF	DOT	27 - VECTOR DOT PRODUCT.
0240	REP	1		6273	1 7427 0		TCF	VXV	30 - VECTOR CROSS PRODUCT.
0241	REP	1		6274	1 7374 1		TCF	VPROJ	31 - VECTOR PROJECTION.
0242	REP	1		6275	1 6754 0		TCF	DSU	32 - DP SUBTRACT.
0243	REP	1		6276	1 7031 0		TCF	BDSU	33 - DP SUBTRACT FROM.
0244	REP	1		6277	1 6744 1		TCF	DAD	34 - DP ADD.
0245				6300	1 6300 0		TCF		35 - AVAILABLE
0246	REP	1		6301	1 7541 1		TCF	DMP1	36 - DP MULTIPLY.
0247	REP	1		6302	1 7562 0		TCF	SETPD	37 - SET PUSH DOWN POINTER (DIRECT ONLY)

R0248 CODES 10 AND 14 MUST NOT PUSH UP. CODE 04 MAY BE USED FOR VECTOR DECLARE BEFORE PUSHUP IF DESIRED.

P0250 THE FOLLOWING JUMP TABLE APPLIES TO INDEX, BRANCH, AND MISCELLANEOUS INSTRUCTIONS.

0252	REF	1	6303	1 2371 1	MISCJUMP	TCF	AXT	00 - ADDRESS TO INDEX TRUE.
0253	REF	1	6304	1 2376 0		TCF	AXC	01 - ADDRESS TO INDEX COMPLEMENTED.
0254	REF	1	6305	1 2401 1		TCF	LXA	02 - LOAD INDEX FROM ERASABLE.
0255	REF	1	6306	1 2405 0		TCF	LXC	03 - LOAD INDEX FROM COMPLEMENT OF ERAS.
0256	REF	1	6307	1 2411 0		TCF	SXA	04 - STORE INDEX IN ERASABLE.
0257	REF	1	6310	1 2417 0		TCF	XCHX	05 - EXCHANGE INDEX WITH ERASABLE.
0258	REF	1	6311	1 2433 0		TCF	INCR	06 - INCREMENT INDEX REGISTER.
0259	REF	1	6312	1 2442 0		TCF	TIX	07 - TRANSFER ON INDEX.
0260	REF	1	6313	1 2425 1		TCF	XAD	10 - INDEX REGISTER ADD FROM ERASABLE.
0261	REF	1	6314	1 2436 0		TCF	XSU	11 - INDEX SUBTRACT FROM ERASABLE.
0262	REF	1	6315	1 2514 1		TCF	BZE/GOTO	12 - BRANCH ZERO AND GOTO.
0263	REF	1	6316	1 2521 1		TCF	BPL/BMN	13 - BRANCH PLUS AND BRANCH MINUS.
0264	REF	1	6317	1 2474 0		TCF	RTB/BHIZ	14 - RETURN TO BASIC AND BRANCH HI ZERO.
0265	REF	1	6320	1 2534 0		TCF	CALL/ITA	15 - CALL AND STORE QPRET.
0266	REF	1	6321	1 2543 0		TCF	SW/	16 - SWITCH INSTRUCTIONS AND AVAILABLE.
0267	REF	1	6322	1 2504 0		TCF	BOV(B)	17 - BRANCH ON OVERFLOW TO BASIC OR INT.

P0268 THE FOLLOWING JUMP TABLE APPIES TO UNARY INSTRUCTIONS.

```
0269  REP  1                                          COUNT  00/INTER
0270                    00,2000                      BANK   0
0271  REP  1           00,2000  1 3207 0  UNAJUMP    TCF    SQRT      00 - EXIT - DETECTED EARLIER.
0272  REP  1           00,2001  1 3527 0             TCF    SINE      01 - SQUARE ROOT.
0273  REP  1           00,2002  1 3516 1             TCF    COSINE    02 - SIN.
0274  REP  1           00,2003  1 3807 1             TCF    ARCSIN    03 - COS.
0275  REP  1           00,2004  1 3811 0             TCF    ARCCOS    04 - ARC SIN.
0276  REP  1           00,2005  1 3174 1             TCF    DSQ       05 - ARC COS.
0277  REP  1           00,2006  1 2116 1             TCF    ROUND     06 - DP SQUARE.
                                                                     07 - ROUND TO DP.
0278  REP  1           00,2007  1 7637 0             TCF    COMP      10 - COMPLEMENT VECTOR OR SCALAR.
0279  REP  1           00,2010  1 3232 0             TCF    VDEF      11 - VECTOR DEFINE.
0280  REP  1           00,2011  1 3023 1             TCF    UNIT      12 - UNIT VECTOR.
0281  REP  1           00,2012  1 3176 0             TCF    ABVALABS  13 - LENGTH OF VECTOR OR MAG OF SCALAR.
0282  REP  1           00,2013  1 3245 0             TCF    VSQ       14 - SQUARE OF LENGTH OF VECTOR.
0283  REP  1           00,2014  1 6323 1             TCF    STADR     15 - PUSH UP ON STORE CODE.
0284  REP  1           00,2015  1 3274 1             TCF    RVQ       16 - RETURN VIA QPRET.
0285  REP  1           00,2016  1 3247 1             TCF    PUSH      17 - PUSH MPAC DOWN.
```

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P0286 SECTION 2 LOAD AND STORE PACKAGE.

R0287 A SET OF EIGHT STORE CODES IS PROVIDED AS THE PRIMARY METHOD OF STORING THE MULTI-PURPOSE
R0289 ACCUMULATOR (MPAC). IF IN THE DANZIG SECTION LOC REFERS TO AN ALGEBRAICALLY POSITIVE WORD, IT IS TAKEN AS A
R0291 STORE CODE WITH A CORRESPONDING ERASABLE ADDRESS. MOST OF THESE CODES ARE TWO ADDRESS, SPECIFYING THAT THE WORD
R0293 FOLLOWING THE STORE CODE IS TO BE USED AS AN ADDRESS FROM WHICH TO RE-LOAD MPAC. FOUR OPTIONS ARE AVAILABLE'

R0295 1. STORE STORE MPAC. THE E ADDRESS MAY BE INDEXED.
R0297 2. STODL STORE MPAC AND RE-LOAD IT IN DP WITH THE NEXT ADDRESS (THE LOAD MAY BE INDEXED).
R0299 3. STOVL STORE MPAC AND RE-LOAD A VECTOR (AS ABOVE).
R0301 4. STCALL STORE AND DO A CALL (BOTH ADDRESSES MUST BE DIRECT HERE).

R0303 STODL AND STOVL WILL TAKE FROM THE PUSH-DOWN LIST IF NO LOAD ADDRESS IS GIVEN.
0305 6323 BLOCK 3

0306 REF 2 LAST 1077 TO 1088' 205 205* COUNT 03/INTER

0307	REF	4	LAST 1078	6323	3 0165 0	STADR	CA	BANKSET	THE STADR CODE (PUSHUP UP ON STORE
0308	REF	15	LAST 1085	6324	54 004 1		TS	FBANK	ADDRESS) ENTERS HERE.
0309	REF	16	LAST 1084	6325	24 164 1		INCR	LOC	
0310	REF	17	LAST 1089	6326	50 164 1	ITR1	INDEX	LOC	THE STORECODE WAS STORED COMPLEMENTED TO
0311				6327	4 0000 0		CS	0	MAKE IT LOOK LIKE AN OPCODE PAIR.
0312	REF	23	LAST 1069	6330	6 7716 0		AD	NEGONE	(YUL CANT REMOVE 1 BECAUSE OF EARLY CCS)
0313	REF	14	LAST 1083	6331	54 116 0	DOSTORE	TS	ADDRWD	
0314	REF	7	LAST 373	6332	7 4372 1		MASK	LOW11	ENTRY FROM DISPATCHER. SAVE THE ERASABLE
0315	REF	15	LAST 1089	6333	56 116 1		XCH	ADDRWD	ADDRESS AND JUMP ON THE STORE CODE NO.
0316	REF	1		6334	7 7671 1		MASK	B12T14	
0317				6335	0 0006 1		EXTEND		
0318	REF	38	LAST 1013	6336	7 4706 0		MP	BIT5	EACH TRANSFER VECTOR ENTRY IS TWO WORDS.
0319	REF	286	LAST 1085	6337	50 000 1	ITR0	INDEX	A	
0320	REF	1		6340	1 6341 0		TCF	STORJUMP	

P0321 STORE CODE JUMP TABLE. CALLS THE APPROPRIATE STORING ROUTINE AND EXITS TO DANZIG OR TO ADDRESS WITH
R0323 A SUPPLIED OPERATION CODE.

R03231 STORE STORE,1 AND STORE,2 RETURN TO DANZIG, THUS RESETTING THE EBANK TO ITS STATE AT INTPRET.

```
0324  REF   1                 6341  0 6371 1  STORJUMP TC    STORE       STORE.
0325  REF   9  LAST  754       6342  1 6030 0           TCF   DANZIG      PICK UP NEW OP CODE(S).
0326  REF   1                 6343  0 6363 1           TC    STORE,1
0327  REF  10  LAST 1090       6344  1 6030 0           TCF   DANZIG
0328  REF   1                 6345  0 6366 1           TC    STORE,2
0329  REF  11  LAST 1090       6346  1 6030 0           TCF   DANZIG

0330  REF   2  LAST 1090       6347  0 6371 1           TC    STORE       STODL.
0331  REF   1                 6350  1 6427 1           TCF   DODLOAD

0332  REF   3  LAST 1090       6351  0 6371 1           TC    STORE       STODL WITH INDEXED LOAD ADDRESS.
0333  REF   1                 6352  1 6113 0           TCF   DODLOAD*

0334  REF   4  LAST 1090       6353  0 6371 1           TC    STORE       STOVL.
0335  REF   1                 6354  1 6432 0           TCF   DOVLOAD

0336  REF   5  LAST 1090       6355  0 6371 1           TC    STORE       STOVL WITH INDEXED LOAD ADDRESS.
0337  REF   1                 6356  1 6435 1           TCF   DOVLOAD*
0338  REF   6  LAST 1090       6357  0 6371 1           TC    STORE       STOIC.
0339  REF   1                 6360  3 4723 0           CAF   CALLCODE
0340  REF  28  LAST 1085       6361  54 020 1           TS    CYR
0341  REF   1                 6362  1 6221 1           TCF   15BITADR    GET A 15 BIT ADDRESS.
```

P0342 STORE CODE ADDRESS PROCESSOR.

```
0343  REP  21  LAST 1081    6363  50 120 1  STORE,1  INDEX  FIXLOC
0344  REP  49  LAST 1081    6364  4 0046 1           CS     X1
0345  REP   1               6365  1 6370 1           TCF    PRESTORE

0346  REP  22  LAST 1091    6366  50 120 1  STORE,2  INDEX  FIXLOC
0347  REP  26  LAST  890    6367  4 0047 0           CS     X2
0348  REP  16  LAST 1089    6370  26 116 0  PRESTORE ADS    ADDRWD      RESULTANT ADDRESS IS IN ERASABLE.

0349  REP  17  LAST 1091    6371  4 0116 0  STORE    CS     ADDRWD
0350  REP   2  LAST  941    6372  6 4727 1           AD     DEC45
0351  REP 287  LAST 1089    6373  10 000 0           CCS    A           DOES THE ADDRESS POINT TO THE WORK AREA
0352  REP  23  LAST 1091    6374  3 0120 1           CA     FIXLOC      YES.
0353  REP   1               6375  1 6402 0           TCF    AHEAD5
0354  REP   5  LAST 1081    6376  3 4744 1           CA     OCT1400     NO.  SET EBANK d MAKE UP SUBADDRESS.
0355  REP  18  LAST 1091    6377  56 116 1           XCH    ADDRWD
0356  REP  48  LAST 1081    6400  54 003 0           TS     EBANK
0357  REP  10  LAST 1081    6401  7 4373 0           MASK   LOW8
0358  REP  19  LAST 1091    6402  26 116 0  AHEAD5   ADS    ADDRWD
```

```
P0359          STORING ROUTINES. STORE DP, TP, OR VECTOR AS INDICATED BY MODE.

 0360                          6403  0 0006 1  STARTSTO EXTEND          MPAC,+1 MUST BE STORED IN ANY EVENT.
R0361          LOCATION (5) REFERS TO *STARTSTO*.
 0362  REF 291  LAST 1078     6404  3 0155 0           DCA    MPAC
 0363  REF  20  LAST 1091     6405  50 116 1           INDEX  ADDRWD
 0364                          6406  52 001 1           DXCH   0

 0365  REF   8  LAST 1085     6407  10 163 1           CCS    MODE
 0366  REF   1                6410  1 6423 0           TCF    TSTORE
 0367  REF 229  LAST 1076     6411  0 0002 0           TC     Q

 0368                          6412  0 0006 1  VSTORE   EXTEND
 0369  REF 292  LAST 1092     6413  3 0160 0           DCA    MPAC +3
 0370  REF  21  LAST 1092     6414  50 116 1           INDEX  ADDRWD
 0371                          6415  52 003 0           DXCH   2

 0372                          6416  0 0006 1           EXTEND
 0373  REF 293  LAST 1092     6417  3 0162 1           DCA    MPAC +5
 0374  REF  22  LAST 1092     6420  50 116 1           INDEX  ADDRWD
 0375                          6421  52 005 0           DXCH   4
 0376  REF 230  LAST 1092     6422  0 0002 0           TC     Q

 0377  REF 294  LAST 1092     6423  3 0156 0  TSTORE   CA     MPAC +2
 0378  REF  23  LAST 1092     6424  50 116 1           INDEX  ADDRWD
 0379                          6425  54 002 1           TS     2
 0380  REF 231  LAST 1092     6426  0 0002 0           TC     Q
```

```
P0381          ROUTINES TO BEGIN PROCESSING OF THE SECOND ADDRESS ASSOCIATED WITH ALL STORE-TYPE CODES EXCEPT STORE
R0383  ITSELF.

 0384  REF   1                 6427  3 7701 0  DODLOAD  CAF   DLOADCOD
 0385  REF  27  LAST 1090      6430  54 020 1            TS    CYR
 0386  REF   1                 6431  1 6055 0           TCF   DIRADRES       GO GET A DIRECT ADDRESS.

 0387  REF   1                 6432  3 4674 0  DOVLOAD  CAF   VLOADCOD
 0388  REF  28  LAST 1093      6433  54 020 1            TS    CYR
 0389  REF   2  LAST 1093      6434  1 6055 0           TCF   DIRADRES

 0390  REF   1                 6435  3 6056 1  DOVLOAD* CAF   VLOAD*
 0391  REF   2  LAST 1090      6436  1 6114 1           TCF   DODLOAD* +1    PROLOGUE TO INDEX ROUTINE.
```

P0392 THE FOLLOWING LOAD INSTRUCTIONS ARE PROVIDED FOR LOADING THE MULTI-PURPOSE ACCUMULATOR MPAC.

```
0394  REF  24  LAST 1092    6437  50 116 1  TLOAD    INDEX   ADDRWD
0395                        6440  3 0002 0           CA      2          LOAD A TRIPLE PRECISION ARGUMENT INTO
0396  REF 295  LAST 1092    6441  54 156 1           TS      MPAC +2    THE FIRST THREE MPAC REGISTERS, WITH THE
0397                        6442  0 0006 1           EXTEND             CONTENTS OF THE OTHER FOUR IRRELEVANT.
0398  REF  25  LAST 1094    6443  5 0116 1           INDEX   ADDRWD
0399                        6444  3 0001 0           DCA     0
0400  REF 296  LAST 1094    6445  52 155 1           DXCH    MPAC
0401  REF 133  LAST 1058    6446  3 4712 1  TMODE    CAF     ONE
0402  REF   1                6447  1 6027 0           TCF     NEWMODE    DECLARE TRIPLE PRECISION MODE.

0403                        6450  22 007 0  SLOAD    ZL                 LOAD A SINGLE PRECISION NUMBER INTO
0404  REF  26  LAST 1094    6451  50 116 1           INDEX   ADDRWD     MPAC, SETTING MPAC+1,2 TO ZERO. THE
0405                        6452  3 0000 1           CA      0          CONTENTS OF THE REMAINING MPAC REGISTERS
0406  REF   1                6453  1 6024 0           TCF     SLOAD2     ARE IRRELEVANT.

0407                        6454  0 0006 1  VLOAD    EXTEND             LOAD A DOUBLE PRECISION VECTOR INTO
0408  REF  27  LAST 1094    6455  5 0116 1           INDEX   ADDRWD     MPAC,+1, MPAC+3,4, AND MPAC+5,6. THE
0409                        6456  3 0001 0           DCA     0          CONTENTS OF MPAC +2 ARE IRRELEVANT.
0410  REF 297  LAST 1094    6457  52 155 1           DXCH    MPAC

0411                        6460  0 0006 1  ENDVLOAD EXTEND             PDVL COMES HERE TO FINISH UP FOR DP, TP.
0412  REF  28  LAST 1094    6461  5 0116 1           INDEX   ADDRWD
0413                        6462  3 0003 1           DCA     2
0414  REF 298  LAST 1094    6463  52 160 1           DXCH    MPAC +3

0415                        6464  0 0006 1  +4       EXTEND             TPDVL FINISHES HERE.
0416  REF  29  LAST 1094    6465  5 0116 1           INDEX   ADDRWD
0417                        6466  3 0005 1           DCA     4
0418  REF 299  LAST 1094    6467  52 162 0           DXCH    MPAC +5

0419  REF 134  LAST 1094    6470  4 4712 0  VMODE    CS      ONE        DECLARE VECTOR MODE.
0420  REF   2  LAST 1094    6471  1 6027 0           TCF     NEWMODE
```

```
P0421          THE FOLLOWING INSTRUCTIONS ARE PROVIDED FOR STORING OPERANDS IN THE PUSHDOWN LIST'

R0423          1.  PUSH        PUSHDOWN AND NO LOAD.
R0424          2.  PDDL        PUSHDOWN AND DOUBLE PRECISION LOAD.
R0425          3.  PDVL        PUSHDOWN AND VECTOR LOAD.

 0426                           6472  0 0006 1  PDDL    EXTEND
 0427  REP  30  LAST 1094      6473  5 0116 1          INDEX   ADDRWD      LOAD MPAC,+1, PUSHING THE FORMER
 0428                           6474  3 0001 0          DCA     0           CONTENTS DOWN.
 0429  REP 300  LAST 1094      6475  52 155 1          DXCH    MPAC
 0430  REP   2  LAST 1083      6476  50 166 0          INDEX   PUSHLOC
 0431                           6477  52 001 1          DXCH    0

 0432  REP   9  LAST 1092      6500  50 163 0          INDEX   MODE        ADVANCE THE PUSHDOWN POINTER APPRO-
 0433  REP   3  LAST 1083      6501  3 6213 1          CAF     NO.WDS      PRIATELY.
 0434  REP   3  LAST 1095      6502  26 166 1          ADS     PUSHLOC

 0435  REP  10  LAST 1095      6503  10 163 1          CCS     MODE
 0436  REP   1                 6504  1 6521 0          TCF     ENDTPUSH
 0437  REP   1.                6505  1 6517 0          TCF     ENDDPUSH

 0438  REP  11  LAST 1095      6506  54 163 1          TS      MODE        NOW DP.
 0439  REP 301  LAST 1095      6507  54 156 1  ENDVPUSH TS      MPAC +2
 0440  REP 302  LAST 1095      6510  52 160 1          DXCH    MPAC +3     PUSH DOWN THE REST OF THE VECTOR HERE.
 0441  REP   4  LAST 1095      6511  50 166 0          INDEX   PUSHLOC
 0442                           6512  51=775 0          DXCH    0 -4

 0443  REP 303  LAST 1095      6513  52 162 0          DXCH    MPAC +5
 0444  REP   5  LAST 1095      6514  50 166 0          INDEX   PUSHLOC
 0445                           6515  51=777 1          DXCH    0 -2

 0446  REP  12  LAST 1090      6516  1 6030 0          TCF     DANZIG

 0447  REP 304  LAST 1095      6517  54 156 1  ENDDPUSH TS      MPAC +2     SET MPAC +2 TO ZERO AND EXIT ON DP.
 0448  REP  13  LAST 1095      6520  1 6030 0          TCF     DANZIG

 0449  REP  12  LAST 1095      6521  54 163 1  ENDTPUSH TS      MODE
 0450  REP 305  LAST 1095      6522  56 156 0          XCH     MPAC +2     ON TRIPLE, SET MPAC +2 TO ZERO, PUSHING
 0451  REP   6  LAST 1095      6523  50 166 0    +2    INDEX   PUSHLOC     DOWN THE OLD CONTENTS
 0452                           6524  53=777 0          TS      0 -1
 0453  REP  14  LAST 1095      6525  1 6030 0          TCF     DANZIG
```

P0454 PDVL - PUSHDOWN AND VECTOR LOAD.

```
0455                          6526  0 0006 1  PDVL    EXTEND            RELOAD MPAC AND PUSH DOWN ITS CONTENTS.
0456  REF  31  LAST 1095     6527  5 0116 1          INDEX   ADDRWD
0457                          6530  3 0001 0          DCA     0
0458  REF 306  LAST 1095     6531  52 155 1          DXCH    MPAC
0459  REF   7  LAST 1095     6532  50 166 0          INDEX   PUSHLOC
0460                          6533  52 001 1          DXCH    0

0461  REF  13  LAST 1095     6534  50 163 0          INDEX   MODE            ADVANCE THE PUSHDOWN POINTER.
0462  REF   4  LAST 1095     6535  3 6213 1          CAF     NO.WDS
0463  REF   8  LAST 1096     6536  26 166 1          ADS     PUSHLOC

0464  REF  14  LAST 1096     6537  10 163 1          CCS     MODE            TEST PAST MODE.
0465  REF   1                 6540  1 6557 1          TCF     TPDVL
0466  REF   1                 6541  1 6460 1          TCF     ENDVLOAD        JUST LOAD LAST FOUR REGISTERS ON DP.

0467                          6542  0 0006 1  VPDVL   EXTEND            PUSHDOWN AND RE-LOAD LAST TWO COMPONENTS
0468  REF  32  LAST 1096     6543  5 0116 1          INDEX   ADDRWD
0469                          6544  3 0003 1          DCA     2
0470  REF 307  LAST 1096     6545  52 160 1          DXCH    MPAC +3
0471  REF   9  LAST 1096     6546  50 166 0          INDEX   PUSHLOC
0472                          6547  51=775 0          DXCH    0 -4

0473                          6550  0 0006 1          EXTEND
0474  REF  33  LAST 1096     6551  5 0116 1          INDEX   ADDRWD
0475                          6552  3 0005 1          DCA     4
0476  REF 308  LAST 1096     6553  52 162 0          DXCH    MPAC +5
0477  REF  10  LAST 1096     6554  50 166 0          INDEX   PUSHLOC
0478                          6555  51=777 1          DXCH    0 -2

0479  REF  15  LAST 1095     6556  1 6030 0          TCF     DANZIG

0480                          6557  0 0006 1  TPDVL   EXTEND            ON TP, WE MUST LOAD THE Y COMPONENT
0481  REF  34  LAST 1096     6560  5 0116 1          INDEX   ADDRWD          BEFORE STORING MPAC +2 INCASE THIS IS A
0482                          6561  3 0003 1          DCA     2               PUSHUP.
0483  REF 309  LAST 1096     6562  52 160 1          DXCH    MPAC +3

0484  REF 310  LAST 1096     6563  3 0156 0          CA      MPAC +2
0485  REF  11  LAST 1096     6564  50 166 0          INDEX   PUSHLOC         IN DP.
0486                          6565  53=777 0          TS      0 -1
0487  REF   2  LAST 1096     6566  1 6464 0          TCF     ENDVLOAD +4

R0488  SSP (STORE SINGLE PRECISION) IS EXECUTED HERE.

0489  REF  18  LAST 1089     6567  24 164 1  SSP     INCR    LOC             PICK UP THE WORD FOLLOWING THE GIVEN
0490  REF  19  LAST 1096     6570  50 164 1          INDEX   LOC             ADDRESS AND STORE IT AT X.
0491                          6571  3 0000 1          CA      0
0492  REF  35  LAST 1096     6572  50 116 1  STORE1  INDEX   ADDRWD          SOME INDEX AND MISCELLANEOUS OPS END
0493                          6573  54 000 0          TS      0               HERE.
```

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0494 REF 16 LAST 1096 6574 1 6030 0 TCF DANZIG

P0495 SEQUENCE CHANGING AND SUBROUTINE CALLING OPTIONS.

R0498 THE FOLLOWING OPERATIONS ARE AVAILABLE FOR SEQUENCING CHANGING, BRANCHING, AND CALLING SUBROUTINES'

R0498 1. GOTO GO TO.
R0499 2. CALL CALL SUBROUTINE SETTING QPRET.
R0500 3. CGOTO COMPUTED GO TO.
R0501 4. CCALL COMPUTED CALL.
R0502 7. BPL BRANCH IF MPAC POSITIVE OR ZERO.
R0503 8. BZE BRANCH IF MPAC ZERO.
R0504 9. BMN BRANCH IF MPAC NEGATIVE NON-ZERO.

```
0505  REF  20  LAST 1096    6575  24 164 1  CCALL   INCR    LOC       MAINTAIN LOC FOR QPRET COMPUTATION.
0506  REF  21  LAST 1098    6576  50 164 1          INDEX   LOC
0507                        6577  3 0000 1           CAF     0         GET BASE ADDRESS OF CADR LIST.
0508  REF  36  LAST 1096    6600  50 116 1           INDEX   ADDRWD
0509                        6601  6 0000 1           AD      0         ADD INCREMENT.
0510  REF  16  LAST 1089    6602  54 004 1           TS      FBANK     SELECT DESIRED CADR.
0511  REF  16  LAST 1081    6603  7 4747 0           MASK    LOW10
0512  REF 288  LAST 1091    6604  50 000 1           INDEX   A
0513                        6605  3 2000 0           CAF     10000
0514  REF   6  LAST 1084    6606  54 117 1           TS      POLISH

0515  REF   5  LAST 1089    6607  3 0165 0  CALL    CA      BANKSET   FOR ANY OF THE CALL OPTIONS, MAKE UP THE
0516  REF   2  LAST 1085    6610  7 4364 0           MASK    BANKMASK  ADDRESS OF THE NEXT OP-CODE PAIR/STORE
0517  REF   3  LAST 1098    6611  6 4364 1           AD      BANKMASK  CODE AND LEAVE IT IN QPRET.  NOTE THAT
0518  REF  22  LAST 1098    6612  6 0164 1           AD      LOC       BANKMASK = -(2000 - 1).
0519  REF  24  LAST 1091    6613  50 120 1           INDEX   FIXLOC
0520  REF  17  LAST  748    6614  54 052 1           TS      QPRET

0521  REF   7  LAST 1098    6615  3 0117 0  GOTO    CA      POLISH    BASIC BRANCHING SEQUENCE.
0522  REF   4  LAST 1081    6616  7 7711 0   +1     MASK    HIGH4
0523                        6617  0 0006 1           EXTEND
0524  REF   1                6620  1 6631 1           BZF     GOTOERS   SEE IF ADDRESS POINTS TO FIXED OR ERAS.
0525  REF   6  LAST 1098    6621  3 0165 0   +4     CA      BANKSET   SET EBANK PART OF BBANK. NEXT, SET UP
0526  REF  18  LAST 1078    6622  54 006 0           TS      BBANK     FBANK. THE COMBINATION IS PICKED UP d
0527  REF   8  LAST 1098    6623  3 0117 0           CA      POLISH    PUT INTO BANKSET AT INTPRET +2.
0528  REF  17  LAST 1098    6624  54 004 1           TS      FBANK
0529  REF  17  LAST 1098    6625  7 4747 0           MASK    LOW10
0530  REF   2  LAST 1081    6626  6 4700 1           AD      2K
0531  REF  23  LAST 1098    6627  54 164 0           TS      LOC
0532  REF 227  LAST 1077    6630  1 6011 0           TCF     INTPRET +3

0533                       E3,1400                  EBANK=  1400      SO YUL DOESN'T CUSS THE $CA 1400$ BELOW.

0534  REF   9  LAST 1098    6631  3 0117 0  GOTOERS CA      POLISH    THE GIVEN ADDRESS IS IN ERASABLE - SEE
0535  REF   2  LAST 1080    6632  6 6220 1           AD      -ENDVAC   IF RELATIVE TO THE WORK AREA.
0536  REF 289  LAST 1098    6633  10 000 0           CCS     A
0537  REF  10  LAST 1098    6634  3 0117 0           CA      POLISH    GENERAL ERASABLE.
0538  REF   1                6635  1 6644 0           TCF     GOTOGE
```

```
0539  REF  25  LAST 1098    6636  3 0120 1          CA     FIXLOC    WORK AREA.
0540  REF  11  LAST 1098    6637  6 0117 0          AD     POLISH
0541  REF 290  LAST 1098    6640  50 000 1          INDEX  A         USE THE GIVEN ADDRESS AS THE ADDRESS OF
0542                        6641  3 0000 1          CA     0         THE BRANCH ADDRESS.
0543  REF  12  LAST 1099    6642  54 117 1          TS     POLISH
0544  REF   1               6643  1 6616 1          TCF    GOTO +1   ALLOWS ARBITRARY INDIRECTNESS LEVELS.

0545  REF  49  LAST 1091    6644  54 003 0  GOTOGE  TS     EBANK
0546  REF  11  LAST 1091    6645  7 4373 0          MASK   LOW8
0547  REF 291  LAST 1099    6646  50 000 1          INDEX  A         USE THE GIVEN ADDRESS AS THE ADDRESS OF
0548                        6647  3 1400 1          CA     1400      THE BRANCH ADDRESS.
0549  REF  13  LAST 1099    6650  54 117 1          TS     POLISH
0550  REF   2  LAST 1099    6651  1 6616 1          TCF    GOTO +1

0551  REF  24  LAST 1098    6652  50 164 1  CGOTO   INDEX  LOC       COMPUTED GO TO. PICK UP ADDRESS OF CADR
0552                        6653  3 0001 0          CA     1         LIST.
0553  REF  37  LAST 1098    6654  50 116 1          INDEX  ADDRWD    ADD MODIFIER.
0554                        6655  6 0000 1          AD     0
0555  REF  18  LAST 1098    6656  54 004 1          TS     FBANK     SELECT GOTO ADDRESS.
0556  REF  18  LAST 1098    6657  7 4747 0          MASK   LOW10
0557  REF 292  LAST 1099    6660  50 000 1          INDEX  A
0558                        6661  3 2000 0          CA     10000
0559  REF  14  LAST 1099    6662  54 117 1          TS     POLISH
0560  REF   3  LAST 1099    6663  1 6616 1          TCF    GOTO +1   WITH ADDRESS IN A.

0561  REF   7  LAST 1098    6664  3 0165 0  SWBRANCH CA    BANKSET   SWITCH INSTRUCTIONS WHICH ELECT TO
0562  REF  19  LAST 1099    6665  54 004 1          TS     FBANK     BRANCH COME HERE TO DO SO.
0563  REF  25  LAST 1099    6666  50 164 1          INDEX  LOC
0564                        6667  3 0001 0          CA     1
0565  REF  15  LAST 1099    6670  54 117 1          TS     POLISH
0566  REF   4  LAST 1099    6671  1 6616 1          TCF    GOTO +1
```

```
P0567           TRIPLE PRECISION BRANCHING ROUTINE. IF CALLING TC IS AT L, RETURN IS AS FOLLOWS'

R0569           L+1  IF MPAC IS GREATER THAN ZERO.
R0570           L+2  IF MPAC IS EQUAL TO +0 OR -0.
R0571           L+3  IF MPAC IS LESS THAN ZERO.
 0572   REF 311 LAST 1098      6672  10 154 0  BRANCH  CCS   MPAC
 0573   REF 232 LAST 1092      6673  0 0002 0          TC    Q
 0574                         6674  1 6676 1          TCF   +2          ON ZERO.
 0575   REF   1                6675  1 6710 0          TCF   NEG

 0576   REF 312 LAST 1100      6676  10 155 1          CCS   MPAC +1
 0577   REF 233 LAST 1100      6677  0 0002 0          TC    Q
 0578                         6700  1 6702 0          TCF   +2
 0579   REF   2 LAST 1100      6701  1 6710 0          TCF   NEG

 0580   REF 313 LAST 1100      6702  10 156 1          CCS   MPAC +2
 0581   REF 234 LAST 1100      6703  0 0002 0          TC    Q
 0582                         6704  1 6706 1          TCF   +2
 0583   REF   3 LAST 1100      6705  1 6710 0          TCF   NEG

 0584   REF 235 LAST 1100      6706  50 002 0  Q+1     INDEX Q
 0585                         6707  0 0001 0          TC    1

 0586   REF 236 LAST 1100      6710  50 002 0  NEG     INDEX Q           IF FIRST NON-ZERO REGISTER WAS NEGATIVE.
 0587                         6711  0 0002 0          TC    2
 0588   REF   4 LAST 1100      6710                Q+2   =     NEG

R0589           ITRACE (3) REFERS TO $EXIT$.
 0590   REF   8 LAST 1099      6712  3 0165 0  EXIT    CA    BANKSET     RESTORE USER'S BANK SETTING, AND LEAVE
 0591   REF  19 LAST 1098      6713  54 006 0          TS    BBANK       INTERPRETIVE MODE.
 0592   REF  26 LAST 1099      6714  50 164 1          INDEX LOC
 0593                         6715  0 0001 0          TC    1
```

```
P0594   SECTION 3 - ADD/SUBTRACT PACKAGE.

R0595           THE FOLLOWING OPERATIONS ARE PROVIDED FOR ADDING TO AND SUBTRACTING FROM THE MULTI-PURPOSE ACCUMULATOR
R0597   MPAC'

R0598           1.  DAD             DOUBLE PRECISION ADD.
R0599           2.  DSU             DOUBLE PRECISION SUBTRACT.
R0600           3.  BDSU            DOUBLE PRECISION SUBTRACT FROM.

R0601           4.  TAD             TRIPLE PRECISION ADD.

R0602           5.  VAD             VECTOR ADD.
R0603           6.  VSU             VECTOR SUBTRACT.
R0604           7.  BVSU            VECTOR SUBTRACT FROM.

R0605   THE INTERPRETIVE OVERFLOW INDICATOR OVFIND IS SET NON-ZERO IF OVERFLOW OCCURS IN ANY OF THE ABOVE.
 0607   REF  44  LAST 1077      6716  3 4674 0  VSU       CAF     BIT15           CHANGES 0 TO DCS.
 0608                           6717  1 6721 1            TCF     +2

 0609   REF  12  LAST  953      6720  3 4371 0  VAD       CAF     PRIO30          CHANGES 0 TO DCA.
 0610   REF  38  LAST 1099      6721  26 116 0            ADS     ADDRWD
 0611                           6722  0 0006 1            EXTEND
 0612   REF  39  LAST 1101      6723  5 0116 1            INDEX   ADDRWD
 0613   REF   2  LAST  424      6724  00 003 1            READ    HISCALAR        DCA 2  OR  DCS 2
 0614   REF 314  LAST 1100      6725  20 160 1            DAS     MPAC +3
 0615                           6726  0 0006 1            EXTEND                  CHECK OVERFLOW.
 0616                           6727  1 6731 0            BZF     +2
 0617   REF   1                 6730  0 6763 0            TC      OVERFLWY

 0618                           6731  0 0006 1            EXTEND
 0619   REF  40  LAST 1101      6732  5 0116 1            INDEX   ADDRWD
 0620   REF   8  LAST 1033      6733  00 005 1            READ    CHAN5           DCA 4  OR  DCS 4
 0621   REF 315  LAST 1101      6734  20 162 0            DAS     MPAC +5
 0622                           6735  0 0006 1            EXTEND
 0623                           6736  1 6740 0            BZF     +2
 0624   REF   1                 6737  0 6760 0            TC      OVERFLWZ

 0625                           6740  0 0006 1            EXTEND
 0626   REF  41  LAST 1101      6741  5 0116 1            INDEX   ADDRWD
 0627   REF  15  LAST 1049      6742  00 001 0            READ    LCHAN           DCA 0  OR  DCS 0
 0628   REF   1                 6743  1 6747 1            TCF     ENDVXV

 0629                           6744  0 0006 1  DAD       EXTEND
 0630   REF  42  LAST 1101      6745  5 0116 1            INDEX   ADDRWD
 0631                           6746  3 0001 0            DCA     0
 0632   REF 316  LAST 1101      6747  20 155 1  ENDVXV    DAS     MPAC            VXV FINISHES HERE.
 0633                           6750  0 0006 1            EXTEND
 0634   REF  17  LAST 1097      6751  1 6030 0            BZF     DANZIG
```

L INTERPRETER


```
0635  REP   1                 6752  0 6766 0  SETOVF   TC     OVERFLOW
0636  REP   18  LAST 1101     6753  1 6030 0           TCF    DANZIG
```

```
0637                                6754  0 0006 1  DSU     EXTEND
0638  REF  43  LAST 1101           6755  5 0116 1          INDEX  ADDRWD
0639                                6756  4 0001 1          DCS    0
0640  REF   2  LAST 1101           6757  1 6747 1          TCF    ENDVXV

0641  REF 168  LAST 1075           6760  54 001 1  OVERFLWZ TS    L          ENTRY FOR THIRD COMPONENT.
0642  REF  26  LAST 1039           6761  3 4715 0          CAF    FIVE
0643                                6762  1 6765 1          TCF    +3

0644  REF 169  LAST 1103           6763  54 001 1  OVERFLWY TS    L          ENTRY FOR SECOND COMPONENT.
0645  REF  40  LAST 1060           6764  3 6214 0          CAF    THREE
0646  REF 170  LAST 1103           6765  56 001 0          XCH    L

0647  REF 293  LAST 1099           6766  50 000 1  OVERFLOW INDEX  A          ENTRY FOR 1ST COMP OR DP (L=0).
0648  REF   5  LAST 1036           6767  4 4673 0          CS     LIMITS     PICK UP POSMAX OR NEGMAX.
0649  REF  44  LAST  369           6770  54 130 1          TS     BUF
0650                                6771  0 0006 1          EXTEND
0651  REF 294  LAST 1103           6772  24 000 1          AUG    A          FORCE OVERFLOW.
0652  REF 171  LAST 1103           6773  50 001 0          INDEX  L
0653  REF 317  LAST 1101           6774  26 155 1          ADS    MPAC +1
0654                                6775  54 007 1          TS     Y
0655  REF 210  LAST 1077           6776  3 4714 1          CAF    ZERO
0656  REF  45  LAST 1103           6777  6 0130 0          AD     BUF
0657  REF 172  LAST 1103           7000  50 001 0          INDEX  L
0658  REF 318  LAST 1103           7001  26 154 0          ADS    MPAC
0659                                7002  54 007 1          TS     Y
0660  REF 237  LAST 1100           7003  0 0002 0          TC     Q          NO OVERFLOW EXIT.
0661  REF   1                     7004  1 7121 0          TCF    SETOVF2    SET OVFIND AND EXIT.

0662                                7005  0 0006 1  BVSU    EXTEND
0663  REF  44  LAST 1103           7006  5 0116 1          INDEX  ADDRWD
0664                                7007  3 0003 1          DCA    2
0665  REF 319  LAST 1103           7010  52 160 1          DXCH   MPAC +3
0666                                7011  0 0006 1          EXTEND
0667                                7012  4 0001 1          DCOM
0668  REF 320  LAST 1103           7013  20 160 1          DAS    MPAC +3
0669                                7014  0 0006 1          EXTEND
0670                                7015  1 7017 1          BZF    +2
0671  REF   2  LAST 1101           7016  0 6763 0          TC     OVERFLWY

0672                                7017  0 0006 1          EXTEND
0673  REF  45  LAST 1103           7020  5 0116 1          INDEX  ADDRWD
0674                                7021  3 0005 1          DCA    4
0675  REF 321  LAST 1103           7022  52 162 0          DXCH   MPAC +5
0676                                7023  0 0006 1          EXTEND
0677                                7024  4 0001 1          DCOM
0678  REF 322  LAST 1103           7025  20 162 0          DAS    MPAC +5
0679                                7026  0 0006 1          EXTEND
0680                                7027  1 7031 0          BZF    +2
0681  REF   2  LAST 1101           7030  0 6760 0          TC     OVERFLWZ
```

```
0682                          7031  0 0006 1  BDSU    EXTEND
0683  REP  46  LAST 1103       7032  5 0116 1         INDEX   ADDRWD
0684                          7033  3 0001 0         DCA     0
0685  REP 323  LAST 1103       7034  52 155 1         DXCH    MPAC
0686                          7035  0 0006 1         EXTEND
0687                          7036  4 0001 1         DCOM
0688  REP   3  LAST 1103       7037  1 6747 1         TCF     ENDVXV
```

```
P0689          TRIPLE PRECISION ADD ROUTINE.

0690                                7040  0 0006 1  TAD     EXTEND
0691   REF  47 LAST 1104           7041  5 0116 1          INDEX   ADDRWD
0692                                7042  3 0002 0          DCA     1          ADD MINOR PARTS FIRST.
0693   REF 324 LAST 1104           7043  20 156 1          DAS     MPAC +1
0694   REF  48 LAST 1105           7044  50 116 1          INDEX   ADDRWD
0695                                7045  6 0000 1          AD      0
0696   REF 325 LAST 1105           7046  6 0154 1          AD      MPAC
0697   REF 326 LAST 1105           7047  54 154 0          TS      MPAC
0698   REF  19 LAST 1102           7050  1 6030 0          TCF     DANZIG

0699   REF   1                     7051  1 6752 0          TCF     SETOVF     SET OVFIND IF SUCH OCCURS.
```

P0700 ARITHMETIC SUBROUTINES REQUIRED IN FIXED-FIXED.

R0701 1. DMPSUB DOUBLE PRECISION MULTIPLY. MULTIPLY THE CONTENTS OF MPAC,+1 BY THE DP WORD WHOSE ADDRESS
R0703 IS IN ADDRWD AND LEAVE A TRIPLE PRECISION RESULT IN MPAC.
R0705 2. ROUNDSUB ROUND THE TRIPLE PRECISON CONTENTS OF MPAC TO DOUBLE PRECISION.
R0707 3. DOTSUB TAKE THE DOT PRODUCT OF THE VECTOR IN MPAC AND THE VECTOR WHOSE ADDRESS IS IN ADDRWD
R0709 AND LEAVE THE TRIPLE PRECISION RESULT IN MPAC.
R0710 4. POLY USING THE CONTENTS OF MPAC AS A DP ARGUMENT, EVALUATE THE POLYNOMIAL WHOSE DEGREE AND
R0712 COEFFICIENTS IMMEDIATELY FOLLOW THE TC POLY INSTRUCTION (SEE ROUTINE FOR DETAILS.)

```
0714  REF 238  LAST 1103   7052  50 002 0  DMP      INDEX   Q          BASIC SUBROUTINE FOR USE BY PINBALL, ETC
0715                       7053  3 0000 1           CAF     0          ADRES OF ARGUMENT FOLLOWS  TC DMP
0716  REF 239  LAST 1106   7054  24 002 0           INCR    Q
0717  REF  49  LAST 1105   7055  54 116 0  -1       TS      ADDRWD     (PROLOGUE FOR SETTING ADDRWD.)

0718  REF  50  LAST 1106   7056  50 116 1  DMPSUB   INDEX   ADDRWD     GET MINOR PART OF OPERAND AT C(ADDRWD).
0719                       7057  3 0001 0           CA      1
0720  REF 327  LAST 1105   7060  54 156 1           TS      MPAC +2    THIS WORKS FOR SQUARING MPAC AS WELL.
0721  REF 211  LAST 1103   7061  3 4714 1           CAF     ZERO       SET MPAC +1 TO ZERO SO WE CAN ACCUMULATE
0722  REF 328  LAST 1106   7062  56 155 0           XCH     MPAC +1    THE PARTIAL PRODUCTS WITH DAS
0723  REF   8  LAST 1074   7063  54 135 1           TS      MPTEMP     INSTRUCTIONS.
0724                       7064  0 0006 1           EXTEND
0725  REF 329  LAST 1106   7065  7 0156 1           MP      MPAC +2    MINOR OF MPAC X MINOR OF C(ADDRWD).

0726  REF 330  LAST 1106   7066  56 156 0           XCH     MPAC +2    DISCARD MINOR PART OF ABOVE RESULT AND
0727                       7067  0 0006 1           EXTEND             FORM MAJOR OF MPAC X MINOR OF C(ADDRWD).
0728  REF 331  LAST 1106   7070  7 0154 0           MP      MPAC
0729  REF 332  LAST 1106   7071  20 156 1           DAS     MPAC +1    GUARANTEED NO OVERFLOW.

0730  REF  51  LAST 1106   7072  50 116 1           INDEX   ADDRWD     GET MAJOR PART OF ARGUMENT AT C(ADDRWD).
0731                       7073  3 0000 1           CA      0
0732  REF   9  LAST 1106   7074  56 135 0           XCH     MPTEMP     SAVE AND BRING OUT MINOR OF MPAC.
0733                       7075  0 0006 1  DMPSUB2  EXTEND
0734  REF  10  LAST 1106   7076  7 0135 1           MP      MPTEMP     MAJOR OF C(ADDRWD) X MINOR OF MPAC.
0735  REF 333  LAST 1106   7077  20 156 1           DAS     MPAC +1    ACCUMULATE, SETTING A TO NET OVERFLOW.

0736  REF 334  LAST 1106   7100  56 154 1           XCH     MPAC       SETTING MPAC TO 0 OR +-1.
0737                       7101  0 0006 1           EXTEND
0738  REF  11  LAST 1106   7102  7 0135 1           MP      MPTEMP     MAJOR OF MPAC X MAJOR OF C(ADDRWD).
0739  REF 335  LAST 1106   7103  20 155 1           DAS     MPAC       GUARANTEED NO OVERFLOW.
0740  REF 240  LAST 1106   7104  0 0002 0           TC      Q          49 MCT = .573 MS. INCLUDING RETURN.
```

```
P0T41           ROUND MPAC TO DOUBLE PRECISION, SETTING OVFIND ON THE RARE EVENT OF OVERFLOW.

0743  REP 212  LAST 1106   7105  3 4714 1  ROUNDSUB CAF    ZERO      SET MPAC +2 = 0 FOR SCALARS AND CHANGE
0744  REP  15  LAST 1098   7106  54 163 1   +1      TS     MODE      MODE TO DP.

0745  REP 336  LAST 1106   7107  56 156 0  VROUND   XCH    MPAC +2   BUT WE NEEDNT TAKE THE TIME FOR VECTORS.
0746                       7110  6 0000 1           DOUBLE
0747  REP 173  LAST 1103   7111  54 001 1           TS     L
0748  REP 241  LAST 1106   7112  0 0002 0           TC     Q

0749  REP 337  LAST 1107   7113  6 0155 0           AD     MPAC +1   ADD ROUNDING BIT IF MPAC +2 WAS GREATER
0750  REP 338  LAST 1107   7114  54 155 1           TS     MPAC +1   THAN .5 IN MAGNITUDE.
0751  REP 242  LAST 1107   7115  0 0002 0           TC     Q

0752  REP 339  LAST 1107   7116  6 0154 1           AD     MPAC      PROPAGATE INTERFLOW.
0753  REP 340  LAST 1107   7117  54 154 0           TS     MPAC
0754  REP 243  LAST 1107   7120  0 0002 0           TC     Q

0755  REP   2  LAST  844   7121  54 121 1  SETOVF2  TS     OVFIND    (RARE).
0756  REP 244  LAST 1107   7122  0 0002 0           TC     Q
```

```
P0757           THE DOT PRODUCT SUBROUTINE USUALLY FORMS THE DOT PRODUCT OF THE VECTOR IN MPAC WITH A STANDARD SIX
R0759   REGISTER VECTOR WHOSE ADDRESS IS IN ADDRWD. IN THIS CASE C(DOTINC) ARE SET TO 2. VXM, HOWEVER, SETS C(DOTINC) TO
R0761   6 SO THAT DOTSUB DOTS MPAC WITH A COLUMN VECTOR OF THE MATRIX IN QUESTION IN THIS CASE.
 0763   REF  52  LAST 1071     7123  3 4711 1  PREDOT  CAF   TWO          PROLOGUE TO SET DOTINC TO 2.
 0764   REF   4  LAST   68     7124  54 136 1           TS    DOTINC

 0765                          7125  0 0006 1  DOTSUB  EXTEND
 0766   REF   5  LAST   68     7126  22 137 1          QXCH  DOTRET       SAVE RETURN.
 0767   REF   1                7127  0 7056 0          TC    DMPSUB       DOT X COMPONENTS.
 0768   REF 341  LAST 1107     7130  52 160 1          DXCH  MPAC +3      POSITION Y COMPONENT OF MPAC FOR
 0769   REF 342  LAST 1108     7131  52 155 1          DXCH  MPAC         MULTIPLICATION WHILE SAVING RESULT IN
 0770   REF  46  LAST 1103     7132  52 131 0          DXCH  BUF          THREE WORD BUFFER, BUF.
 0771   REF 343  LAST 1108     7133  3 0156 0          CA    MPAC +2
 0772   REF  47  LAST 1108     7134  54 132 0          TS    BUF +2

 0773   REF   5  LAST 1108     7135  3 0136 0          CA    DOTINC       ADVANCE ADDRWD TO Y COMPONENT OF
 0774   REF  52  LAST 1106     7136  26 116 0          ADS   ADDRWD       OTHER ARGUMENT.
 0775   REF   2  LAST 1108     7137  0 7056 0          TC    DMPSUB
 0776   REF 344  LAST 1108     7140  52 156 1          DXCH  MPAC +1      ACCUMULATE PARTIAL PRODUCTS.
 0777   REF  48  LAST 1108     7141  20 132 0          DAS   BUF +1
 0778   REF 345  LAST 1108     7142  6 0154 1          AD    MPAC
 0779   REF  49  LAST 1108     7143  6 0130 0          AD    BUF
 0780   REF  50  LAST 1108     7144  54 130 1          TS    BUF
 0781                          7145  1 7147 0          TCF   +2
 0782   REF   3  LAST 1107     7146  54 121 1          TS    OVFIND       IF OVERFLOW OCCURS.

 0783   REF 346  LAST 1108     7147  52 162 0          DXCH  MPAC +5      MULTIPLY Z COMPONENTS.
 0784   REF 347  LAST 1108     7150  52 155 1          DXCH  MPAC
 0785   REF   6  LAST 1108     7151  3 0136 0          CA    DOTINC
 0786   REF  53  LAST 1108     7152  26 116 0          ADS   ADDRWD
 0787   REF   3  LAST 1108     7153  0 7056 0          TC    DMPSUB
 0788   REF  51  LAST 1108     7154  52 132 0  ENDDOT  DXCH  BUF +1       LEAVE FINAL ACCUMULATION IN MPAC.
 0789   REF 348  LAST 1108     7155  20 156 1          DAS   MPAC +1
 0790   REF 349  LAST 1108     7156  6 0154 1          AD    MPAC
 0791   REF  52  LAST 1108     7157  6 0130 0          AD    BUF
 0792   REF 350  LAST 1108     7160  54 154 0          TS    MPAC
 0793   REF   6  LAST 1108     7161  0 0137 1          TC    DOTRET

 0794   REF   2  LAST 1102     7162  0 6766 0          TC    OVERFLOW     ON OVERFLOW HERE.
 0795   REF   7  LAST 1108     7163  0 0137 1          TC    DOTRET
```

```
P0796   DOUBLE PRECISION POLYNOMIAL EVALUATOR

R0797                                   N       N-1
R0798           THIS ROUTINE EVALUATES A X  + A   X    + ... + A X + A  LEAVING THE DP RESULT IN MPAC ON EXIT.
R0800                                   N     N-1              1     0

R0801   THE ROUTINE HAS TWO ENTRIES

R0802           1. ENTRY THRU POWRSERS. THE COEFFICIENTS MAY BE EITHER IN FIXED OR ERASABLE, THE CALL IS BY
R0804              TC POWRSERS, AND THE RETURN IS TO LOC(TC POWRSERS)+1. THE ENTERING DATA MUST BE AS FOLLOWS

A0806                                           A       SP      LOC-3           ADDRESS FOR REFERENCING COEF TABLE
A0807                                           L       SP      N-1             N IS THE DEGREE OF THE POWER SERIES
A0808                                           MPAC    DP      X               ARGUMENT

A0809                                           LOC-2N  DP      A(0)
A0810                                                   ...
A0811                                           LOC     DP      A(N)

R0812           2. ENTRY THRU POLY. THE CALL TO POLY AND THE ENTERING DATA MUST BE AS FOLLOWS

A0814                                           MPAC    DP      X               ARGUMENT

A0815                                           LOC     TC      POLY
A0816                                           LOC+1   SP      N-1
A0817                                           LOC+2   DP      A(0)
A0818                                                   ...
A0819                                           LOC+2N+2 DP     A(N)            RETURN IS TO LOC+2N+4

 0820                           7164  0 0006 1  POWRSERS EXTEND
 0821   REF   1                 7165  22 141 0          QXCH    POLYRET         RETURN ADDRESS
 0822   REF  16  LAST 1099      7166  54 117 1          TS      POLISH          POWER SERIES ADDRESS
 0823   REF   1                 7167  22 140 1          LXCH    POLYCNT         N-1 TO COUNTER
 0824   REF   1                 7170  1 7201 1          TCF     POLYCOM         SKIP SET UP BY POLY

 0825   REF 245  LAST 1107      7171  50 002 0  POLY    INDEX   Q
 0826                           7172  3 0000 1          CAF     0
 0827   REF   2  LAST 1109      7173  54 140 0          TS      POLYCNT         N-1 TO COUNTER
 0828                           7174  6 0000 1          DOUBLE
 0829   REF 246  LAST 1109      7175  6 0002 0          AD      Q
 0830   REF  17  LAST 1109      7176  54 117 1          TS      POLISH          L(A(N))-3 TO POLISH
 0831   REF  27  LAST 1103      7177  6 4715 0          AD      FIVE
 0832   REF   2  LAST 1109      7200  54 141 1          TS      POLYRET         STORE RETURN ADDRESS

 0833   REF   1                 7201  3 6242 0  POLYCOM CAF     LVBUF           INCOMING X WILL BE MOVED TO VBUF, SO
 0834   REF  54  LAST 1108      7202  54 116 0          TS      ADDRWD          SET ADDRWD SO DMPSUB WILL MPY BY VBUF.

 0835                           7203  0 0006 1          EXTEND
 0836   REF  18  LAST 1109      7204  5 0117 0          INDEX   POLISH
 0837                           7205  3 0004 0          DCA     3
```

```
0838  REP 351  LAST 1108     7206  52 155 1            DXCH  MPAC      LOAD A(N) INTO MPAC,
0839  REP  23  LAST 1085     7207  52 123 0            DXCH  VBUF      SAVING X IN VBUF
0840  REP   1                7210  1 7214 0            TCF   POLY2

0841  REP   3  LAST 1109     7211  54 140 0  POLYLOOP  TS    POLYCNT   SAVE DECREMENTED LOOP COUNTER
0842  REP  53  LAST 1108     7212  4 4711 0            CS    TWO
0843  REP  19  LAST 1109     7213  26 117 1            ADS   POLISH    REGRESS COEFFICIENT POINTER

0844  REP   4  LAST 1108     7214  0 7056 0  POLY2     TC    DMPSUB    MULTIPLY BY X
0845                          7215  0 0006 1            EXTEND
0846  REP  20  LAST 1110     7216  5 0117 0            INDEX POLISH
0847                          7217  3 0002 0            DCA   1         ADD IN NEXT COEFFICIENT
0848  REP 352  LAST 1110     7220  20 155 1            DAS   MPAC      USERS RESPONSIBILITY TO ASSURE NO OVFLOW

0849  REP   4  LAST 1110     7221  10 140 0            CCS   POLYCNT
0850  REP   1                7222  1 7211 0            TCF   POLYLOOP
0851  REP   3  LAST 1109     7223  0 0141 0            TC    POLYRET   RETURN CALLER
```

R0852 MISCELLANEOUS MULTI-PRECISION ROUTINES REQUIRED IN FIXED-FIXED BUT NOT USED BY THE INTERPRETER.

```
 085398 REF 213 LAST 1107    7224  3 4714 1  DPAGREE  CAF   ZERO          DOUBLE PRECISION ENTRY -
 085399 REF 353 LAST 1110    7225  54 156 1           TS    MPAC +2       ZERO LOW-ORDER WORD

  0854  REF 247 LAST 1109    7226  22 002 0  TPAGREE  LXCH  Q             FORCE SIGN AGREEMENT AMONG THE TRIPLE
  0855  REF   1             7227  0 6672 1           TC    BRANCH        PRECISION CONTENTS OF MPAC.  RETURNING
  0856  REF   1             7230  1 7234 1           TCF   ARG+           WITH SIGNUM OF THE INPUT IN A.
  0857  REF   1             7231  1 7254 1           TCF   ARGZERO

  0858  REF  28 LAST 1043    7232  4 4672 1           CS    POSMAX        IF NEGATIVE.
  0859                      7233  1 7235 0           TCF   +2

  0860  REF  29 LAST 1111    7234  3 4672 0  ARG+     CAF   POSMAX
  0861  REF 248 LAST 1111    7235  54 002 1           TS    Q
  0862                      7236  0 0006 1           EXTEND
  0863  REF 295 LAST 1103    7237  24 000 1           AUG   A             FORMS +-1.0.
  0864  REF 354 LAST 1111    7240  6 0156 0           AD    MPAC +2
  0865  REF 355 LAST 1111    7241  54 156 1           TS    MPAC +2
  0866  REF 214 LAST 1111    7242  3 4714 1           CAF   ZERO
  0867  REF 249 LAST 1111    7243  6 0002 0           AD    Q
  0868  REF 356 LAST 1111    7244  6 0155 0           AD    MPAC +1
  0869  REF 357 LAST 1111    7245  54 155 1           TS    MPAC +1
  0870  REF 215 LAST 1111    7246  3 4714 1           CAF   ZERO
  0871  REF 250 LAST 1111    7247  6 0002 0           AD    Q             Q STILL HAS POSMAX OR NEGMAX IN IT.
  0872  REF 358 LAST 1111    7250  6 0154 1           AD    MPAC
  0873  REF 359 LAST 1111    7251  54 154 0  ARGZERO2 TS    MPAC          ALWAYS SKIPPING UNLESS ARGZERO.
  0874  REF 360 LAST 1111    7252  54 155 1           TS    MPAC +1
  0875  REF 174 LAST 1107    7253  0 0001 0           TC    L             RETURN VIA L.

  0876  REF 361 LAST 1111    7254  54 156 1  ARGZERO  TS    MPAC +2       SET ALL THREE MPAC REGISTERS TO ZERO.
  0877  REF   1             7255  1 7251 1           TCF   ARGZERO2
```

R0878 SHORTMP MULTIPLIES THE TP CONTENTS OF MPAC BY THE SINGLE PRECISION NUMBER ARRIVING IN A.

```
  0880  REF  12 LAST 1106    7256  54 135 1  SHORTMP  TS    MPTEMP
  0881                      7257  0 0006 1           EXTEND
  0882  REF 362 LAST 1111    7260  7 0156 1           MP    MPAC +2
  0883  REF 363 LAST 1111    7261  54 156 1           TS    MPAC +2
  0884  REF 216 LAST 1111    7262  3 4714 1  SHORTMP2 CAF   ZERO          SO SUBSEQUENT DAS WILL WORK.
  0885  REF 364 LAST 1111    7263  56 155 0           XCH   MPAC +1
  0886  REF   1             7264  1 7075 0           TCF   DMPSUB2
```

```
P0887          DMPNSUB MULTIPLIES THE DP FRACTION ARRIVING IN MPAC BY THE SP
R0888     INTEGER ARRIVING IN A.  THE DP PRODUCT DEPARTS BOTH IN MPAC AND IN
R0889     A AND L.  NOTE THAT DMPNSUB NORMALLY INCREASES THE MAGNITUDE OF THE
R0890     CONTENTS OF MPAC.  THE CUSTOMER MUST INSURE THAT B(A) X B(MPAC,MPAC+1)
R0891     AND B(A) X B(MPAC) ARE LESS THAN 1 IN MAGNITUDE, WHERE B, AS IS OBVIOUS,
R0892     INDICATES THE ARRIVING CONTENTS.

0893     REF   1                 7265  54 135 1  DMPNSUB  TS      DMPNTEMP
0894                              7266   0 0006 1          EXTEND
0895     REF 365  LAST 1111      7267   7 0155 1          MP      MPAC +1
0896     REF 366  LAST 1112      7270  52 155 1          DXCH    MPAC
0897                              7271   0 0006 1          EXTEND                  LOW PRODUCT TO MPAC, HIGH FACTOR TO A
0898     REF   2  LAST 1112      7272   7 0135 1          MP      DMPNTEMP
0899     REF 175  LAST 1111      7273   3 0001 0          CA      L
0900     REF 367  LAST 1112      7274  26 154 0          ADS     MPAC            COMPLETING THE PRODUCT IN MPAC
0901                              7275   0 0006 1          EXTEND
0902     REF 368  LAST 1112      7276   3 0155 0          DCA     MPAC            BRINGING THE PRODUCT INTO A AND L
0903     REF 251  LAST 1111      7277   0 0002 0          TC      Q
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P0904   MISCELLANEOUS VECTOR OPERATIONS. INCLUDED HERE ARE THE FOLLOWING:

R0905            1.  DOT          DP VECTOR DOT PRODUCT.
R0906            2.  VXV          DP VECTOR CROSS PRODUCT.
R0907            3.  VXSC         DP VECTOR TIMES SCALAR.
R0908            4.  V/SC         DP VECTOR DIVIDED BY SCALAR.
R0909            5.  VPROJ        DP VECTOR PROJECTION. ( (MPAC,X)MPAC ).
R0910            6.  VXM          DP VECTOR POST-MULTIPLIED BY MATRIX.
R0911            7.  MXV          DP VECTOR PRE-MULTIPLIED BY MATRIX.
 0912   REMADR  1                  7300  0 7123 0  DOT     TC      PREDOT      DO THE DOT PRODUCT AND EXIT, CHANGING
 0913   REMADR 217  LAST 1111      7301  3 4714 1  DMODE   CAF     ZERO        THE MODE TO DP SCALAR.
 0914   REMADR  3   LAST 1094      7302  1 6027 0          TCF     NEWMODE
 0915   REMADR 54   LAST 1110      7303  3 4711 1  MXV     CAF     TWO         SET UP MATINC AND DOTINC FOR ROW
 0916   REMADR  5   LAST   68      7304 54 140  0          TS      MATINC      VECTORS.
 0917   REMADR  1                  7305  1 7311 1          TCF     VXM/MXV     GO TO COMMON PORTION.

 0918   REMADR  9   LAST 1040      7306  4 4377 1  VXM     CS      TEN         SET MATINC AND DOTINC TO REFER TO MATRIX
 0919   REMADR  6   LAST 1113      7307 54 140  0          TS      MATINC      AS THREE COLUMN VECTORS.
 0920   REMADR 35   LAST 1028      7310  3 6211 0          CAF     SIX
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P0921           COMMON PORTION OF MXV AND VXM.

 0922   REF   7  LAST 1108      7311  54 136 1  VXM/MXV  TS      DOTINC
R0923           ITRACE (2) REFERS TO $VXM/MXV$.
 0924   REF   1                 7312  0 7501 1           TC      MPACVBUF      SAVE VECTOR IN MPAC FOR FURTHER USE.

 0925   REF   1                 7313  0 7125 0           TC      DOTSUB        GO DOT TO GET X COMPONENT OF ANSWER.
 0926                           7314  0 0006 1           EXTEND
 0927   REF  24  LAST 1110      7315  3 0123 1           DCA     VBUF          MOVE MPAC VECTOR BACK INTO MPAC, SAVING
 0928   REF 369  LAST 1112      7316  52 155 1           DXCH    MPAC          NEW X COMPONENT IN BUF2.
 0929   REF  11  LAST 1074      7317  52 134 0           DXCH    BUF2
 0930                           7320  0 0006 1           EXTEND
 0931   REF  25  LAST 1114      7321  3 0125 1           DCA     VBUF +2
 0932   REF 370  LAST 1114      7322  52 160 1           DXCH    MPAC +3
 0933                           7323  0 0006 1           EXTEND
 0934   REF  26  LAST 1114      7324  3 0127 0           DCA     VBUF +4
 0935   REF 371  LAST 1114      7325  52 162 0           DXCH    MPAC +5
 0936   REF   7  LAST 1113      7326  3 0140 1           CA      MATINC        INITIALIZE ADDRWD FOR NEXT DOT PRODUCT.
 0937   REF  55  LAST 1109      7327  26 116 0           ADS     ADDRWD        FORMS BASE ADDRESS OF NEXT COLUMN(ROW).

 0938   REF   2  LAST 1114      7330  0 7125 0           TC      DOTSUB
 0939   REF  27  LAST 1114      7331  52 123 0           DXCH    VBUF          MOVE GIVEN VECTOR BACK TO MPAC, SAVING Y
 0940   REF 372  LAST 1114      7332  52 155 1           DXCH    MPAC          COMPONENT OF ANSWER IN VBUF +2.
 0941   REF  28  LAST 1114      7333  52 125 0           DXCH    VBUF +2
 0942   REF 373  LAST 1114      7334  52 160 1           DXCH    MPAC +3
 0943   REF  29  LAST 1114      7335  52 127 1           DXCH    VBUF +4
 0944   REF 374  LAST 1114      7336  52 162 0           DXCH    MPAC +5
 0945   REF   8  LAST 1114      7337  3 0140 1           CA      MATINC        FORM ADDRESS OF LAST COLUMN OR ROW.
 0946   REF  56  LAST 1114      7340  26 116 0           ADS     ADDRWD

 0947   REF   3  LAST 1114      7341  0 7125 0           TC      DOTSUB
 0948   REF  12  LAST 1114      7342  52 134 0           DXCH    BUF2          ANSWER NOW COMPLETE. PUT COMPONENTS INTO
 0949   REF 375  LAST 1114      7343  52 155 1           DXCH    MPAC          PROPER MPAC REGISTERS.
 0950   REF 376  LAST 1114      7344  52 162 0           DXCH    MPAC +5
 0951   REF  30  LAST 1114      7345  52 125 0           DXCH    VBUF +2
 0952   REF 377  LAST 1114      7346  52 160 1           DXCH    MPAC +3
 0953   REF  20  LAST 1105      7347  1 6030 0           TCF     DANZIG        EXIT.
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P0954           VXSC - VECTOR TIMES SCALAR.

 0955   REP  16  LAST 1107     7350  10 163 1  VXSC   CCS    MODE     TEST PRESENT MODE.
 0956   REP   1                7351  1 7377 1          TCF    DVXSC    SEPARATE ROUTINE WHEN SCALAR IS IN MPAC.
 0957   REP   2  LAST 1115     7352  1 7377 1          TCF    DVXSC

 0958   REP   5  LAST 1110     7353  0 7056 0  VVXSC  TC     DMPSUB   COMPUTE X COMPONENT
 0959   REP   1                7354  0 7107 0          TC     VROUND   AND ROUND IT.
 0960   REP 378  LAST 1114     7355  52 160 1          DXCH   MPAC +3  PUT Y COMPONENT INTO MPAC SAVING MPAC IN
 0961   REP 379  LAST 1115     7356  52 155 1          DXCH   MPAC      MPAC +3.
 0962   REP 380  LAST 1115     7357  52 160 1          DXCH   MPAC +3

 0963   REP   6  LAST 1115     7360  0 7056 0          TC     DMPSUB   DO SAME FOR Y AND Z COMPONENTS.
 0964   REP   2  LAST 1115     7361  0 7107 0          TC     VROUND
 0965   REP 381  LAST 1115     7362  52 162 0          DXCH   MPAC +5
 0966   REP 382  LAST 1115     7363  52 155 1          DXCH   MPAC
 0967   REP 383  LAST 1115     7364  52 162 0          DXCH   MPAC +5

 0968   REP   7  LAST 1115     7365  0 7056 0          TC     DMPSUB
 0969   REP   3  LAST 1115     7366  0 7107 0          TC     VROUND
 0970   REP 384  LAST 1115     7367  52 155 1  VROTATEX DXCH   MPAC     EXIT USED TO RESTORE MPAC AFTER THIS
 0971   REP 385  LAST 1115     7370  52 162 0          DXCH   MPAC +5   TYPE OF ROTATION. CALLED BY VECTOR SHIFT
 0972   REP 386  LAST 1115     7371  52 160 1          DXCH   MPAC +3   RIGHT, V/SC, ETC.
 0973   REP 387  LAST 1115     7372  52 155 1          DXCH   MPAC
 0974   REP  21  LAST 1114     7373  1 6030 0          TCF    DANZIG
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P0975           DP VECTOR PROJECTION ROUTINE.

 0976  REP   2  LAST 1113    7374  0 7123 0  VPROJ  TC      PREDOT    (MPAC,X)MPAC IS COMPUTED AND LEFT IN
 0977  REP  15  LAST 1030    7375  4 4710 1         CS      FOUR      MPAC. DO DOT AND FALL INTO DVXSC.
 0978  REP  57  LAST 1114    7376  26 116 0         ADS     ADDRWD

R0979           VXSC WHEN SCALAR ARRIVES IN MPAC AND VECTOR IS AT X.

 0980                        7377  0 0006 1  DVXSC  EXTEND
 0981  REP 388  LAST 1115    7400  3 0155 0         DCA     MPAC      SAVE SCALAR IN MPAC +3 AND GET X
 0982  REP 389  LAST 1116    7401  52 160 1         DXCH    MPAC +3   COMPONENT OF ANSWER.
 0983  REP   8  LAST 1115    7402  0 7056 0         TC      DMPSUB
 0984  REP   4  LAST 1115    7403  0 7107 0         TC      VROUND

 0985  REP  55  LAST 1113    7404  3 4711 1         CAF     TWO       ADVANCE ADDRWD TO Y COMPONENT OF X.
 0986  REP  58  LAST 1116    7405  26 116 0         ADS     ADDRWD
 0987                        7406  0 0006 1         EXTEND
 0988  REP 390  LAST 1116    7407  3 0160 0         DCA     MPAC +3   PUT SCALAR BACK INTO MPAC AND SAVE
 0989  REP 391  LAST 1116    7410  52 155 1         DXCH    MPAC      X RESULT IN MPAC +5.
 0990  REP 392  LAST 1116    7411  52 162 0         DXCH    MPAC +5
 0991  REP   9  LAST 1116    7412  0 7056 0         TC      DMPSUB
 0992  REP   5  LAST 1116    7413  0 7107 0         TC      VROUND

 0993  REP  56  LAST 1116    7414  3 4711 1         CAF     TWO
 0994  REP  59  LAST 1116    7415  26 116 0         ADS     ADDRWD    TO Z COMPONENT.
 0995  REP 393  LAST 1116    7416  52 160 1         DXCH    MPAC +3   BRING SCALAR BACK, PUTTING Y RESULT IN
 0996  REP 394  LAST 1116    7417  52 155 1         DXCH    MPAC      THE PROPER PLACE.
 0997  REP 395  LAST 1116    7420  52 160 1         DXCH    MPAC +3
 0998  REP  10  LAST 1116    7421  0 7056 0         TC      DMPSUB
 0999  REP   6  LAST 1116    7422  0 7107 0         TC      VROUND

 1000  REP 396  LAST 1116    7423  52 155 1         DXCH    MPAC      PUT Z COMPONENT IN PROPER PLACE, ALSO
 1001  REP 397  LAST 1116    7424  52 162 0         DXCH    MPAC +5   POSITIONING X.
 1002  REP 398  LAST 1116    7425  52 155 1         DXCH    MPAC

 1003  REP   1               7426  1 6470 0         TCF     VMODE     MODE HAS CHANGED TO VECTOR.
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P1004           THE VECTOR CROSS PRODUCT ROUTINE CALCULATES (X M -X M ,X M -X M ,X M -X M ) WHERE M IS THE VECTOR IN
R1006                                                        3 2  2 3  1 3  3 1  2 1  1 2
R1008  MPAC AND X THE VECTOR AT THE GIVEN ADDRESS.
 1009                                7427  0 0006 1  VXV   EXTEND
 1010   REF 399  LAST 1116          7430  3 0162 1        DCA     MPAC +5         FORM UP M3X1, LEAVING M1 IN VBUF.
 1011   REF 400  LAST 1117          7431  52 155 1        DXCH    MPAC
 1012   REF  31  LAST 1114          7432  52 123 0        DXCH    VBUF
 1013   REF  11  LAST 1116          7433  0 7056 0        TC      DMPSUB          BY X1.

 1014                                7434  0 0006 1        EXTEND
 1015   REF 401  LAST 1117          7435  4 0160 1        DCS     MPAC +3         CALCULATE -X1M2, SAVING X1M3 IN VBUF +2.
 1016   REF 402  LAST 1117          7436  52 155 1        DXCH    MPAC
 1017   REF  32  LAST 1117          7437  52 125 0        DXCH    VBUF +2
 1018   REF  12  LAST 1117          7440  0 7056 0        TC      DMPSUB

 1019   REF  57  LAST 1116          7441  3 4711 1        CAF     TWO             ADVANCE ADDRWD TO X2.
 1020   REF  60  LAST 1116          7442  26 116 0        ADS     ADDRWD
 1021                                7443  0 0006 1        EXTEND
 1022   REF 403  LAST 1117          7444  4 0162 0        DCS     MPAC +5         PREPARE TO GET -X2M3, SAVING -X1M2 IN
 1023   REF 404  LAST 1117          7445  52 155 1        DXCH    MPAC            MPAC +5.
 1024   REF 405  LAST 1117          7446  52 162 0        DXCH    MPAC +5
 1025   REF  13  LAST 1117          7447  0 7056 0        TC      DMPSUB

 1026                                7450  0 0006 1        EXTEND
 1027   REF  33  LAST 1117          7451  3 0123 1        DCA     VBUF            GET X2M1, SAVING -X2M3 IN VBUF +4.
 1028   REF 406  LAST 1117          7452  52 155 1        DXCH    MPAC
 1029   REF  34  LAST 1117          7453  52 127 1        DXCH    VBUF +4
 1030   REF  14  LAST 1117          7454  0 7056 0        TC      DMPSUB

 1031   REF  58  LAST 1117          7455  3 4711 1        CAF     TWO             ADVANCE ADDRWD TO X3.
 1032   REF  61  LAST 1117          7456  26 116 0        ADS     ADDRWD
 1033                                7457  0 0006 1        EXTEND
 1034   REF  35  LAST 1117          7460  4 0123 0        DCS     VBUF            GET -X3M1, ADDING X2M1 TO MPAC +5 TO
 1035   REF 407  LAST 1117          7461  52 155 1        DXCH    MPAC            COMPLETE THE Z COMPONENT OF THE ANSWER.
 1036   REF 408  LAST 1117          7462  20 162 0        DAS     MPAC +5

 1037                                7463  0 0006 1        EXTEND
 1038                                7464  1 7466 0        BZF     +2
 1039   REF   3  LAST 1103          7465  0 6760 0        TC      OVERFLWZ

 1040   REF  15  LAST 1117          7466  0 7056 0        TC      DMPSUB
 1041   REF  36  LAST 1117          7467  52 125 0        DXCH    VBUF +2         MOVE X1M3 TO MPAC +3 SETTING UP FOR X3M2
 1042   REF 409  LAST 1117          7470  52 160 1        DXCH    MPAC +3         AND ADD -X3M1 TO MPAC +3 TO COMPLETE THE
 1043   REF 410  LAST 1117          7471  52 155 1        DXCH    MPAC            Y COMPONENT OF THE RESULT.
 1044   REF 411  LAST 1117          7472  20 160 1        DAS     MPAC +3

 1045                                7473  0 0006 1        EXTEND
 1046                                7474  1 7476 1        BZF     +2
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1047  REF   3  LAST 1103   7475  0 6763 0          TC     OVERFLWY

1048  REF  16  LAST 1117   7476  0 7056 0          TC     DMPSUB
1049  REF  37  LAST 1117   7477  52 127 1          DXCH   VBUF +4        GO ADD -X2M3 TO X3M2 TO COMPLETE THE X
1050  REF   4  LAST 1104   7500  1 6747 1          TCF    ENDVXV         COMPONENT (TAIL END OF DAD).

R1051          THE MPACVBUF SUBROUTINE SAVES THE VECTOR IN MPAC IN VBUF WITHOUT CLOBBERING MPAC.

1053                        7501  0 0006 1  MPACVBUF EXTEND                CALLED BY MXV, VXM, AND UNIT.
1054  REF 412  LAST 1117   7502  3 0155 0          DCA    MPAC
1055  REF  38  LAST 1118   7503  52 123 0          DXCH   VBUF
1056                        7504  0 0006 1          EXTEND
1057  REF 413  LAST 1118   7505  3 0160 0          DCA    MPAC +3
1058  REF  39  LAST 1118   7506  52 125 0          DXCH   VBUF +2
1059                        7507  0 0006 1          EXTEND
1060  REF 414  LAST 1118   7510  3 0162 1          DCA    MPAC +5
1061  REF  40  LAST 1118   7511  52 127 1          DXCH   VBUF +4
1062  REF 252  LAST 1112   7512  0 0002 0          TC     Q              RETURN TO CALLER.
R1063          DOUBLE PRECISION SIGN AGREE ROUTINE. ARRIVE WITH INPUT IN A+L. OUTPUT IS IN A + L.

1065  REF 296  LAST 1111   7513  10 000 0  ALSIGNAG CCS    A              TEST UPPER PART.
1066  REF   1              7514  1 7520 0          TCF    UPPOS          IT IS POSITIVE
1067  REF 253  LAST 1118   7515  0 0002 0          TC     Q              ZERO
1068  REF   1              7516  1 7530 1          TCF    UPNEG          NEGATIVE
1069  REF 254  LAST 1118   7517  0 0002 0          TC     Q              ZERO

1070  REF 176  LAST 1112   7520  56 001 0  UPPOS   XCH    L              SAVE DECREMENTED UPPER PART.
1071  REF   9  LAST 1062   7521  6 4675 1          AD     HALF
1072  REF  10  LAST 1118   7522  6 4675 1          AD     HALF
1073  REF 297  LAST 1118   7523  54 000 0          TS     A              SKIPS ON OVERFLOW
1074                        7524  1 7526 0          TCF    +2
1075  REF 177  LAST 1118   7525  24 001 0          INCR   L              RESTORE UPPER TO ROIGINAL VALUE
1076  REF 178  LAST 1118   7526  56 001 0          XCH    L              SWAP A + L BACK.
1077  REF 255  LAST 1118   7527  0 0002 0          TC     Q

1078  REF 179  LAST 1118   7530  56 001 0  UPNEG   XCH    L              SAVE COMPLEMENTED + DECREMENTED UPPER PT
1079  REF  11  LAST 1033   7531  6 4674 0          AD     NEGMAX
1080  REF  24  LAST 1089   7532  6 7716 0          AD     NEGONE
1081  REF 298  LAST 1118   7533  54 000 0          TS     A
1082                        7534  1 7536 1          TCF    +2             DONT INCREMENT IF NO OVERFLOW.
1083  REF 180  LAST 1118   7535  24 001 0          INCR   L
1084  REF 181  LAST 1118   7536  56 001 0          XCH    L
1085                        7537  4 0000 0          COM                   MAKE NEGATIVE AGAIN.
1086  REF 256  LAST 1118   7540  0 0002 0          TC     Q
```

P1087 INTERPRETIVE INSTRUCTIONS WHOSE EXECUTION CONSISTS OF PRINCIPALLY CALLING SUBROUTINES.

```
1089  REF  17  LAST 1118   7541  0 7056 0  DMP1   TC     DMPSUB          DMP INSTRUCTION.
1090  REF  22  LAST 1115   7542  1 6030 0         TCF    DANZIG

1091  REF  18  LAST 1119   7543  0 7056 0  DMPR   TC     DMPSUB
1092  REF   1              7544  0 7106 1         TC     ROUNDSUB +1     (C(A) = +0).
1093  REF  23  LAST 1119   7545  1 6030 0         TCF    DANZIG

1094                       7546  0 0006 1  DDV    EXTEND
1095  REF  62  LAST 1117   7547  5 0116 1         INDEX  ADDRWD          MOVE DIVIDEND INTO BUF.
1096                       7550  3 0001 0         DCA    0
1097  REF   2  LAST 1086   7551  1 7556 1         TCF    BDDV +4

1098                       7552  0 0006 1  BDDV   EXTEND                 MOVE DIVISOR INTO MPAC SAVING MPAC, THE
1099  REF  63  LAST 1119   7553  5 0116 1         INDEX  ADDRWD          DIVIDEND, IN BUF.
1100                       7554  3 0001 0         DCA    0
1101  REF 415  LAST 1118   7555  52 155 1         DXCH   MPAC
1102  REF  53  LAST 1108   7556  52 131 0   +4    DXCH   BUF
1103  REF 218  LAST 1113   7557  3 4714 1         CAF    ZERO            DIVIDE ROUTINES IN BANK 0.
1104  REF  20  LAST 1099   7560  54 004 1         TS     FBANK
1105  REF   1              7561  1 2353 1         TCF    DDV/BDDV

1106  REF  64  LAST 1119   7562  3 0116 1  SETPD  CA     ADDRWD          MUST SET TO WORK AREA, OR EBANK TROUBLE.
1107  REF  12  LAST 1096   7563  54 166 1         TS     PUSHLOC
1108  REF   1              7564  1 6032 1         TCF    NOIBNKSW        NO FBANK SWITCH REQUIRED.

1109  REF 219  LAST 1119   7565  3 4714 1  TSLC   CAF    ZERO            SHIFTING ROUTINES LOCATED IN BANK 00.
1110  REF  21  LAST 1119   7566  54 004 1         TS     FBANK
1111  REF   1              7567  1 2172 0         TCF    TSLC2

1112  REF   7  LAST 1078   7570  3 6043 0  GSHIFT CAF    LOW7            USED AS MASK AT GENSHIFT. THIS PROCESSES
1113  REF  22  LAST 1119   7571  54 004 1         TS     FBANK           ANY SHIFT INSTRUCTION (EXCEPT TSLC) WITH
1114  REF   1              7572  1 2214 0         TCF    GENSHIFT        AN ADDRESS (ROUTINES IN BANK 0).
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P1115          THE FOLLOWING IS THE PROLOGUE TO V/SC. IF THE PRESENT MODE IS VECTOR, IT SAVES THE SCALAR AT X IN BUF
R1117  AND CALLS THE V/SC ROUTINE IN BANK 0. IF THE PRESENT MODE IS SCALAR, IT MOVES THE VECTOR AT X INTO MPAC, SAVING
R1119  THE SCALAR IN MPAC IN BUF BEFORE CALLING THE V/SC ROUTINE IN BANK 0.
 1120  REF  17  LAST 1115     7573  10 163 1  V/SC     CCS    MODE
 1121  REF   1                7574  1 7605 1           TCF    DV/SC          MOVE VECTOR INTO MPAC.
 1122  REF   2  LAST 1120     7575  1 7605 1           TCF    DV/SC

 1123                         7576  0 0006 1  VV/SC    EXTEND
 1124  REF  65  LAST 1119     7577  5 0116 1           INDEX  ADDRWD
 1125                         7600  3 0001 0           DCA    0
 1126  REF  54  LAST 1119     7601  52 131 0  V/SC1     DXCH   BUF            IN BOTH CASES, VECTOR IS NOW IN MPAC AND
 1127  REF 220  LAST 1119     7602  3 4714 1           CAF    ZERO           SCALAR IN BUF.
 1128  REF  23  LAST 1119     7603  54 004 1           TS     FBANK
 1129  REF   1                7604  1 2654 0           TCF    V/SC2

 1130                         7605  0 0006 1  DV/SC    EXTEND
 1131  REF  66  LAST 1120     7606  5 0116 1           INDEX  ADDRWD
 1132                         7607  3 0003 1           DCA    2
 1133  REF 416  LAST 1119     7610  52 160 1           DXCH   MPAC +3
 1134                         7611  0 0006 1           EXTEND
 1135  REF  67  LAST 1120     7612  5 0116 1           INDEX  ADDRWD
 1136                         7613  3 0005 1           DCA    4
 1137  REF 417  LAST 1120     7614  52 162 0           DXCH   MPAC +5

 1138  REF 135  LAST 1094     7615  4 4712 0           CS     ONE            CHANGE MODE TO VECTOR.
 1139  REF  18  LAST 1120     7616  54 163 1           TS     MODE

 1140                         7617  0 0006 1           EXTEND
 1141  REF  68  LAST 1120     7620  5 0116 1           INDEX  ADDRWD
 1142                         7621  3 0001 0           DCA    0
 1143  REF 418  LAST 1120     7622  52 155 1           DXCH   MPAC
 1144  REF   1                7623  1 7601 0           TCF    V/SC1          FINISH PROLOGUE AT COMMON SECTION.
```

P1145 SIGN AND COMPLEMENT INSTRUCTIONS.

```
1146  REF  69  LAST 1120    7624  50 116 1  SIGN   INDEX  ADDRWD    CALL COMP INSTRUCTION IF WORD AT X IS
1147                        7625  10 000 0         CCS    0         NEGATIVE NON-ZERO.
1148  REF  24  LAST 1119    7626  1 6030 0         TCF    DANZIG
1149                        7627  1 7631 0         TCF    +2
1150  REF   2  LAST 1088    7630  1 7637 0         TCF    COMP      DO THE COMPLEMENT.

1151  REF  70  LAST 1121    7631  50 116 1         INDEX  ADDRWD
1152                        7632  10 001 1  CCSL   CCS    1
1153  REF  25  LAST 1121    7633  1 6030 0         TCF    DANZIG
1154  REF  26  LAST 1121    7634  1 6030 0         TCF    DANZIG
1155  REF   3  LAST 1121    7635  1 7637 0         TCF    COMP
1156  REF  27  LAST 1121    7636  1 6030 0         TCF    DANZIG
1157                        7637  0 0006 1  COMP   EXTEND            COMPLEMENT DP MPAC IN EVERY CASE.
1158  REF 419  LAST 1120    7640  4 0155 1         DCS    MPAC
1159  REF 420  LAST 1121    7641  52 155 1         DXCH   MPAC

1160  REF  19  LAST 1120    7642  10 163 1         CCS    MODE      EITHER COMPLEMENT MPAC +3 OR THE REST OF
1161  REF   1                7643  1 7654 0         TCF    DCOMP     THE VECTOR ACCUMULATOR.
1162  REF   2  LAST 1121    7644  1 7654 0         TCF    DCOMP

1163                        7645  0 0006 1         EXTEND            VECTOR COMPLEMENT.
1164  REF 421  LAST 1121    7646  4 0160 1         DCS    MPAC +3
1165  REF 422  LAST 1121    7647  52 160 1         DXCH   MPAC +3
1166                        7650  0 0006 1         EXTEND
1167  REF 423  LAST 1121    7651  4 0162 0         DCS    MPAC +5
1168  REF 424  LAST 1121    7652  52 162 0         DXCH   MPAC +5
1169  REF  28  LAST 1121    7653  1 6030 0         TCF    DANZIG

1170  REF 425  LAST 1121    7654  4 0156 1  DCOMP  CS     MPAC +2
1171  REF 426  LAST 1121    7655  54 156 1         TS     MPAC +2
1172  REF  29  LAST 1121    7656  1 6030 0         TCF    DANZIG
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P1173           THE FOLLOWING SHORT SHIFT CODES REQUIRE NO ADDRESS WORD'

R1174           1.  SR1 TO SR4          SCALAR SHIFT RIGHT.
R1175           2.  SR1R TO SR4R        SCALAR SHIFT RIGHT AND ROUND.
R1176           3.  SL1 TO SL4          SCALAR SHIFT LEFT.
R1177           4.  SL1R TO SL4R        SCALAR SHIFT LEFT AND ROUND.

R1178           5.  VSR1 TO VSR8        VECTOR SHIFT RIGHT (ALWAYS ROUNDS).
R1179           6.  VSL1 TO VSL8        VECTOR SHIFT LEFT (NEVER ROUNDS).

R1180           THE FOLLOWING CODES REQUIRE AN ADDRESS WHICH MAY BE INDEXED'*

R1181           1.  SR                  SCALAR SHIFT RIGHT.
R1182           2.  SRR                 SCALAR SHIFT RIGHT AND ROUND.
R1183           3.  SL                  SCALAR SHIFT LEFT.
R1184           4.  SLR                 SCALAR SHIFT LEFT AND ROUND.

R1185           5.  VSR                 VECTOR SHIFT RIGHT.
R1186           6.  VSL                 VECTOR SHIFT LEFT.

R1187   *  IF THE ADDRESS IS INDEXED, AND THE INDEX MODIFICATION RESULTS IN A NEGATIVE SHIFT COUNT, A SHIFT OF THE
R1189   ABSOLUTE VALUE OF THE COUNT IS DONE IN THE OPPOSITE DIRECTION.
 1190                    00,2017                         BANK    00

 1191   REF    2 LAST 1088 TO 1089'    15    15*        COUNT   00/INTER

 1192   REF   36  LAST 1113    00,2017  3 6211 0  SHORTT  CAF     SIX          SCALAR SHORT SHIFTS COME HERE. THE SHIFT
 1193   REF   29  LAST 1093    00,2020  7 0020 1         MASK    CYR          COUNT-1 IS NOW IN BITS 2-3 OF CYR. THE
 1194   REF   20  LAST 1061    00,2021  54 021 0         TS      SR           ROUNDING BIT IS IN BIT1 AT THIS POINT.

 1195   REF   30  LAST 1122    00,2022  10 020 1         CCS     CYR          SEE IF RIGHT OR LEFT SHIFT DESIRED.
 1196   REF    1               00,2023  1 2101 1         TCF     TSSL         SHIFT LEFT.

 1197                          00,2024   00024 1  SRDDV  DEC     20           MPTEMP SETTING FOR SR BEFORE DDV.

 1198   REF   21  LAST 1122    00,2025  50 021 1  TSSR   INDEX   SR           GET SHIFTING BIT.
 1199   REF   63  LAST 1010    00,2026  3 4675 1         CAF     BIT14
 1200   REF   13  LAST 1111    00,2027  54 135 1         TS      MPTEMP

 1201   REF   31  LAST 1122    00,2030  10 020 1         CCS     CYR          SEE IF A ROUND IS DESIRED.
 1202   REF    1               00,2031  0 2050 0  RIGHTR TC      MPACSRND     YES - SHIFT RIGHT AND ROUND.
 1203   REF    4  LAST 1113    00,2032  1 6027 0         TCF     NEWMODE      SET MODE TO DP (C(A) = 0).
 1204   REF   14  LAST 1122    00,2033  3 0135 0  MPACSHR CA      MPTEMP       DO A TRIPLE PRECISION SHIFT RIGHT.
 1205                          00,2034  0 0006 1         EXTEND
 1206   REF  427  LAST 1121    00,2035  7 0156 1         MP      MPAC +2
 1207   REF  428  LAST 1122    00,2036  54 156 1   +3    TS      MPAC +2      (EXIT FROM SQRT AND ABVAL).
 1208   REF   15  LAST 1122    00,2037  3 0135 0         CA      MPTEMP
 1209                          00,2040  0 0006 1         EXTEND
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1210  REF 429  LAST 1122   00,2041  7 0154 0          MP      MPAC       SHIFT MAJOR PART INTO A,L AND PLACE IN
1211  REF 430  LAST 1123   00,2042  52 155 1          DXCH    MPAC       MPAC,+1.
1212  REF  16  LAST 1122   00,2043  3 0135 0          CA      MPTEMP
1213                       00,2044  0 0006 1          EXTEND
1214  REF 182  LAST 1118   00,2045  7 0001 1          MP      L          ORIGINAL C(MPAC +1).
1215  REF 431  LAST 1123   00,2046  20 156 1          DAS     MPAC +1    GUARANTEED NO OVERFLOW.
1216  REF  30  LAST 1121   00,2047  1 6030 0          TCF     DANZIG

R1217          MPAC SHIFT RIGHT AND ROUND SUBROUTINES.

1218  REF 432  LAST 1123   00,2050  3 0156 0  MPACSRND CA      MPAC +2    WE HAVE TO DO ALL THREE MULTIPLIES SINCE
1219                       00,2051  0 0006 1          EXTEND               MPAC +1 AND MPAC +2 MIGHT HAVE SIGN
1220  REF  17  LAST 1123   00,2052  7 0135 1          MP      MPTEMP     DISAGREEMENT WITH A SHIFT RIGHT OF 1.
1221  REF 433  LAST 1123   00,2053  56 155 0          XCH     MPAC +1
1222                       00,2054  0 0006 1          EXTEND
1223  REF  18  LAST 1123   00,2055  7 0135 1          MP      MPTEMP
1224  REF 434  LAST 1123   00,2056  56 155 0          XCH     MPAC +1    TRIAL MINOR PART.
1225  REF 183  LAST 1123   00,2057  6 0001 0          AD      L

1226                       00,2060  6 0000 1  VSHR2    DOUBLE             (FINISH VECTOR COMPONENT SHIFT RIGHT
1227  REF 435  LAST 1123   00,2061  54 156 1          TS      MPAC +2    AND ROUND.
1228                       00,2062  1 2064 0          TCF     +2
1229  REF 436  LAST 1123   00,2063  26 155 1          ADS     MPAC +1    GUARANTEED NO OVERFLOW.

1230  REF 221  LAST 1120   00,2064  3 4714 1          CAF     ZERO
1231  REF 437  LAST 1123   00,2065  54 156 1          TS      MPAC +2
1232  REF 438  LAST 1123   00,2066  56 154 1          XCH     MPAC       SETTING TO ZERO SO FOLLOWING DAS WORKS.
1233                       00,2067  0 0006 1          EXTEND
1234  REF  19  LAST 1123   00,2070  7 0135 1          MP      MPTEMP
1235  REF 439  LAST 1123   00,2071  20 155 1          DAS     MPAC       AGAIN NO OVERFLOW.
1236  REF 257  LAST 1118   00,2072  0 0002 0          TC      Q

1237  REF  20  LAST 1123   00,2073  3 0135 0  VSHRRND  CA      MPTEMP     ENTRY TO SHIFT RIGHT AND ROUND MPAC WHEN
1238                       00,2074  0 0006 1          EXTEND               MPAC CONTAINS A VECTOR COMPONENT.
1239  REF 440  LAST 1123   00,2075  7 0155 1          MP      MPAC +1
1240  REF 441  LAST 1123   00,2076  54 155 1          TS      MPAC +1
1241  REF 184  LAST 1123   00,2077  56 001 0          XCH     L
1242  REF   1              00,2100  1 2060 1          TCF     VSHR2      GO ADD ONE IF NECESSARY AND FINISH.
```

P1243 ROUTINE FOR SHORT SCALAR SHIFT LEFT (AND MAYBE ROUND).

1244	REF	22	LAST	1122	00,2101	3 0021 1	TSSL	CA	SR	GET SHIFT COUNT FOR SR.
1245	REF	21	LAST	1123	00,2102	54 135 1	+1	TS	MPTEMP	
1246					00,2103	0 0006 1	+2	EXTEND		ENTRY HERE FROM SL FOR SCALARS.
1247	REF	442	LAST	1123	00,2104	3 0156 0		DCA	MPAC +1	SHIFTING LEFT ONE PLACE AT A TIME IS
1248	REF	443	LAST	1124	00,2105	20 156 1		DAS	MPAC +1	FASTER THAN DOING THE WHOLE SHIFT WITH
1249	REF	444	LAST	1124	00,2106	6 0154 1		AD	MPAC	MULTIPLIES ASSUMING THAT FREQUENCY OF
1250	REF	445	LAST	1124	00,2107	6 0154 1		AD	MPAC	SHIFT COUNTS GOES DOWN RAPIDLY AS A
1251	REF	446	LAST	1124	00,2110	54 154 0		TS	MPAC	FUNCTION OF THEIR MAGNITUDE.
1252					00,2111	1 2113 1		TCF	+2	
1253	REF	4	LAST	1108	00,2112	54 121 1		TS	OVFIND	OVERFLOW. (LEAVES OVERFLOW-CORRECTED
A1254										RESULT ANYWAY).
1255	REF	22	LAST	1124	00,2113	10 135 1		CCS	MPTEMP	LOOP ON DECREMENTED SHIFT COUNT.
1256	REF	2	LAST	1122	00,2114	1 2102 1		TCF	TSSL +1	
1257	REF	32	LAST	1122	00,2115	10 020 1		CCS	CYR	SEE IF ROUND WANTED.
1258	REF	2	LAST	1119	00,2116	0 7105 1	ROUND	TC	ROUNDSUB	YES - ROUND AND EXIT.
1259	REF	31	LAST	1123	00,2117	1 6030 0		TCF	DANZIG	SL LEAVES A ZERO IN CYR FOR NO ROUND.
1260	REF	32	LAST	1124	00,2120	1 6030 0		TCF	DANZIG	NO - EXIT IMMEDIATL

P1261 VECTOR SHIFTING ROUTINES.

1262	REF 3	LAST 726	00,2121	3 4716 0	SHORTV	CAF	LOW3		SAVE 3 BIT SHIFT COUNT - 1 WITHOUT
1263	REF 33	LAST 1124	00,2122	7 0020 1		MASK	CYR		EDITING CYR.
1264	REF 23	LAST 1124	00,2123	54 135 1		TS	MPTEMP		
1265	REF 34	LAST 1125	00,2124	10 020 1		CCS	CYR		SEE IF LEFT OR RIGHT SHIFT.
1266	REF 1		00,2125	1 2145 1		TCF	VSSL		VECTOR SHIFT LEFT.
1267			00,2126	00176 1	OCT176	OCT	176		USED IN PROCESSED SHIFTS WITH - COUNT.
1268	REF 24	LAST 1125	00,2127	50 135 0	VSSR	INDEX	MPTEMP		(ENTRY FROM SR). PICK UP SHIFTING BIT.
1269	REF 64	LAST 1122	00,2130	3 4675 1		CAF	BIT14		MPTEMP CONTAINS THE SHIFT COUNT - 1.
1270	REF 25	LAST 1125	00,2131	54 135 1		TS	MPTEMP		
1271	REF 1		00,2132	0 2073 1		TC	VSHRRND		SHIFT X COMPONENT.
1272	REF 447	LAST 1124	00,2133	52 155 1		DXCH	MPAC		SWAP X AND Y COMPONENTS.
1273	REF 448	LAST 1125	00,2134	52 160 1		DXCH	MPAC +3		
1274	REF 449	LAST 1125	00,2135	52 155 1		DXCH	MPAC		
1275	REF 2	LAST 1125	00,2136	0 2073 1		TC	VSHRRND		SHIFT Y COMPONENT.
1276	REF 450	LAST 1125	00,2137	52 155 1		DXCH	MPAC		SWAP Y AND Z COMPONENTS.
1277	REF 451	LAST 1125	00,2140	52 162 0		DXCH	MPAC +5		
1278	REF 452	LAST 1125	00,2141	52 155 1		DXCH	MPAC		
1279	REF 3	LAST 1125	00,2142	0 2073 1		TC	VSHRRND		SHIFT Z COMPONENT.
1280	REF 1		00,2143	1 7367 0		TCF	VROTATEX		RESTORE COMPONENTS TO PROPER PLACES.

L INTERPRETER

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P1281   VECTOR SHIFT LEFT - DONE ONE PLACE AT A TIME.

1282    REP  26  LAST 1125   00,2144  54 135 1   -1      TS      MPTEMP      SHIFTING LOOP.
1283                         00,2145  0 0006 1   VSSL    EXTEND
1284    REP 453  LAST 1125   00,2146  3 0155 0           DCA     MPAC
1285    REP 454  LAST 1128   00,2147  20 155 1           DAS     MPAC
1286                         00,2150  0 0006 1           EXTEND
1287                         00,2151  1 2153 0           BZF     +2
1288    REP   3  LAST 1108   00,2152  0 6766 0           TC      OVERFLOW
1289                         00,2153  0 0006 1           EXTEND
1290    REP 455  LAST 1126   00,2154  3 0160 0           DCA     MPAC +3
1291    REP 456  LAST 1126   00,2155  20 160 1           DAS     MPAC +3
1292                         00,2156  0 0006 1           EXTEND
1293                         00,2157  1 2161 1           BZF     +2
1294    REP   4  LAST 1118   00,2160  0 6763 0           TC      OVERFLWY
1295                         00,2161  0 0006 1           EXTEND
1296    REP 457  LAST 1126   00,2162  3 0162 1           DCA     MPAC +5
1297    REP 458  LAST 1126   00,2163  20 162 0           DAS     MPAC +5
1298                         00,2164  0 0006 1           EXTEND
1299                         00,2165  1 2167 1           BZF     +2
1300    REP   4  LAST 1117   00,2166  0 6760 0           TC      OVERFLWZ

1301    REP  27  LAST 1126   00,2167  10 135 1           CCS     MPTEMP      LOOP ON DECREMENTED SHIFT COUNTER.
1302    REP   2  LAST 1125   00,2170  1 2144 0           TCF     VSSL -1
1303    REP  33  LAST 1124   00,2171  1 6030 0           TCF     DANZIG      EXIT.
```

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P1304           TSLC - TRIPLE SHIFT LEFT AND COUNT. SHIFTS MPAC LEFT UNTIL GREATER THAN .5 IN MAGNITUDE, LEAVING
R1306   THE COMPLEMENT OF THE NUMBER OF SHIFTS REQUIRED IN X.

 1307   REP  28  LAST 1126   00,2172  54 135 1  TSLC2    TS      MPTEMP      START BY ZEROING SHIFT COUNT (IN A NOW).
 1308   REP   2  LAST 1111   00,2173  0 6672 1           TC      BRANCH      EXIT WITH NO SHIFTING IF ARGUMENT ZERO.
 1309                        00,2174  1 2176 1           TCF     +2
 1310   REP   1              00,2175  1 2212 0           TCF     ENDTSLC     STORES ZERO SHIFT COUNT IN THIS CASE.

 1311   REP   6  LAST  683   00,2176  0 7226 0           TC      TPAGREE     MAY CAUSE UPSHIFT OF ONE EXTRA PLACE.

 1312   REP 459  LAST 1126   00,2177  3 0154 1           CA      MPAC        BEGIN NORMALIZATION LOOP.
 1313   REP   1              00,2200  1 2207 1           TCF     TSLCTEST

 1314   REP  29  LAST 1127   00,2201  24 135 0  TSLCLOOP INCR    MPTEMP      INCREMENT SHIFT COUNTER.
 1315                        00,2202  0 0006 1           EXTEND
 1316   REP 460  LAST 1127   00,2203  3 0156 0           DCA     MPAC +1
 1317   REP 461  LAST 1127   00,2204  20 156 1           DAS     MPAC +1
 1318   REP 462  LAST 1127   00,2205  6 0154 1           AD      MPAC
 1319   REP 463  LAST 1127   00,2206  26 154 0           ADS     MPAC
 1320                        00,2207  6 0000 1  TSLCTEST DOUBLE                SEE IF (ANOTHER) SHIFT IS REQUIRED.
 1321                        00,2210  54 000 0           OVSK
 1322   REP   1              00,2211  1 2201 1           TCF     TSLCLOOP    YES - INCREMENT COUNT AND SHIFT AGAIN.

 1323   REP  30  LAST 1127   00,2212  4 0135 1  ENDTSLC  CS      MPTEMP
 1324   REP   1              00,2213  1 6572 0           TCF     STORE1      STORE SHIFT COUNT AND RETURN TO DANZIG.
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P1325           THE FOLLOWING ROUTINES PROCESSES THE GENERAL SHIFT INSTRUCTIONS SR, SRR, SL, AND SLR.
R1327   THE GIVEN ADDRESS IS DECODED AS FOLLOWS'

R1328           BITS 1-7    SHIFT COUNT (SUBADDRESS) LESS THAN 125 DECIMAL.
R1329           BIT 8       PSEUDO SIGN BIT (DETECTS CHANGE IN SIGN IN INDEXED SHIFTS).
R1331           BIT 9       0 FOR LEFT SHIFT, AND 1 FOR RIGHT SHIFT.
R1332           BIT 10      1 FOR TERMINAL ROUND ON SCALAR SHIFTS, 0 OTHERWISE.
R1333           BITS 11-13  0.
R1334           BIT 14      1.
R1335           BIT 15      0.

R1336   THE ABOVE ENCODING IS DONE BY THE YUL SYSTEM.
 1337   REP  71  LAST 1121   00,2214  7 0116 0  GENSHIFT MASK   ADDRWD     GET SHIFT COUNT, TESTING FOR ZERO.
 1338   REP 299  LAST 1118   00,2215  10 000 0            CCS    A        (ARRIVES WITH C(A) = LOW7).
 1339   REP   1              00,2216  1 2224 0            TCF    GENSHFT2 IF NON-ZERO, PROCEED WITH DECREMENTED CT

 1340   REP  33  LAST  701   00,2217  3 4701 0            CAF    BIT10    ZERO SHIFT COUNT. NO SHIFTS NEEDED BUT
 1341   REP  72  LAST 1128   00,2220  7 0116 0            MASK   ADDRWD   WE MIGHT HAVE TO ROUND MPAC ON SLR AND
 1342   REP 300  LAST 1128   00,2221  10 000 0            CCS    A        SRR (SCALAR ONLY).
 1343   REP   3  LAST 1124   00,2222  0 7105 1            TC     ROUNDSUB
 1344   REP  34  LAST 1126   00,2223  1 6030 0            TCF    DANZIG

 1345   REP  31  LAST 1127   00,2224  54 135 1  GENSHFT2  TS     MPTEMP   DECREMENTED SHIFT COUNT TO MPTEMP.
 1346   REP  26  LAST 1075   00,2225  3 4703 1            CAF    BIT8     TEST MEANING OF LOW SEVEN BIT COUNT IN
 1347                        00,2226  0 0006 1            EXTEND          MPTEMP NOW.
 1348   REP  73  LAST 1128   00,2227  7 0116 0            MP     ADDRWD
 1349   REP   1              00,2230  7 6214 1            MASK   LOW2     JUMPS ON SHIFT DIRECTION (BIT8) AND
 1350   REP 301  LAST 1128   00,2231  50 000 1            INDEX  A
 1351                        00,2232  1 2233 0            TCF    +1       ORIGINAL SHIFT DIRECTION (BIT 9).
 1352   REP   1              00,2233  1 2332 0            TCF    RIGHT-   NEGATIVE SHIFT COUNT FOR SL OR SLR.
 1353   REP   1              00,2234  1 2342 1            TCF    LEFT     SL OR SLR.
 1354   REP   1              00,2235  1 2336 1            TCF    LEFT-    NEGATIVE SHIFT COUNT WITH SR OR SRR.
```

P1355 GENERAL SHIFT RIGHT.

```
1356  BEP  20  LAST 1121  00,2236  10 163 1  RIGHT     CCS   MODE      SEE IF VECTOR OR SCALAR.
1357  BEP   1             00,2237  1 2277 0           TCF   GENSCR
1358  BEP   2  LAST 1129  00,2240  1 2277 0           TCF   GENSCR

1359  BEP  32  LAST 1128  00,2241  3 0135 0           CA    MPTEMP    SEE IF SHIFT COUNT LESS THAN 14D.
1360  BEP   1             00,2242  6 3730 0  VRIGHT2  AD    NEG12
1361                      00,2243  0 0006 1           EXTEND
1362  BEP   1             00,2244  6 2127 1           BZMF  VSSR      IF SO, BRANCH AND SHIFT IMMEDIATELY.

1363  BEP  25  LAST 1118  00,2245  6 7716 0           AD    NEGONE    IF NOT, REDUCE MPTEMP BY A TOTAL OF 14,
1364  BEP  33  LAST 1129  00,2246  54 135 1           TS    MPTEMP    AND DO A SHIFT RIGHT AND ROUND BY 14.
1365  BEP 222  LAST 1123  00,2247  3 4714 1           CAF   ZERO      THE ROUND AT THIS STAGE MAY INTRODUCE A
1366  BEP 185  LAST 1123  00,2250  54 001 1           TS    L         ONE BIT ERROR IN A SHIFT RIGHT 15D.
1367  BEP 464  LAST 1127  00,2251  56 154 1           XCH   MPAC
1368  BEP 465  LAST 1129  00,2252  56 155 0           XCH   MPAC +1
1369  BEP   1             00,2253  0 2272 1           TC    SETROUND  X COMPONENT NOW SHIFTED, SO MAKE UP THE
1370  BEP 466  LAST 1129  00,2254  20 155 1           DAS   MPAC      ROUNDING QUANTITY (0 IN A AND 0 OR +-1
A1371                                                               IN L).
1372  BEP 467  LAST 1129  00,2255  56 157 1           XCH   MPAC +3   REPEAT THE ABOVE PROCESS FOR Y AND Z.
1373  BEP 468  LAST 1129  00,2256  56 160 0           XCH   MPAC +4
1374  BEP   2  LAST 1129  00,2257  0 2272 1           TC    SETROUND
1375  BEP 469  LAST 1129  00,2260  20 160 1           DAS   MPAC +3   NO OVERFLOW ON THESE ADDS.

1376  BEP 470  LAST 1129  00,2261  56 161 1           XCH   MPAC +5
1377  BEP 471  LAST 1129  00,2262  56 162 1           XCH   MPAC +6
1378  BEP   3  LAST 1129  00,2263  0 2272 1           TC    SETROUND
1379  BEP 472  LAST 1129  00,2264  20 162 0           DAS   MPAC +5

1380  BEP  34  LAST 1129  00,2265  10 135 1           CCS   MPTEMP    SEE IF DONE, DOING FINAL DECREMENT.
1381  BEP  35  LAST 1129  00,2266  54 135 1           TS    MPTEMP
1382  BEP   1             00,2267  1 2242 0           TCF   VRIGHT2
1383                      00,2270   04604 1  BIASLO   DEC   .2974 B-1  SORT CONSTANT

1384  BEP  35  LAST 1128  00,2271  1 6030 0           TCF   DANZIG
1385                      00,2272  6 0000 1  SETROUND DOUBLE            MAKES UP ROUNDING QUANTITY FROM ARRIVING
1386  BEP 473  LAST 1129  00,2273  54 156 1           TS    MPAC +2     C(A). L IS ZERO INITIALLY.
1387  BEP 223  LAST 1129  00,2274  3 4714 1           CAF   ZERO
1388  BEP 186  LAST 1129  00,2275  56 001 0           XCH   L
1389  BEP 258  LAST 1123  00,2276  0 0002 0           TC    Q         RETURN AND DO THE DAS, RESETTING L TO 0.
```

L INTERPRETER

P1390 PROCESS SR AND SRR FOR SCALARS.

1391	REF	36	LAST 1129	00,2277	3 0135 0	GENSCR	CA	MPTEMP	SEE IF THE ORIGINAL SHIFT COUNT WAS LESS
1392	REF	2	LAST 1129	00,2300	6 3730 0	+1	AD	NEG12	THAN 14D.
1393				00,2301	0 0006 1		EXTEND		
1394	REF	1		00,2302	6 2322 0		BZMF	DOSSHFT	DO THE SHIFT IMMEDIATELY IF SO.
1395	REF	26	LAST 1129	00,2303	6 7716 0	+4	AD	NEGONE	IF NOT, DECREMENT SHIFT COUNT BY 14D AND
1396	REF	37	LAST 1130	00,2304	54 135 1		TS	MPTEMP	SHIFT MPAC RIGHT 14 PLACES.
1397	REF	224	LAST 1129	00,2305	3 4714 1		CAF	ZERO	
1398	REF	474	LAST 1129	00,2306	56 154 1		XCH	MPAC	
1399	REF	475	LAST 1130	00,2307	56 155 0		XCH	MPAC +1	
1400	REF	476	LAST 1130	00,2310	54 156 1		TS	MPAC +2	
1401	REF	38	LAST 1130	00,2311	10 135 1		CCS	MPTEMP	SEE IF FINISHED, DO FINAL DECREMENT.
1402	REF	39	LAST 1130	00,2312	54 135 1		TS	MPTEMP	
1403	REF	3	LAST 1129	00,2313	0 2300 0		TC	GENSCR +1	
1404				00,2314	22650 1	SLOPEHI	DEC	.5884	SQRT CONSTANT.
1405	REF	34	LAST 1128	00,2315	3 4701 0		CAF	BIT10	FINISHED WITH SHIFT. SEE IF ROUND
1406	REF	74	LAST 1128	00,2316	7 0116 0		MASK	ADDRWD	WANTED.
1407	REF	302	LAST 1128	00,2317	10 000 0		CCS	A	
1408	REF	4	LAST 1128	00,2320	0 7105 1		TC	ROUNDSUB	
1409	REF	36	LAST 1129	00,2321	1 6030 0		TCF	DANZIG	DO SO AND/OR EXIT.
1410	REF	40	LAST 1130	00,2322	50 135 0	DOSSHFT	INDEX	MPTEMP	PICK UP SHIFTING BIT.
1411	REF	65	LAST 1125	00,2323	3 4675 1		CAF	BIT14	
1412	REF	41	LAST 1130	00,2324	54 135 1		TS	MPTEMP	
1413	REF	35	LAST 1130	00,2325	3 4701 0		CAF	BIT10	SEE IF TERMINAL ROUND DESIRED.
1414	REF	75	LAST 1130	00,2326	7 0116 0		MASK	ADDRWD	
1415	REF	303	LAST 1130	00,2327	10 000 0		CCS	A	
1416	REF	1		00,2330	1 2031 0		TCF	RIGHTR	YES.
1417	REF	1		00,2331	1 2033 1		TCF	MPACSHR	JUST SHIFT RIGHT.

P1418 PROCESS THE RIGHT- (SL(R) WITH A NEGATIVE COUNT), LEFT-, AND LEFT OPTIONS.

1420	REP	42	LAST 1130	00,2332	4 0135 1	RIGHT-	CS	MPTEMP		GET ABSOLUTE VALUE - 1 OF SHIFT COUNT
1421	REP	1		00,2333	6 2126 0		AD	OCT176		UNDERSTANDING THAT BIT8 (PSEUDO-SIGN)
1422	REP	43	LAST 1131	00,2334	54 135 1		TS	MPTEMP		WAS 1 INITIALLY.
1423	REP	1		00,2335	1 2236 0		TCF	RIGHT		DO NORMAL SHIFT RIGHT.
1424	REP	2	LAST 1131	00,2336	4 2126 1	LEFT-	CS	OCT176		SAME PROLOGUE TO LEFT FOR INDEXED RIGHT
1425	REP	44	LAST 1131	00,2337	6 0135 0		AD	MPTEMP		SHIFTS WHOSE NET SHIFT COUNT IS NEGATIVE
1426				00,2340	4 0000 0		COM			
1427	REP	45	LAST 1131	00,2341	54 135 1		TS	MPTEMP		
1428	REP	21	LAST 1129	00,2342	10 163 1	LEFT	CCS	MODE		SINCE LEFT SHIFTING IS SONE ONE PLACE AT
1429	REP	1		00,2343	1 2346 0		TCF	GENSCL		A TIME, NO COMPARISON WITH 14 NEED BE
1430	REP	2	LAST 1131	00,2344	1 2346 0		TCF	GENSCL		DONE. FOR SCALARS, SEE IF TERMINAL ROUND
1431	REP	3	LAST 1126	00,2345	1 2145 1		TCF	VSSL		DESIRED. FOR VECTORS, SHIFT IMMEDIATELY.
1432	REP	76	LAST 1130	00,2346	4 0116 0	GENSCL	CS	ADDRWD		PUT ROUNDING BIT (BIT 10 OF ADDRWD) INTO
1433				00,2347	0 0006 1		EXTEND			BIT 15 OF CYR WHERE THE ROUNDING BIT OF
1434	REP	43	LAST 1034	00,2350	7 4705 0		MP	BIT8		A SHORT SHIFT LEFT WOULD BE
1435	REP	35	LAST 1125	00,2351	54 020 1		TS	CYR		
1436	REP	3	LAST 1124	00,2352	1 2103 0		TCF	TSSL +2		DO THE SHIFT.

P1437 SCALAR DIVISION INSTRUCTIONS, DDV AND BDDV, ARE EXECUTED HERE. AT THIS POINT, THE DIVIDEND IS IN MPAC
R1439 AND THE DIVISOR IN BUF.

1440	REP	136	LAST 1120	00,2353	4 4712 0	DDV/BDDV	CS	ONE	INITIALIZATION.
1441	REP	1		00,2354	54 136 1		TS	DVSIGN	+-1 FOR POSITIVE QUOTIENT - -0 FOR NEG.
1442	REP	1		00,2355	54 137 0		TS	DVNORMCT	DIVIDEND NORMALIZATION COUNT.
1443	REP	1		00,2356	54 140 0		TS	MAXDVSW	NEAR-ONE DIVIDE FLAG.
1444	REP	55	LAST 1120	00,2357	10 130 1		CCS	BUF	FORCE BUF POSITIVE WITH THE MAJOR PART
1445	REP	1		00,2360	1 2516 0		TCF	BUFPOS	NON-ZERO.
1446				00,2361	1 2363 1		TCF	+2	
1447	REP	1		00,2362	1 2531 0		TCF	BUFNEG	
1448	REP	477	LAST 1130	00,2363	54 156 1	BUFZERO	TS	MPAC +2	ZERO THIS.
1449	REP	9	LAST 1127	00,2364	0 7226 0		TC	TPAGREE	FORCE SIGN AGREEMENT BEFORE OVERFLOW
1450	REP	478	LAST 1132	00,2365	10 154 0		CCS	MPAC	TEST TO SEE IF MPAC NON-ZERO. (TOO BIG)
1451	REP	1		00,2366	1 2414 0		TCF	OVF+	MAJOR PART OF DIVIDEND IS POSITIVE NON-0
1452				00,2367	1 2371 1		TCF	+2	
1453	REP	2	LAST 1132	00,2370	1 2413 1		TCF	OVF+ -1	MAJOR PART OF DIVIDEND IS NEG. NON-ZERO
1454	REP	56	LAST 1132	00,2371	56 131 1		XCH	BUF +1	SHIFT DIVIDEND AND DIVISOR LEFT 14.
1455	REP	57	LAST 1132	00,2372	56 130 0		XCH	BUF	
1456	REP	479	LAST 1132	00,2373	56 155 0		XCH	MPAC +1	
1457	REP	480	LAST 1132	00,2374	56 154 1		XCH	MPAC	
1458	REP	58	LAST 1132	00,2375	10 130 1		CCS	BUF	TRY AGAIN ON FORMER MINOR PART.
1459	REP	1		00,2376	1 2422 0		TCF	BUF+	
1460				00,2377	1 2401 1		TCF	+2	
1461	REP	1		00,2400	1 2416 1		TCF	BUF-	OVERFLOW ON ZERO DIVISOR.
1462	REP	481	LAST 1132	00,2401	4 0154 0		CS	MPAC	SIGN OF MPAC DETERMINES SIGN OF RESULT.
1463				00,2402	0 0006 1	SGNDVOVF	EXTEND		
1464				00,2403	6 2405 1		BZMF	+2	
1465	REP	2	LAST 1132	00,2404	24 136 0		INCR	DVSIGN	NEGMAX IN MPAC PERHAPS.
1466	REP	30	LAST 1111	00,2405	3 4672 0	DVOVF	CAF	POSMAX	ON DIVISION OVERFLOW OF ANY SORT, SET
1467	REP	482	LAST 1132	00,2406	54 154 0		TS	MPAC	SET DP MPAC TO +-POSMAX.
1468	REP	1		00,2407	0 2630 0		TC	FINALDV +3	
1469	REP	137	LAST 1132	00,2410	3 4712 1		CAF	ONE	SET OVERFLOW INDICATOR AND EXIT.
1470	REP	5	LAST 1124	00,2411	54 121 1		TS	OVFIND	
1471	REP	37	LAST 1130	00,2412	0 6030 1		TC	DANZIG	
1472	REP	3	LAST 1132	00,2413	24 136 0	-1	INCR	DVSIGN	
1473	REP	59	LAST 1132	00,2414	4 0131 0	OVF+	CS	BUF +1	LOAD LOWER ORDER PART OF DIVISOR.
1474	REP	1		00,2415	1 2402 1		TCF	SGNDVOVF	GET SIGN OF RESULT.
1475				00,2416	0 0006 1	BUF-	EXTEND		IF BUF IS NEGATIVE, COMPLEMENT IT AND
1476	REP	60	LAST 1132	00,2417	4 0131 0		DCS	BUF	MAINTAIN DVSIGN FOR FINAL QUOTIENT SIGN.
1477	REP	61	LAST 1132	00,2420	52 131 0		DXCH	BUF	
1478	REP	4	LAST 1132	00,2421	24 136 0		INCR	DVSIGN	NOW -0.

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1479  REP 483  LAST 1132   00,2422  10 154 0  BUF+    CCS   MPAC      FORCE MPAC POSITIVE, CHECKING FOR ZERO
1480  REP   1              00,2423  1 2437 1          TCF   MPAC+     DIVIDEND IN THE PROCESS.
1481                       00,2424  1 2426 1          TCF   +2
1482  REP   1              00,2425  1 2433 0          TCF   MPAC-
1483  REP 484  LAST 1133   00,2426  10 155 1          CCS   MPAC +1
1484  REP   2  LAST 1133   00,2427  1 2437 1          TCF   MPAC+
1485  REP  38  LAST 1132   00,2430  1 6030 0          TCF   DANZIG    EXIT IMMEDIATELY ON ZERO DIVIDEND.
1486  REP   2  LAST 1133   00,2431  1 2433 0          TCF   MPAC-
1487  REP  39  LAST 1133   00,2432  1 6030 0          TCF   DANZIG

1488                       00,2433  0 0006 1  MPAC-   EXTEND          FORCE MPAC POSITIVE AS BUF IN BUF-.
1489  REP 485  LAST 1133   00,2434  4 0155 1          DCS   MPAC
1490  REP 486  LAST 1133   00,2435  52 155 1          DXCH  MPAC
1491  REP   5  LAST 1132   00,2436  24 136 0          INCR  DVSIGN    NOW +1 OR -0.
```

L INTERPRETER

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1492  REF 487  LAST 1133   00,2437  4 0154 0  MPAC+   CS     MPAC
1493  REF  27  LAST 1130   00,2440  6 7716 0          AD     NEGONE
1494  REF  62  LAST 1132   00,2441  6 0130 0          AD     BUF
1495  REF 304  LAST 1130   00,2442  10 000 0          CCS    A
1496  REF   1              00,2443  1 2505 1          TCF    DVNORM
1497                       00,2444   60001 0  -1/2+2  OCT    60001

1498                       00,2445  1 2446 1          TCF    +1
1499  REF  11  LAST 1118   00,2446  3 4675 1          CAF    HALF
1500                       00,2447  6 0000 1          DOUBLE
1501  REF 488  LAST 1134   00,2450  6 0155 0          AD     MPAC +1
1502  REF 489  LAST 1134   00,2451  54 155 1          TS     MPAC +1
1503  REF 225  LAST 1130   00,2452  3 4714 1          CAF    ZERO
1504  REF  31  LAST 1132   00,2453  6 4672 0          AD     POSMAX
1505  REF 490  LAST 1134   00,2454  26 154 0          ADS    MPAC

1506  REF  12  LAST 1134   00,2455  3 4675 1          CAF    HALF
1507                       00,2456  6 0000 1          DOUBLE
1508  REF  63  LAST 1134   00,2457  6 0131 1          AD     BUF +1
1509  REF  64  LAST 1134   00,2460  54 131 0          TS     BUF +1
1510  REF 226  LAST 1134   00,2461  3 4714 1          CAF    ZERO
1511  REF  32  LAST 1134   00,2462  6 4672 0          AD     POSMAX
1512  REF  65  LAST 1134   00,2463  26 130 1          ADS    BUF

1513  REF 491  LAST 1134   00,2464  4 0154 0          CS     MPAC
1514  REF  66  LAST 1134   00,2465  6 0130 0          AD     BUF
1515  REF 305  LAST 1134   00,2466  10 000 0          CCS    A
1516  REF   2  LAST 1134   00,2467  1 2505 1          TCF    DVNORM
1517  REF  13  LAST 1114   00,2470   00133 0  LBUF2   ADRES  BUF2
1518  REF   1              00,2471  1 2405 0          TCF    DVOVF

1519  REF   2  LAST 1132   00,2472  54 140 0          TS     MAXDVSW
1520  REF 492  LAST 1134   00,2473  4 0155 1          CS     MPAC +1
1521  REF  67  LAST 1134   00,2474  6 0131 1          AD     BUF +1
1522                       00,2475  0 0006 1          EXTEND
1523  REF   2  LAST 1134   00,2476  6 2405 1          BZMF   DVOVF
1524  REF   3  LAST 1134   00,2477  1 2505 1          TCF    DVNORM
```

CHECK FOR DIVISION OVERFLOW. IF THE MAJOR PART OF THE DIVIDEND IS LESS THAN THE MAJOR PART OF THE DIVISOR BY AT LEAST TWO, WE CAN PROCEED IMMEDIATELY WITHOUT NORMALIZATION PRODUCING A DVMAX. USED IN SQRTSUB.

IF THE ABOVE DOES NOT HOLD, FORCE SIGN AGREEMENT IN NUMERATOR AND DENOMINATOR TO FACILITATE OVERFLOW AND NEAR-ONE CHECKING.

SAME FOR BUF.

CHECK MAGNITUDE OF SIGN-CORRECTED OPERANDS.

DIVIDE OK - WILL NOT BECOME MAXDV CASE.

DIVISOR NOT LESS THAN DIVIDEND - OVF.

IF THE MAJOR PARTS OF THE DIVIDEND AND DIVISOR ARE EQUAL, A SPECIAL APPROXIMATION IS USED (PROVIDED THE DIVISION IS POSSIBLE, OF COURSE).

IF NO OVERFLOW.

```
1525                          00,2500  0 0006 1  BUFNORM  EXTEND
1526  REP   2  LAST 1132     00,2501  24 137 1           AUG     DVNORMCT   ADD -1 TO AUGMENT SHIFT COUNT AND SHIFT
1527                          00,2502  0 0006 1           EXTEND             LEFT ONE PLACE.
1528  REP  68  LAST 1134     00,2503  3 0131 1           DCA     BUF
1529  REP  69  LAST 1135     00,2504  20 131 0           DAS     BUF

1530  REP  70  LAST 1135     00,2505  3 0130 0  DVNORM   CA      BUF        SEE IF DIVISOR NORMALIZED YET.
1531                          00,2506  6 0000 1           DOUBLE
1532                          00,2507  54 000 0           OVSK
1533  REP   1                00,2510  1 2500 1           TCF     BUFNORM    NO - SHIFT LEFT ONE AND TRY AGAIN.

1534  REP 493  LAST 1134     00,2511  52 155 1           DXCH    MPAC       CALL DIVIDEND NORMALIZATION SEQUENCE
1535  REP   3  LAST 1135     00,2512  50 137 1           INDEX   DVNORMCT   PRIOR TO DOING THE DIVIDE.
1536  REP   1                00,2513  0 2565 0           TC      MAXTEST

1537  REP 494  LAST 1135     00,2514  54 156 1           TS      MPAC +2    RETURNS WITH DIVISION DONE AND C(A) = 0.
1538  REP  40  LAST 1133     00,2515  1 6030 0           TCF     DANZIG

1539  REP 306  LAST 1134     00,2516  10 000 0  BUFPOS   CCS     A
1540  REP   2  LAST 1132     00,2517  1 2422 0           TCF     BUF+       TO BUF+ IF BUF IS GREATER THAN +1.

1541  REP  71  LAST 1135     00,2520  4 0131 0           CS      BUF +1     IF BUF IS +1, FORCING SIGN AGREEMENT
1542                          00,2521  0 0006 1           EXTEND             MAY CAUSE BUF TO BECOME ZERO.
1543  REP   3  LAST 1135     00,2522  6 2422 1           BZMF    BUF+       BRANCH IF SIGNS AGREE.

1544  REP  13  LAST 1134     00,2523  3 4675 1           CA      HALF       SIGNS DISAGREE.  FORCE AGREEMENT.
1545                          00,2524  6 0000 1  +6       DOUBLE
1546  REP  72  LAST 1135     00,2525  26 131 0           ADS     BUF +1
1547  REP 227  LAST 1134     00,2526  3 4714 1           CA      ZERO
1548  REP  73  LAST 1135     00,2527  54 130 1           TS      BUF
1549  REP   1                00,2530  1 2363 1           TCF     BUFZERO
1550  REP 307  LAST 1135     00,2531  10 000 0  BUFNEG   CCS     A
1551  REP   2  LAST 1132     00,2532  1 2416 1           TCF     BUF-       TO BUF- IF BUF IS LESS THAN -1.

1552  REP  74  LAST 1135     00,2533  3 0131 1           CA      BUF +1     IF BUF IS -1, FORCING SIGN AGREEMENT
1553                          00,2534  0 0006 1           EXTEND             MAY CAUSE BUF TO BECOME ZERO.
1554  REP   3  LAST 1135     00,2535  6 2416 0           BZMF    BUF-       BRANCH IF SIGNS AGREE.

1555  REP  14  LAST 1135     00,2536  4 4675 0           CS      HALF       SIGNS DISAGREE.  FORCE AGREEMENT.
1556  REP   2  LAST 1132     00,2537  1 2524 1           TCF     BUFPOS +6
```

P1557 THE FOLLOWING ARE PROLOGUES TO SHIFT THE DIVIDEND ARRIVING IN A AND L BEFORE THE DIVIDE.

```
1559  REP  23  LAST 1124   00,2540  22 021 1  -21D   LXCH   SR          SPECIAL PROLOGUE FOR UNIT WHEN THE
1560                       00,2541  0 0006 1          EXTEND            LENGTH OF THE ARGUMENT WAS NOT LESS THAN
1561  REP  15  LAST 1135   00,2542  7 4675 0          MP     HALP       .5. IN THIS CASE, EACH COMPONENT MUST BE
1562  REP 187  LAST 1129   00,2543  56 001 0          XCH    L          SHIFTED RIGHT ONE TO PRODUCE A HALF-UNIT
1563  REP  24  LAST 1136   00,2544  6 0021 1          AD     SR         VECTOR.
1564  REP 188  LAST 1136   00,2545  56 001 0          XCH    L
1565  REP   1              00,2546  1 2571 1          TCF    GENDDV +1  WITH DP DIVIDEND IN A,L.

1566                       00,2547  20 001 1          DDOUBL
1567                       00,2550  20 001 1          DDOUBL             PROLOGUE WHICH NORMALIZES THE DIVIDEND
1568                       00,2551  20 001 1          DDOUBL             WHEN IT IS KNOWN THAT NO DIVISION
1569                       00,2552  20 001 1          DDOUBL             OVERFLOW WILL OCCUR.
1570                       00,2553  20 001 1          DDOUBL
1571                       00,2554  20 001 1          DDOUBL
1572                       00,2555  20 001 1          DDOUBL
1573                       00,2556  20 001 1          DDOUBL
1574                       00,2557  20 001 1          DDOUBL
1575                       00,2560  20 001 1          DDOUBL
1576                       00,2561  20 001 1          DDOUBL
1577                       00,2562  20 001 1          DDOUBL
1578                       00,2563  20 001 1          DDOUBL
1579  REP 495  LAST 1135   00,2564  52 155 1          DXCH   MPAC

1580  REP   3  LAST 1134   00,2565  10 140 0  MAXTEST  CCS    MAXDVSW    0 IF MAJORS MIGHT BE =, -1 OTHERWISE.
1581                       00,2566   06552 0  BIASHI   DEC    .4192 B-1  SQRT CONSTANTS

1582  REP   1              00,2567  1 2642 1          TCF    MAXDV      CHECK TO SEE IF THEY ARE NOW EQUAL.
```

·L· INTERPRETER

P1583 THE FOLLOWING IS A GENERAL PURPOSE DOUBLE PRECISION DIVISION ROUTINE. IT DIVIDES MPAC BY BUF AND LEAVES
R1585 THE RESULT IN MPAC. THE FOLLOWING CONDITIONS MUST BE SATISFIED'

R1586 1. THE DIVISOR (BUF) MUST BE POSITIVE AND NOT LESS THAN .5.

R1587 2. THE DIVIDEND (MPAC) MUST BE POSITIVE WITH THE MAJOR PART OF MPAC STRICTLY LESS THAN THAT OF BUF
R1589 (A SPECIAL APPROXIMATION, MAXDV, IS USED WHEN THE MAJOR PARTS ARE EQUAL).

R1591 UNDERSTANDING THAT A/B = Q + S(R/B) WHERE S = 2(-14) AND Q AND R ARE QUOTIENT AND REMAINDER, RESPEC-
R1593 TIVELY, THE FOLLOWING APPROXIMATION IS OBTAINED BY MULTIPLYING ABOVE AND BELOW BY C - SD AND NEGLECTING TERMS OF
R1595 ORDER S-SQUARED (POSSIBLY INTRODUCING ERROR INTO THE LOW TWO BITS OF THE RESULT). SIGN AGREEMENT IS UNNECESSARY.

R1597 $\frac{A + SB}{C + SD} = Q + S\left(\frac{(R - QD)}{(C)}\right)$ WHERE Q AND R ARE QUOTIENT AND REMAINDER OF $\frac{A + SB}{C}$ RESPECTIVELY.
R1599
R1601

1603	REF	496	LAST	1138	000,25770	52	155	1	GENDDV	DXCH	MPAC	WE NEED A AND B ONLY FOR FIRST DV.
1604					000,25771	0	0006	1	+1	EXTEND		(SPECIAL UNIT PROLOGUE ENTERS HERE).
1605	REF	75	LAST	1135	000,25772	10	130	1		DV	BUF	A NOW CONTAINS Q AND L, R.
1606	REF	497	LAST	1137	000,25773	52	155	1		DXCH	MPAC	
1607	REF	498	LAST	1137	000,25774	4	0154	0		CS	MPAC	FORM DIVIDEND FOR MINOR PART OF RESULT.
1608					000,25775	0	0006	1		EXTEND		
1609	REF	76	LAST	1137	000,25776	7	0131	0		MP	BUF +1	
1610	REF	499	LAST	1137	000,25777	6	0155	0		AD	MPAC +1	OVERFLOW AT THIS POINT IS POSITIVE SINCE
1611					000,26000	54	000	0		OVSK		R IS POSITIVE IN EVERY CASE.
1612					000,26001	1	2606	1		TCF	+5	
1613					000,26002	0	0006	1		EXTEND		OVERFLOW CAN BE REMOVED BY SUBTRACTING C
1614	REF	77	LAST	1137	000,26003	60	130	0		SU	BUF	(BUF) ONCE SINCE R IS ALWAYS LESS THAN C
1615	REF	500	LAST	1137	000,26004	24	154	1		INCR	MPAC	IN THIS CASE. INCR COMPENSATES SUBTRACT.
1616	REF	1			000,26005	1	2610	0		TCF	+DOWN	(SINCE C(A) IS STILL POSITIVE).
1617					000,26006	0	0006	1	+5	EXTEND		C(A) CAN BE MADE LESS THAN C IN MAGNI-
1618	REF	1			000,26007	6	2620	1		BZMF	-UP	TUDE BY DIMINISHING IT BY C (SINCE C IS
A1619												NOT LESS THAN .5) UNLESS C(A) = 0.

```
1620
1621  REF  78  LAST 1137   00,2610  0 0006 1  +DOWN    EXTEND
1622                       00,2611  60 130 0           SU      BUP        IF POSITIVE, REDUCE ONLY IF NECESSARY
1623                       00,2612  0 0006 1           EXTEND             SINCE THE COMPENSATING INCR MIGHT CAUSE
1624                       00,2613  1 2616 0           BZF     +3         OVERFLOW.
1625  REF   1              00,2614  0 0006 1           EXTEND             DONT SUBTRACT UNLESS RESULT IS POSITIVE
                           00,2615  6 2624 0           BZMF    ENDMAXDV   OR ZERO.

1626  REF 501  LAST 1137   00,2616  24 154 1   +3      INCR    MPAC       KEEP SUBTRACT HERE AND COMPENSATE.
1627  REF   2  LAST 1132   00,2617  1 2625 0           TCF     FINALDV

1628
1629  REF   3  LAST 1138   00,2620  0 0006 1   -UP     EXTEND
                           00,2621  1 2630 1           BZF     FINALDV +3 IF ZERO, SET MINOR PART OF RESULT TO
                                                                          ZERO.
1630
                           00,2622  0 0006 1           EXTEND
1631  REF 502  LAST 1138   00,2623  26 154 0           DIM     MPAC       IF NEGATIVE, ADD C TO A, SUBTRACTING ONE
1632  REF  79  LAST 1138   00,2624  6 0130 0  ENDMAXDV  AD      BUP        TO COMPENSATE. DIM IS OK HERE SINCE THE
                                                                          MAJOR PART NEVER GOES NEGATIVE.
```

```
1633                        00,2625  22 007 0  FINALDV  ZL                 DO DV TO OBTAIN MINOR PART OF RESULT.
1634                        00,2626  0 0006 1           EXTEND
1635  REP  80  LAST 1138   00,2627  10 130 1           DV       BUF
1636  REP 503  LAST 1138   00,2630  54 155 1  +3       TS       MPAC +1

1637  REP   6  LAST 1133   00,2631  10 136 1           CCS      DVSIGN    LEAVE RESULT POSITIVE UNLESS C(DVSIGN)=
1638  REP 259  LAST 1129   00,2632  0 0002 0           TC       Q         -0.
1639  REP 260  LAST 1139   00,2633  0 0002 0           TC       Q
1640  REP 261  LAST 1139   00,2634  0 0002 0           TC       Q

1641                        00,2635  0 0006 1           EXTEND
1642  REP 504  LAST 1139   00,2636  4 0155 1           DCS      MPAC
1643  REP 505  LAST 1139   00,2637  52 155 1           DXCH     MPAC
1644  REP 228  LAST 1135   00,2640  3 4714 1           CAF      ZERO      SO WE ALWAYS RETURN WITH C(A) = 0.
1645  REP 262  LAST 1139   00,2641  0 0002 0           TC       Q
```

P1646 IF THE MAJOR PARTS OF THE DIVISOR AND DIVIDEND ARE EQUAL, BUT THE MINOR PARTS ARE SUCH THAT THE
R1648 DIVIDEND IS STRICTLY LESS THAN THE DIVISOR IN MAGNITUDE, THE FOLLOWING APPROXIMATION IS USED. THE ASSUMPTIONS
R1650 ARE THE SAME AS THE GENERAL ROUTINE WITH THE ADDITION THAT SIGN AGREEMENT IS NECESSARY (B, C, d D POSITIVE).

R1652 $$\frac{C + SB}{C + SD} = 37777 + S\left(\frac{B - D}{C}\right)$$

R1655 THE DIVISION MAY BE PERFORMED IMMEDIATELY SINCE B IS STRICTLY LESS THAN D AND C IS NOT LESS THAN .5.

```
1657  REP 506  LAST 1139   00,2642  4 0154 0  MAXDV   CS    MPAC      SEE IF MAXDV CASE STILL HOLDS AFTER
1658  REP  81  LAST 1139   00,2643  6 0130 0          AD    BUF       NORMALIZATION.
1659                       00,2644  0 0006 1          EXTEND
1660                       00,2645  1 2647 1          BZF   +2
1661  REP   2  LAST 1136   00,2646  1 2570 0          TCF   GENDDV    MPAC NOW LESS THAN BUF - DIVIDE AS USUAL

1662  REP  33  LAST 1134   00,2647  3 4672 0    +2    CAF   POSMAX    SET MAJOR PART OF RESULT.
1663  REP 507  LAST 1140   00,2650  54 154 0          TS    MPAC

1664  REP  82  LAST 1140   00,2651  4 0131 0          CS    BUF +1    FORM DIVIDEND OF MINOR PART OF RESULT.
1665  REP 508  LAST 1140   00,2652  6 0155 0          AD    MPAC +1
1666  REP   2  LAST 1138   00,2653  1 2624 1          TCF   ENDMAXDV  GO ADD C AND DO DIVIDE, ATTACHING SIGN
A1667                                                               BEFORE EXITING.
```

L INTERPRETER

P1668 VECTOR DIVIDED BY SCALAR, V/SC, IS EXECUTED HERE. THE VECTOR IS NOW IN MPAC WITH SCALAR IN BUF.

```
1670  REP 138  LAST 1132  00,2654  4 4712 0  V/SC2   CS    ONE        INITIALIZE DIVIDEND NORMALIZATION COUNT
1671  REP   4  LAST 1135  00,2655  54 137 0           TS    DVNORMCT   AND DIVISION SIGN REGISTER.
1672  REP  41  LAST 1118  00,2656  54 127 1           TS    VBUF +5

1673  REP   1              00,2657  0 3010 0           TC    VECAGREE   FORCE SIGN AGREEMENT IN VECTOR

1674  REP  83  LAST 1140  00,2660  52 131 0           DXCH  BUF
1675  REP   1              00,2661  0 7513 1           TC    ALSIGNAG   SIGN AGREE BUF
1676  REP  84  LAST 1141  00,2662  52 131 0           DXCH  BUF
1677  REP  85  LAST 1141  00,2663  10 130 1           CCS   BUF        FORCE DIVISOR POSITIVE WITH MAJOR PART
1678  REP   1              00,2664  1 2721 0           TCF   /BUF+      NON-ZERO (IF POSSIBLE).
1679                       00,2665  1 2667 0           TCF   +2
1680  REP   1              00,2666  1 2715 1           TCF   /BUF-

1681  REP  86  LAST 1141  00,2667  56 131 1           XCH   BUF +1     SHIFT VECTOR AND SCALAR LEFT 14.
1682  REP  87  LAST 1141  00,2670  56 130 0           XCH   BUF
1683  REP 509  LAST 1140  00,2671  56 155 0           XCH   MPAC +1
1684  REP 510  LAST 1141  00,2672  56 154 1           XCH   MPAC
1685                       00,2673  0 0006 1           EXTEND           CHECK FOR OVERFLOW IN EACH CASE.
1686                       00,2674  1 2676 0           BZF   +2
1687  REP   3  LAST 1134  00,2675  1 2405 0           TCF   DVOVF

1688  REP 511  LAST 1141  00,2676  56 160 0           XCH   MPAC +4
1689  REP 512  LAST 1141  00,2677  56 157 1           XCH   MPAC +3
1690                       00,2700  0 0006 1           EXTEND
1691                       00,2701  1 2703 0           BZF   +2
1692  REP   4  LAST 1141  00,2702  1 2405 0           TCF   DVOVF

1693  REP 513  LAST 1141  00,2703  56 162 1           XCH   MPAC +6
1694  REP 514  LAST 1141  00,2704  56 161 1           XCH   MPAC +5
1695                       00,2705  0 0006 1           EXTEND
1696                       00,2706  1 2710 1           BZF   +2
1697  REP   5  LAST 1141  00,2707  1 2405 0           TCF   DVOVF

1698  REP  88  LAST 1141  00,2710  10 130 1           CCS   BUF
1699  REP   2  LAST 1141  00,2711  1 2721 0           TCF   /BUF+
1700  REP   6  LAST 1141  00,2712  1 2405 0           TCF   DVOVF      ZERO DIVISOR - OVERFLOW.
1701  REP   2  LAST 1141  00,2713  1 2715 1           TCF   /BUF-
1702  REP   7  LAST 1141  00,2714  1 2405 0           TCF   DVOVF

1703                       00,2715  0 0006 1  /BUF-    EXTEND           ON NEGATIVE, COMPLEMENT BUF AND MAINTAIN
1704  REP  89  LAST 1141  00,2716  4 0131 0           DCS   BUF        DVSIGN IN VBUF +5.
1705  REP  90  LAST 1141  00,2717  52 131 0           DXCH  BUF
1706  REP  42  LAST 1141  00,2720  24 127 0           INCR  VBUF +5
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1707                                00,2721  0 0006 1  /BUF+    EXTEND
1708  REP  91  LAST 1141           00,2722  3 0131 1            DCA     BUF          LEAVE ABS(ORIG DIVISOR) IN BUF2
1709  REP  14  LAST 1134           00,2723  52 134 0            DXCH    BUF2         FOR OVERFLOW TESTING
1710  REP   1                      00,2724  1 2732 1            TCF     /NORM        NORMALIZE DIVISOR IN BUF.

1711                                00,2725  0 0006 1  /NORM2   EXTEND
1712  REP   5  LAST 1141           00,2726  24 137 1            AUG     DVNORMCT     IF LESS THAN .5, AUGMENT DVNORMCT AND
1713                                00,2727  0 0006 1            EXTEND               DOUBLE DIVISOR.
1714  REP  92  LAST 1142           00,2730  3 0131 1            DCA     BUF
1715  REP  93  LAST 1142           00,2731  20 131 0            DAS     BUF

1716  REP  94  LAST 1142           00,2732  3 0130 0  /NORM     CA      BUF          SEE IF DIVISOR NORMALIZED.
1717                                00,2733  6 0000 1            DOUBLE
1718                                00,2734  54 000 0            OVSK
1719  REP   1                      00,2735  1 2725 1            TCF     /NORM2       DOUBLE AND TRY AGAIN IF NOT.

1720  REP   1                      00,2736  0 2750 1            TC      V/SCDV       DO X COMPONENT DIVIDE.
1721  REP 515  LAST 1141           00,2737  52 160 1            DXCH    MPAC +3      SUPPLY ARGUMENTS IN USUAL SEQUENCE.
1722  REP 516  LAST 1142           00,2740  52 155 1            DXCH    MPAC
1723  REP 517  LAST 1142           00,2741  52 160 1            DXCH    MPAC +3

1724  REP   2  LAST 1142           00,2742  0 2750 1            TC      V/SCDV       Y COMPONENT.
1725  REP 518  LAST 1142           00,2743  52 162 0            DXCH    MPAC +5
1726  REP 519  LAST 1142           00,2744  52 155 1            DXCH    MPAC
1727  REP 520  LAST 1142           00,2745  52 162 0            DXCH    MPAC +5

1728  REP   3  LAST 1142           00,2746  0 2750 1            TC      V/SCDV       Z COMPONENT.
1729  REP   2  LAST 1125           00,2747  1 7367 0            TCF     VROTATEX     GO RE-ARRANGE COMPONENTS BEFORE EXIT.
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P1730 SUBROUTINE USED BY V/SC TO DIVIDE VECTOR COMPONENT IN MPAC,+1 BY THE SCALAR GIVEN IN BUF.

1732	REP 43	LAST 1141	00,2750	3 0127 0	V/SCDV	CA	VBUF +5	REFLECTS SIGN OF SCALAR.
1733	REP 7	LAST 1139	00,2751	54 138 1		TS	DVSIGN	
1734	REP 521	LAST 1142	00,2752	10 154 0		CCS	MPAC	FORCE MPAC POSITIVE, EXITING ON ZERO.
1735	REP 1		00,2753	1 2767 1		TCF	/MPAC+	
1736			00,2754	1 2756 0		TCF	+2	
1737	REP 1		00,2755	1 2763 0		TCF	/MPAC-	
1738	REP 522	LAST 1143	00,2756	10 155 1		CCS	MPAC +1	
1739	REP 2	LAST 1143	00,2757	1 2767 1		TCF	/MPAC+	
1740	REP 263	LAST 1139	00,2760	0 0002 0		TC	Q	
1741	REP 2	LAST 1143	00,2761	1 2763 0		TCF	/MPAC-	
1742	REP 264	LAST 1143	00,2762	0 0002 0		TC	Q	
1743			00,2763	0 0006 1	/MPAC-	EXTEND		USUAL COMPLEMENTING AND SETTING OF SIGN.
1744	REP 523	LAST 1143	00,2764	4 0155 1		DCS	MPAC	
1745	REP 524	LAST 1143	00,2765	52 155 1		DXCH	MPAC	
1746	REP 8	LAST 1143	00,2766	24 136 0		INCR	DVSIGN	
1747	REP 139	LAST 1141	00,2767	4 4712 0	/MPAC+	CS	ONE	INITIALIZE NEAR-ONE SWITCH.
1748	REP 4	LAST 1136	00,2770	54 140 0		TS	MAXDVSW	
1749	REP 525	LAST 1143	00,2771	4 0154 0		CS	MPAC	CHECK POSSIBLE OVERFLOW.
1750	REP 15	LAST 1142	00,2772	6 0133 0		AD	BUF2	UNNORMALIZED INPUT DIVISOR.
1751	REP 308	LAST 1135	00,2773	10 000 0		CCS	A	
1752	REP 1		00,2774	1 3004 1		TCF	DDVCALL	NOT NEAR-ONE
1753			00,2775	1 2777 0		TCF	+2	+0 IS JUST POSSIBLE
1754	REP 8	LAST 1141	00,2776	1 2405 0		TCF	DVOVF	NO HOPE
1755	REP 5	LAST 1143	00,2777	54 140 0		TS	MAXDVSW	SIGNAL POSSIBLE NEAR-ONE CASE
1756	REP 526	LAST 1143	00,3000	4 0155 1		CS	MPAC +1	SEE IF DIVISION CAN BE DONE
1757	REP 16	LAST 1143	00,3001	6 0134 1		AD	BUF2 +1	
1758			00,3002	0 0006 1		EXTEND		
1759	REP 9	LAST 1143	00,3003	6 2405 1		BZMF	DVOVF	
1760	REP 527	LAST 1143	00,3004	52 155 1	DDVCALL	DXCH	MPAC	CALL PRE-DIVIDE NORMALIZATION.
1761	REP 6	LAST 1142	00,3005	50 137 1		INDEX	DVNORMCT	
1762	REP 2	LAST 1135	00,3006	1 2565 1		TCF	MAXTEST	

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1763                        00,3007   32506 0  SLOPELO  DEC     .8324

1764  REF 265  LAST 1143    00,3010   56 002 0 VECAGREE XCH     Q          SAVE Q IN A
1765  REF 528  LAST 1143    00,3011   52 155 1          DXCH    MPAC
1766  REF   2  LAST 1141    00,3012   0 7513 1          TC      ALSIGNAG   SIGNAGREE MPAC
1767  REF 529  LAST 1144    00,3013   52 155 1          DXCH    MPAC
1768  REF 530  LAST 1144    00,3014   52 160 1          DXCH    MPAC +3
1769  REF   3  LAST 1144    00,3015   0 7513 1          TC      ALSIGNAG   SIGN AGREE MPAC +3
1770  REF 531  LAST 1144    00,3016   52 160 1          DXCH    MPAC +3
1771  REF 532  LAST 1144    00,3017   52 162 0          DXCH    MPAC +5
1772  REF   4  LAST 1144    00,3020   0 7513 1          TC      ALSIGNAG   SIGNAGREE MPAC +5
1773  REF 533  LAST 1144    00,3021   52 162 0          DXCH    MPAC +5
1774  REF 309  LAST 1143    00,3022   0 0000 1          TC      A
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L INTERPRETER

P1775 THE FOLLOWING ROUTINE EXECUTES THE UNIT INSTRUCTION, WHICH TAKES THE UNIT OF THE VECTOR IN MPAC.

1777	REP 2	LAST 1141	00,3023	0 3010 0	UNIT	TC	VECAGREE		FORCE SIGN AGREEMENT IN VECTOR
1776	REP 2	LAST 1114	00,3024	0 7501 1		TC	MPACVBUF		SAVE ARGUMENT IN VBUF
1779	REP 229	LAST 1139	00,3025	3 4714 1		CAF	ZERO		MUST SENSE OVERFLOW IN FOLLOWING DOT.
1780	REP 6	LAST 1132	00,3026	56 121 0		XCH	OVFIND		
1781	REP 3	LAST 68	00,3027	54 141 1		TS	TEM1		
1782	REP 1		00,3030	0 3317 1		TC	VSQSUB		DOT MPAC WITH ITSELF.
1783	REP 4	LAST 1145	00,3031	3 0141 0		CA	TEM1		
1784	REP 7	LAST 1145	00,3032	56 121 0		XCH	OVFIND		
1785			00,3033	0 0006 1		EXTEND			
1786			00,3034	1 3036 0		BZF	+2		
1787	REP 10	LAST 1143	00,3035	1 2405 0		TCF	DVOVF		
1788			00,3036	0 0006 1		EXTEND			
1789	REP 534	LAST 1144	00,3037	3 0155 0		DCA	MPAC		LEAVE THE SQUARE OF THE LENGTH OF THE
1790	REP 26	LAST 1099	00,3040	50 120 1		INDEX	FIXLOC		ARGUMENT IN LVSQUARE.
1791	REP 1		00,3041	52 043 1		DXCH	LVSQUARE		
1792	REP 1		00,3042	0 3343 0		TC	SQRTSUB		GO TAKE THE NORMALIZED SQUARE ROOT.
1793	REP 535	LAST 1145	00,3043	10 154 0		CCS	MPAC		CHECK FOR UNIT OVERFLOW.
1794			00,3044	1 3051 1		TCF	+5		MPAC IS NOT LESS THAN .5 UNLESS
1795	REP 189	LAST 1136	00,3045	54 001 1		TS	L		
1796	REP 27	LAST 1145	00,3046	50 120 1		INDEX	FIXLOC		
1797	REP 1		00,3047	52 045 1		DXCH	LV		
1798	REP 11	LAST 1145	00,3050	1 2405 0		TCF	DVOVF		INPUT TO SQRTSUB WAS 0.
1799	REP 1		00,3051	4 4333 1		CS	FOURTEEN		SEE IF THE INPUT WAS SO SMALL THE THE
1800	REP 46	LAST 1131	00,3052	6 0135 0		AD	MPTEMP		FIRST TWO REGISTERS OF THE SQUARE WERE 0
1801	REP 310	LAST 1144	00,3053	10 000 0		CCS	A		
1802			00,3054	4 0000 0		COM			IF SO, SAVE THE NEGATIVE OF THE SHIFT
1803	REP 1		00,3055	1 3133 1		TCF	SMALL		COUNT -15D.
1804	REP 1		00,3056	1 3065 0		TCF	LARGE		(THIS IS USUALLY THE CASE.)
1805	REP 4	LAST 1061	00,3057	4 4720 1		CS	THIRTEEN		IF THE SHIFT COUNT WAS EXACTLY 14, SET
1806	REP 47	LAST 1145	00,3060	54 135 1		TS	MPTEMP		THE PRE-DIVIDE NORM COUNT TO -13D.
1807	REP 536	LAST 1145	00,3061	3 0154 1		CA	MPAC		SHIFT THE LENGTH RIGHT 14 BEFORE STORING
1808	REP 190	LAST 1145	00,3062	54 001 1	SMALL2	TS	L		(SMALL EXITS TO THIS POINT).
1809	REP 230	LAST 1145	00,3063	3 4714 1		CAF	ZERO		
1810	REP 1		00,3064	1 3112 1		TCF	LARGE2		GO TO STORE LENGTH AND PROCEED.
1811	REP 48	LAST 1145	00,3065	10 135 1	LARGE	CCS	MPTEMP		MOST ALL CASES COME HERE.
1812	REP 1		00,3066	1 3074 0		TCF	LARGE3		SEE IF NO NORMALIZATION WAS REQUIRED BY
1813	REP 1		00,3067	4 2024 1		CS	SRDDV		SQRT, AND IF SO, SET UP FOR A SHIFT
1814	REP 49	LAST 1145	00,3070	54 135 1		TS	MPTEMP		RIGHT 1 BEFORE DIVIDING TO PRODUCE
1815			00,3071	0 0006 1		EXTEND			THE DESIRED HALF UNIT VECTOR.
1816	REP 537	LAST 1145	00,3072	3 0155 0		DCA	MPAC		

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1818                          00,3074  4 0000 0  LARGE3   COM
1819   REP  50  LAST 1145     00,3075  54 135 1           TS      MPTEMP      LEAVE NEGATIVE OF SHIFT COUNT-1 FOR
                                                                             PREDIVIDE LEFT SHIFT.
1820                          00,3076  4 0000 0           COM
1821   REP 311  LAST 1145     00,3077  50 000 1           INDEX   A           PICK UP REQUIRED SHIFTING BIT TO UNNORM-
1822   REP  66  LAST 1130     00,3100  3 4675 1           CAP     BIT14       ALIZE THE SQRT RESULT.
1823   REP  95  LAST 1142     00,3101  54 130 1           TS      BUF
1824                          00,3102  0 0006 1           EXTEND
1825   REP 538  LAST 1145     00,3103  7 0155 1           MP      MPAC +1
1826   REP  96  LAST 1147     00,3104  56 130 0           XCH     BUF
1827                          00,3105  0 0006 1           EXTEND
1828   REP 539  LAST 1147     00,3106  7 0154 0           MP      MPAC        (UNNORMALIZE THE SQRT FOR LV).
1829   REP 191  LAST 1145     00,3107  56 001 0           XCH     L
1830   REP  97  LAST 1147     00,3110  6 0130 0           AD      BUF
1831   REP 192  LAST 1147     00,3111  56 001 0           XCH     L

1832   REP  28  LAST 1145     00,3112  50 120 1  LARGE2   INDEX   PIXLOC
1833   REP   2  LAST 1145     00,3113  52 045 1           DXCH    LV          LENGTH NOW STORED IN WORK AREA.

1834   REP 140  LAST 1143     00,3114  4 4712 0           CS      ONE
1835   REP   6  LAST 1143     00,3115  54 140 0           TS      MAXDVSW     NO MAXDV CASES IN UNIT.

1836   REP  44  LAST 1143     00,3116  52 123 0           DXCH    VBUF        PREPARE X COMPONENT FOR DIVIDE, SETTING
1837   REP 540  LAST 1147     00,3117  52 155 1           DXCH    MPAC        LENGTH OF VECTOR AS DIVISOR IN BUF.
1838   REP  98  LAST 1147     00,3120  52 131 0           DXCH    BUF
1839   REP   1                00,3121  0 3151 1           TC      UNITDV

1840   REP  45  LAST 1147     00,3122  52 125 0           DXCH    VBUF +2     DO Y AND Z IN USUAL FASHION SO WE CAN
1841   REP 541  LAST 1147     00,3123  52 155 1           DXCH    MPAC        EXIT THROUGH VROTATEX.
1842   REP 542  LAST 1147     00,3124  52 160 1           DXCH    MPAC +3
1843   REP   2  LAST 1147     00,3125  0 3151 1           TC      UNITDV

1844   REP  46  LAST 1147     00,3126  52 127 1           DXCH    VBUF +4
1845   REP 543  LAST 1147     00,3127  52 155 1           DXCH    MPAC
1846   REP 544  LAST 1147     00,3130  52 162 0           DXCH    MPAC +5
1847   REP   3  LAST 1147     00,3131  0 3151 1           TC      UNITDV
1848   REP   3  LAST 1142     00,3132  1 7367 0           TCF     VROTATEX    AND EXIT.
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P1849 IF THE LENGTH OF THE ARGUMENT VECTOR WAS LESS THAN 2(-28), EACH COMPONENT MUST BE SHIFTED LEFT AT LEAST
R1851 14 PLACES BEFORE THE DIVIDE. NOTE THAT IN THIS CASE, THE MAJOR PART OF EACH COMPONENT IS ZERO.

1853	REP	51	LAST	1147	00,3133	54 135 1	SMALL	TS	MPTEMP	NEGATIVE OF PRE-DIVIDE SHIFT COUNT.
1854	REP	231	LAST	1145	00,3134	3 4714 1		CAF	ZERO	SHIFT EACH COMPONENT LEFT 14.
1855	REP	47	LAST	1147	00,3135	56 123 1		XCH	VBUF +1	
1856	REP	48	LAST	1148	00,3136	56 122 0		XCH	VBUF	
1857	REP	49	LAST	1148	00,3137	56 125 1		XCH	VBUF +3	
1858	REP	50	LAST	1148	00,3140	56 124 0		XCH	VBUF +2	
1859	REP	51	LAST	1148	00,3141	56 127 0		XCH	VBUF +5	
1860	REP	52	LAST	1148	00,3142	56 126 1		XCH	VBUF +4	
1861	REP	52	LAST	1148	00,3143	4 0135 1		CS	MPTEMP	
1862	REP	312	LAST	1147	00,3144	50 000 1		INDEX	A	
1863	REP	67	LAST	1147	00,3145	3 4675 1		CAF	BIT14	
1864					00,3146	0 0006 1		EXTEND		
1865	REP	545	LAST	1147	00,3147	7 0154 0		MP	MPAC	
1866	REP	1			00,3150	1 3062 1		TCF	SMALL2	
1867	REP	4	LAST	724	4720		THIRTEEN	=	OCT15	
1868	REP	2	LAST	736	4333		FOURTEEN	=	OCT16	
1869	REP	14	LAST	369	4333		OCT16	=	R1D1	

P1870 THE FOLLOWING ROUTINE SETS UP THE CALL TO THE DIVIDE ROUTINES.

```
1871  REF 546  LAST 1148   00,3151  10 154 0  UNITDV  CCS    MPAC      FORCE MPAC POSITIVE IF POSSIBLE, SETTING
1872  REF   1              00,3152  1 3170 0           TCF    UMPAC+    DVSIGN ACCORDING TO THE SIGN OF MPAC
1873                       00,3153  1 3155 1           TCF    +2        SINCE THE DIVISOR IS ALWAYS POSITIVE
1874  REF   1              00,3154  1 3162 0           TCF    UMPAC-    HERE.

1875  REF 547  LAST 1149   00,3155  10 155 1           CCS    MPAC +1
1876  REF   2  LAST 1149   00,3156  1 3170 0           TCF    UMPAC+
1877  REF 266  LAST 1144   00,3157  0 0002 0           TC     Q         EXIT IMMEDIATELY ON ZERO.
1878  REF   2  LAST 1149   00,3160  1 3162 0           TCF    UMPAC-
1879  REF 267  LAST 1149   00,3161  0 0002 0           TC     Q

1880  REF 232  LAST 1148   00,3162  4 4714 0  UMPAC-   CS     ZERO      IF NEGATIVE, SET -0 IN DVSIGN FOR FINAL
1881  REF   9  LAST 1143   00,3163  54 136 1           TS     DVSIGN    COMPLEMENT.
1882                       00,3164  0 0008 1           EXTEND
1883  REF 548  LAST 1149   00,3165  4 0155 1           DCS    MPAC      PICK UP ABSOLUTE VALUE OF ARG AND JUMP.
1884  REF  53  LAST 1148   00,3166  50 135 0           INDEX  MPTEMP
1885  REF   3  LAST 1143   00,3167  1 2564 0           TCF    MAXTEST -1

1886  REF  10  LAST 1149   00,3170  54 136 1  UMPAC+   TS     DVSIGN    SET DVSIGN FOR POSITIVE QUOTIENT.
1887  REF 549  LAST 1149   00,3171  52 155 1           DXCH   MPAC
1888  REF  54  LAST 1149   00,3172  50 135 0           INDEX  MPTEMP
1889  REF   4  LAST 1149   00,3173  1 2564 0           TCF    MAXTEST -1
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P1890 MISCELLANEOUS UNARY OPERATIONS.

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1891  REP   1                00,3174  0 3300 1  DSQ        TC      DSQSUB     SQUARE THE DP CONTENTS OF MPAC.
1892  REP  41  LAST 1135     00,3175  1 6030 0              TCF     DANZIG

1893  REP  22  LAST 1131     00,3176  10 163 1  ABVALABS   CCS     MODE       ABVAL OR ABS INSTRUCTION.
1894  REP   1                00,3177  1 3226 0              TCF     ABS        DO ABS ON SCALAR.
1895  REP   2  LAST 1150     00,3200  1 3226 0              TCF     ABS

1896  REP   2  LAST 1145     00,3201  0 3317 1  ABVAL      TC      VSQSUB     DOT MPAC WITH ITSELF.
1897  REP  23  LAST 1150     00,3202  22 163 0              LXCH    MODE       MODE IS NOW DP (L ZERO AFTER DAS).

1898                          00,3203  0 0006 1              EXTEND             STORE SQUARE OF LENGTH IN WORK AREA.
1899  REP 550  LAST 1149     00,3204  3 0155 0              DCA     MPAC
1900  REP  29  LAST 1147     00,3205  50 120 1              INDEX   FIXLOC
1901  REP   2  LAST 1145     00,3206  52 043 1              DXCH    LVSQUARE
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P1902   PROGRAM DESCRIPTION- SUBROUTINE SQRT
R1903   FUNCTIONAL DESCRIPTION-DOUBLE PRECISION SQUARE ROOT ROUTINE
R1904       THIS PROGRAM TAKES THE SQUARE ROOT OF THE 27 OR 28 MOST SIGNIFICANT BITS IN THE TRIPLE PRECISION SET OF
R1906       NUMBERS-MPAC,MPAC+1,AND MPAC+2.  THE ROOT IS RETURNED DOUBLE          PRECISION IN MPAC AND MPAC+1.
R1908   WARNING- THIS SUBROUTINE USES A TRIPLE PRECISION INPUT. THE PROGRAMMER  MUST ASSURE THE CONTENTS OF MPAC+2
R1910       ESPECIALLY IF THE CONTENTS OF MPAC IS SMALL OR ZERO.  FOR DETAILS SEE STG MEMO NO.949.
R1912   CALLING SEQUENCE- IN INTERPRETIVE MODE I.E., FOLLOWING TC  INTPRET,SQRT   NO ADDRESS IS ALLOWED
R1914   INPUT SCALING  THE BINARY POINT IS ASSUMED TO THE RIGHT OF BIT 15. THE  ANSWER IS RETURNED WITH THE SAME SCALING
R1916   SUBROUTINES- GENSCR,MPACSHR, SQRTSUB,ABORT
R1917   ABORT EXIT MODE- ABORTS ON NEGATIVE INPUT -1.2X10E-4 (77775  OCTAL)      OR LESS.
R1919       DISPLAYS ERROR CODE 1302
R1920                   TC   ABORT
R1921                   OCT  1302
R1922   DEBRIS -  LOCATIONS BUF,MPTEMP,ADDRWD ARE USED
 1923   REF   2  LAST 1145   00,3207  0 3343 0  SQRT     TC      SQRTSUB      TAKE THE SQUARE ROOT OF MPAC.
 1924   REF  55  LAST 1149   00,3210  10 135 1           CCS     MPTEMP       RETURNED NORMALIZED SQUARE ROOT. SEE IF
 1925                        00,3211  1 3213 0           TCF     +2           ANY UN-NORMALIZATION REQUIRED AND EXIT
 1926   REF  42  LAST 1150   00,3212  1 6030 0           TCF     DANZIG       IF NOT.

 1927   REF   3  LAST 1130   00,3213  6 3730 0           AD      NEG12        A RIGHT SHIFT OF MORE THAN 13 COULD BE
 1928                        00,3214  0 0006 1           EXTEND               REQUIRED IF INPUT WAS ZERO IN MPAC,+1.
 1929   REF   1              00,3215  6 3221 0           BZMF    SQRTSHFT     GOES HERE IN MOST CASES.
 1930                        00,3216  22 007 0           ZL                   IF A LONG SHIFT IS REQUIRED, GO TO
 1931   REF  77  LAST 1131   00,3217  22 116 1           LXCH    ADDRWD       GENERAL RIGHT SHIFT ROUTINES.
 1932   REF   4  LAST 1130   00,3220  1 2303 1           TCF     GENSCR +4    ADDRWD WAS ZERO TO PREVENT ROUND.

 1933   REF  56  LAST 1151   00,3221  50 135 0  SQRTSHFT INDEX   MPTEMP       SELECT SHIFTING BIT AND EXIT THROUGH
 1934   REF  45  LAST 1101   00,3222  3 4674 0           CAF     BIT15        SHIFT ROUTINES.
 1935   REF  57  LAST 1151   00,3223  54 135 1           TS      MPTEMP
 1936   REF 233  LAST 1149   00,3224  3 4714 1           CAF     ZERO         TO ZERO MPAC +2 IN THE PROCESS.
 1937   REF   2  LAST 1130   00,3225  1 2036 1           TCF     MPACSHR +3

 1938   REF   3  LAST 1127   00,3226  0 6672 1  ABS      TC      BRANCH       TEST SIGN OF MPAC AND COMPLEMENT IF
 1939   REF  43  LAST 1151   00,3227  1 6030 0           TCF     DANZIG
 1940   REF  44  LAST 1151   00,3230  1 6030 0           TCF     DANZIG
 1941   REF   4  LAST 1121   00,3231  1 7637 0           TCF     COMP
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1942  REF  16  LAST 1116  00,3232  4 4710 1  VDEF   CS    FOUR      VECTOR DEFINE - ESSENTIALLY TREATS
1943  REF  13  LAST 1119  00,3233  26 166 1         ADS   PUSHLOC   SCALAR IN MPAC AS X COMPONENT, PUSHES UP
1944                      00,3234  0 0006 1         EXTEND          FOR Y AND THEN AGAIN FOR Z.
1945  REF 313  LAST 1148  00,3235  5 0000 1         INDEX A
1946                      00,3236  3 0003 1         DCA   2
1947  REF 551  LAST 1150  00,3237  52 160 1         DXCH  MPAC +3
1948                      00,3240  0 0006 1         EXTEND
1949  REF  14  LAST 1152  00,3241  5 0166 0         INDEX PUSHLOC
1950                      00,3242  3 0001 0         DCA   0
1951  REF 552  LAST 1152  00,3243  52 162 0         DXCH  MPAC +5
1952  REF   2  LAST 1116  00,3244  1 6470 0         TCF   VMODE     MODE IS NON VECTOR.

1953  REF   3  LAST 1150  00,3245  0 3317 1  VSQ    TC    VSQSUB    DOT MPAC WITH ITSELF.
1954  REF   1             00,3246  1 7301 0         TCF   DMODE     MODE IS NOW DP.

1955                      00,3247  0 0006 1  PUSH   EXTEND          PUSH DOWN MPAC LEAVING IT LOADED.
1956  REF 553  LAST 1152  00,3250  3 0155 0         DCA   MPAC
1957  REF  15  LAST 1152  00,3251  50 166 0         INDEX PUSHLOC   PUSH DOWN FIRST TWO REGISTERS IN EACH
1958                      00,3252  52 001 1         DXCH  0

1959  REF  24  LAST 1150  00,3253  50 163 0         INDEX MODE      INCREMENT PUSHDOWN POINTER.
1960  REF   5  LAST 1098  00,3254  3 6213 1         CAF   NO.WDS
1961  REF  16  LAST 1152  00,3255  26 166 1         ADS   PUSHLOC

1962  REF  25  LAST 1152  00,3256  10 163 1         CCS   MODE
1963  REF   1             00,3257  1 3272 1         TCF   TPUSH     PUSH DOWN MPAC +2.
1964  REF  45  LAST 1151  00,3260  1 6030 0         TCF   DANZIG    DONE FOR DP.

1965                      00,3261  0 0006 1         EXTEND          ON VECTOR, PUSH DOWN Y AND Z COMPONENTS.
1966  REF 554  LAST 1152  00,3262  3 0160 0         DCA   MPAC +3
1967  REF  17  LAST 1152  00,3263  50 166 0         INDEX PUSHLOC
1968                      00,3264  51777 0          DXCH  0 -4
1969                      00,3265  0 0006 1         EXTEND
1970  REF 555  LAST 1152  00,3266  3 0162 1         DCA   MPAC +5
1971  REF  18  LAST 1152  00,3267  50 166 0         INDEX PUSHLOC
1972                      00,3270  51777 1          DXCH  0 -2
1973  REF  46  LAST 1152  00,3271  1 6030 0         TCF   DANZIG

1974  REF 556  LAST 1152  00,3272  3 0156 0  TPUSH  CA    MPAC +2
1975  REF   2  LAST 1095  00,3273  1 6523 1         TCF   ENDTPUSH +2

1976  REF  30  LAST 1150  00,3274  50 120 1  RVQ    INDEX FIXLOC    RVQ - RETURN IVA OPRET.
1977  REF  18  LAST 1098  00,3275  3 0052 0         CA    OPRET
1978  REF  21  LAST 1110  00,3276  54 117 1         TS    POLISH
1979  REF   5  LAST 1099  00,3277  1 6621 0         TCF   GOTO +4   (ASSUME OPRET POINTS TO FIXED ONLY.)
```

P1980 THE FOLLOWING SUBROUTINES ARE USED IN SQUARING MPAC, IN BOTH THE SCALAR AND VECTOR SENSE. THEY ARE
R1982 SPECIAL CASES OF DMPSUB AND DOTSUB, PUT IN TO SAVE SOME TIME.

1983	REF 557	LAST 1152	00,3300	3 0155 0	DSQSUB	CA	MPAC +1	SQUARES THE SCALAR CONTENTS OF MPAC.
1984			00,3301	0 0006 1		EXTEND		
1985			00,3302	7 0000 0		SQUARE		
1986	REF 558	LAST 1153	00,3303	54 156 1		TS	MPAC +2	
1987	REF 234	LAST 1151	00,3304	3 4714 1		CAF	ZERO	FORM 2(CROSS TERM).
1988	REF 559	LAST 1153	00,3305	56 155 0		XCH	MPAC +1	
1989			00,3306	0 0006 1		EXTEND		
1990	REF 560	LAST 1153	00,3307	7 0154 0		MP	MPAC	
1991			00,3310	20 001 1		DDOUBL		AND MAYBE OVERFLOW.
1992	REF 561	LAST 1153	00,3311	20 156 1		DAS	MPAC +1	AND SET A TO NET OVERFLOW.
1993	REF 562	LAST 1153	00,3312	56 154 1		XCH	MPAC	
1994			00,3313	0 0006 1		EXTEND		
1995			00,3314	7 0000 0		SQUARE		
1996	REF 563	LAST 1153	00,3315	20 155 1		DAS	MPAC	
1997	REF 268	LAST 1149	00,3316	0 0002 0		TC	Q	
1998			00,3317	0 0006 1	VSQSUB	EXTEND		DOTS THE VECTOR IN MPAC WITH ITSELF.
1999	REF 8	LAST 1108	00,3320	22 137 1		QXCH	DOTRET	
2000	REF 2	LAST 1150	00,3321	0 3300 1		TC	DSQSUB	SQUARE THE X COMPONENT.
2001	REF 564	LAST 1153	00,3322	52 160 1		DXCH	MPAC +3	
2002	REF 565	LAST 1153	00,3323	52 155 1		DXCH	MPAC	
2003	REF 99	LAST 1147	00,3324	52 131 0		DXCH	BUF	SO WE CAN END IN DOTSUB.
2004	REF 566	LAST 1153	00,3325	3 0156 0		CA	MPAC +2	
2005	REF 100	LAST 1153	00,3326	54 132 0		TS	BUF +2	
2006	REF 3	LAST 1153	00,3327	0 3300 1		TC	DSQSUB	SQUARE Y COMPONENT.
2007	REF 567	LAST 1153	00,3330	52 156 1		DXCH	MPAC +1	
2008	REF 101	LAST 1153	00,3331	20 132 0		DAS	BUF +1	
2009	REF 568	LAST 1153	00,3332	6 0154 1		AD	MPAC	
2010	REF 102	LAST 1153	00,3333	6 0130 0		AD	BUF	
2011	REF 103	LAST 1153	00,3334	54 130 1		TS	BUF	
2012			00,3335	1 3337 1		TCF	+2	
2013	REF 8	LAST 1145	00,3336	54 121 1		TS	OVFIND	IF OVERFLOW.
2014	REF 569	LAST 1153	00,3337	52 162 0		DXCH	MPAC +5	
2015	REF 570	LAST 1153	00,3340	52 155 1		DXCH	MPAC	
2016	REF 4	LAST 1153	00,3341	0 3300 1		TC	DSQSUB	SQUARE Z COMPONENT.
2017	REF 1		00,3342	1 7154 1		TCF	ENDDOT	END AS IN DOTSUB.

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P2018           DOUBLE PRECISION SQUARE ROOT ROUTINE. TAKE THE SQUARE ROOT OF THE TRIPLE PRECISION (MPAC +2 USED ONLY
R2020   IN NORMALIZATION) CONTENTS OF MPAC AND LEAVE THE NORMALIZED RESULT IN MPAC (C(MPAC) GREATER THAN OR EQUAL TO
R2022   .5). THE RIGHT SHIFT COUNT (TO UNNORMALIZE) IS LEFT IN MPTEMP.
 2023   REP 235  LAST 1153   00,3343  3 4714 1  SQRTSUB  CAF   ZERO       START BY ZEROING RIGHT SHIFT COUNT.
 2024   REP  58  LAST 1151   00,3344  54 135 1            TS    MPTEMP

 2025   REP 571  LAST 1153   00,3345  10 154 0            CCS   MPAC       CHECK FOR POSITIVE ARGUMENT, SHIFTING
 2026   REP   1               00,3346  1 3404 0            TCF   SMPAC+     FIRST SIGNIFICANT MPAC REGISTER INTO
 2027                         00,3347  1 3351 1            TCF   +2         MPAC ITSELF.
 2028   REP   1               00,3350  1 3373 1            TCF   SQRTNEG    SEE IF MAG OF ARGUMENT LESS THAN 10(-4).

 2029   REP 572  LAST 1154   00,3351  56 156 0            XCH   MPAC +2    MPAC IS ZERO - SHIFT LEFT 14.
 2030   REP 573  LAST 1154   00,3352  56 155 0            XCH   MPAC +1
 2031   REP 574  LAST 1154   00,3353  54 154 0            TS    MPAC
 2032   REP  15  LAST  905   00,3354  3 4716 0            CAF   SEVEN      AUGMENT RIGHT SHIFT COUNTER.
 2033   REP  59  LAST 1154   00,3355  54 135 1            TS    MPTEMP

 2034   REP 575  LAST 1154   00,3356  10 154 0            CCS   MPAC       SEE IF MPAC NOW PNZ.
 2035   REP   2  LAST 1154   00,3357  1 3404 0            TCF   SMPAC+
 2036                         00,3360  1 3362 1            TCF   +2
 2037   REP   1               00,3361  1 3376 1            TCF   ZEROANS    NEGATIVE BUT LESS THAN 10(-4) IN MAG.

 2038   REP 576  LAST 1154   00,3362  56 155 0            XCH   MPAC +1    ZERO - SHIFT LEFT 14 AGAIN.
 2039   REP 577  LAST 1154   00,3363  54 154 0            TS    MPAC
 2040   REP  16  LAST 1154   00,3364  3 4716 0            CAF   SEVEN      AUGMENT RIGHT SHIFT COUNTER.
 2041   REP  60  LAST 1154   00,3365  26 135 1            ADS   MPTEMP

 2042   REP 578  LAST 1154   00,3366  10 154 0            CCS   MPAC
 2043   REP   3  LAST 1154   00,3367  1 3404 0            TCF   SMPAC+
 2044   REP 269  LAST 1153   00,3370  0 0002 0            TC    Q          SQRT(0) = 0.
 2045   REP   2  LAST 1154   00,3371  1 3376 1            TCF   ZEROANS
 2046   REP   1               00,3372  1 3452 0            TCF   PIXROOT    DO NOT LEAVE SQRTSUB WITH -0 IN MPAC.
 2047   REP 314  LAST 1152   00,3373  10 000 0  SQRTNEG   CCS   A          ARGUMENT IS NEGATIVE, BUT SEE IF SIGN-
 2048   REP   1               00,3374  1 3402 0            TCF   SQRTABRT   CORRECTED ARGUMENT IS LESS THAN 10(-4)

 2049   REP 579  LAST 1154   00,3375  10 155 1            CCS   MPAC +1    IN MAGNITUDE. IF SO, CALL ANSWER ZERO.
 2050   REP 236  LAST 1154   00,3376  3 4714 1  ZEROANS   CAF   ZERO       FORCE ANSWER TO ZERO HERE.
 2051   REP   2  LAST 1154   00,3377  1 3452 0            TCF   PIXROOT
 2052   REP   2  LAST 1154   00,3400  1 3402 0            TCF   SQRTABRT
 2053   REP   3  LAST 1154   00,3401  1 3452 0            TCF   PIXROOT

 2054   REP   3  LAST  367   00,3402  0 5622 1  SQRTABRT  TC    POODOO
 2055                         00,3403   01302 1           OCT   1302
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2056  REF   1                00,3404  6 2444 1  SMPAC+  AD      -1/2+2      SEE IF ARGUMENT GREATER THAN OR EQUAL TO
2057                         00,3405  0 0006 1          EXTEND                  .5.
2058  REF   1                00,3406  6 3455 0          BZMF    SRTEST      IF SO, SEE IF LESS THAN .25.

2059  REF 580  LAST 1154     00,3407  52 155 1          DXCH    MPAC        WE WILL TAKE THE SQUARE ROOT OF MPAC/2.
2060  REF  25  LAST 1136     00,3410  22 021 1          LXCH    SR          SHIFT RIGHT 1 AND GO TO THE SQRT ROUTINE
2061                         00,3411  0 0006 1          EXTEND
2062  REF  16  LAST 1136     00,3412  7 4675 0          MP      HALF
2063  REF 581  LAST 1155     00,3413  52 155 1          DXCH    MPAC
2064  REF  26  LAST 1155     00,3414  56 021 1          XCH     SR
2065  REF 582  LAST 1155     00,3415  26 155 1          ADS     MPAC +1     GUARANTEED NO OVERFLOW.

2066  REF   1                00,3416  3 2314 0  ARGHI   CAF     SLOPEHI     ARGUMENT BETWEEN .25 AND .5. GET A
2067                         00,3417  0 0006 1          EXTEND                  LINEAR APPROXIMATION FOR THIS RANGE.
2068  REF 583  LAST 1155     00,3420  7 0154 0          MP      MPAC
2069  REF   1                00,3421  6 2566 0          AD      BIASHI      X0/2 = (MPAC/2)(SLOPEHI) + BIASHI/2.

2070  REF 104  LAST 1153     00,3422  54 130 1  +4      TS      BUF         X0/2 (ARGLO ENTERS HERE).
2071  REF 584  LAST 1155     00,3423  3 0154 1          CA      MPAC        SINGLE-PRECISION THROUGHOUT.
2072                         00,3424  22 007 0          ZL
2073                         00,3425  0 0006 1          EXTEND
2074  REF 105  LAST 1155     00,3426  10 130 1          DV      BUF         (MPAC/2)/(X0/2)
2075                         00,3427  0 0006 1          EXTEND
2076  REF  17  LAST 1155     00,3430  7 4675 0          MP      HALF
2077  REF 106  LAST 1155     00,3431  26 130 1          ADS     BUF         X1 = X0/2 + .5(MPAC/2)/(X0/2).

2078                         00,3432  0 0006 1          EXTEND
2079  REF  18  LAST 1155     00,3433  7 4675 0          MP      HALF        FORM UP X1/2.
2080  REF 585  LAST 1155     00,3434  52 155 1          DXCH    MPAC        SAVE AND BRING OUT ARGUMENT.
2081                         00,3435  0 0006 1          EXTEND              TAKE DP QUOTIENT WITH X1.
2082  REF 107  LAST 1155     00,3436  10 130 1          DV      BUF
2083  REF 108  LAST 1155     00,3437  54 131 0          TS      BUF +1      SAVE MAJOR PART OF QUOTIENT.
2084  REF 237  LAST 1154     00,3440  3 4714 1          CAF     ZERO        FORM MINOR PART OF QUOTIENT USING
2085  REF 193  LAST 1147     00,3441  56 001 0          XCH     L           (REMAINDER,0).
2086                         00,3442  0 0006 1          EXTEND
2087  REF 109  LAST 1155     00,3443  10 130 1          DV      BUF
2088  REF 194  LAST 1155     00,3444  54 001 1          TS      L           IN PREPARATION FOR DAS.
2089  REF 110  LAST 1155     00,3445  3 0131 1          CA      BUF +1
2090  REF 586  LAST 1155     00,3446  20 155 1          DAS     MPAC        X2 = X1/2 + (MPAC/2)X1

2091                         00,3447  0 0006 1          EXTEND              OVERFLOWS IF ARG. NEAR POSMAX.
2092  REF   1                00,3450  1 3454 0          BZF     TCQBNK00
2093  REF  34  LAST 1140     00,3451  3 4672 0          CAF     POSMAX
2094  REF 587  LAST 1155     00,3452  54 154 0  PIXROOT TS      MPAC
2095  REF 588  LAST 1155     00,3453  54 155 1          TS      MPAC +1
2096  REF 270  LAST 1154     00,3454  0 0002 0  TCQBNK00 TC      Q           RETURN TO CALLER TO UNNORMALIZE, ETC.
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L INTERPRETER

USER'S PAGE NO. 80 E3 S3

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2097   REP   6  LAST  992   00,3455  6 4676 1  SRTEST   AD       QUARTER     ARGUMENT WAS LESS THAN .5, SEE IF LESS
2098                         00,3456  0 0006 1           EXTEND               THAN .25.
2099   REP   1               00,3457  6 3501 0           BZMP     SQRTNORM    IF SO, BEGIN NORMALIZATION.

2100   REP 589  LAST 1155    00,3460  52 155 1           DXCH     MPAC        IF BETWEEN .5 AND .25, SHIFT RIGHT 1 AND
2101   REP  27  LAST 1155    00,3461  22 021 1           LXCH     SR          START AT ARGLO.
2102                         00,3462  0 0006 1           EXTEND
2103   REP  19  LAST 1155    00,3463  7 4675 0           MP       HALF
2104   REP 590  LAST 1156    00,3464  52 155 1           DXCH     MPAC
2105   REP  28  LAST 1156    00,3465  56 021 1           XCH      SR
2106   REP 591  LAST 1156    00,3466  26 155 1           ADS      MPAC +1     NO OVERFLOW.

2107   REP   1               00,3467  3 3007 0  ARGLO    CAF      SLOPELO     (NORMALIZED) ARGUMENT BETWEEN .125 AND
2108                         00,3470  0 0006 1           EXTEND               .25
2109   REP 592  LAST 1156    00,3471  7 0154 0           MP       MPAC
2110   REP   1               00,3472  6 2270 0           AD       BIASLO
2111   REP   1               00,3473  1 3422 1           TCF      ARGHI +4    BEGIN SQUARE ROOT.

2112                         00,3474  0 0006 1  SQRTNM2  EXTEND
2113   REP 593  LAST 1156    00,3475  3 0156 0           DCA      MPAC +1     SHIFT LEFT 2 AND INCREMENT RIGHT SHIFT
2114   REP 594  LAST 1156    00,3476  20 156 1           DAS      MPAC +1     COUNT (FOR TERMINAL UNNORMALIZATION).
2115   REP 595  LAST 1156    00,3477  6 0154 1           AD       MPAC
2116   REP 596  LAST 1156    00,3500  26 154 0           ADS      MPAC        (NO OVERFLOW).

2117   REP  61  LAST 1154    00,3501  24 135 0  SQRTNORM INCR     MPTEMP      FIRST TIME THROUGH, JUST SHIFT LEFT 1
2118                         00,3502  0 0006 1           EXTEND               (PUTS IN EFFECTIVE RIGHT SHIFT SINCE
2119   REP 597  LAST 1156    00,3503  3 0156 0           DCA      MPAC +1     WE WANT MPAC/2).
2120   REP 598  LAST 1156    00,3504  20 156 1           DAS      MPAC +1
2121   REP 599  LAST 1156    00,3505  6 0154 1           AD       MPAC
2122   REP 600  LAST 1156    00,3506  26 154 0           ADS      MPAC        (AGAIN NO OVERFLOW).
2123                         00,3507  6 0000 1           DOUBLE
2124   REP  19  LAST  373    00,3510  54 022 0           TS       CYL

2125   REP  20  LAST 1156    00,3511  10 022 0  NORMTEST CCS      CYL         SEE IF ARGUMENT NOW NORMALIZED AT
2126   REP  21  LAST 1156    00,3512  10 022 0           CCS      CYL         GREATER THAN .125.
2127   REP   1               00,3513  1 3474 1           TCF      SQRTNM2     NO - SHIFT LEFT 2 MORE AND TRY AGAIN.
2128   REP   2  LAST 1156    00,3514  1 3416 0           TCF      ARGHI       YES - NOW BETWEEN .5 AND .25.
2129   REP   1               00,3515  1 3467 0           TCF      ARGLO       ARGUMENT NOW BETWEEN .25 AND .125.
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P2130 TRIGONOMETRIC FUNCTION PACKAGE.

R2131 THE FOLLOWING TRIGONOMETRIC FUNCTIONS ARE AVAILABLE AS INTERPRETIVE OPERATIONS'

R2133 1. SIN COMPUTES (1/2)SINE(2 PI MPAC).
R2134 2. COS COMPUTES (1/2)COSINE(2 PI MPAC).

R2135 3. ASIN COMPUTES (1/2PI)ARCSINE(2 MPAC).
R2136 4. ACOS COMPUTES (1/2PI)ARCCOSINE(2 MPAC).

R2137 SIN-ASIN AND COS-ACOS ARE MUTUALLY INVERSE, IE SIN(ASIN(X)) = X.

```
 2138   REF   4  LAST 1151   00,3516  0 6672 1  COSINE   TC      BRANCH        FINDS COSINE USING THE IDENTITY
 2139                        00,3517  1 3522 0           TCF     +3            COS(X) = SIN(PI/2 - ABS(X)).
 2140   REF   1              00,3520  1 3525 1           TCF     PRESINE
 2141   REF   2  LAST 1157   00,3521  1 3525 1           TCF     PRESINE

 2142                        00,3522  0 0006 1  +3       EXTEND
 2143   REF 601  LAST 1156   00,3523  4 0155 1           DCS     MPAC
 2144   REF 602  LAST 1157   00,3524 .52 155 1           DXCH    MPAC

 2145   REF   7  LAST 1156   00,3525  3 4676 1  PRESINE  CAF     QUARTER       PI/2 SCALED.
 2146   REF 603  LAST 1157   00,3526  26 154 0           ADS     MPAC
 2147   REF 604  LAST 1157   00,3527  52 155 1  SINE     DXCH    MPAC          DOUBLE ARGUMENT.
 2148                        00,3530  20 001 1           DDOUBL
 2149                        00,3531  54 000 0           OVSK                  SEE IF OVERFLOW PRESENT.
 2150                        00,3532  1 3535 0           TCF     +3            IF NOT, ARGUMENT OK AS IS.

 2151                        00,3533  0 0006 1           EXTEND                IF SO, WE LOST (OR GAINED) PI, SO
 2152                        00,3534  4 0001 1           DCOM                  COMPLEMENT MPAC USING THE IDENTITY
A2153                                                                         SIN(X-(+)PI) = SIN(-X).
 2154   REF 605  LAST 1157   00,3535  52 155 1  +3       DXCH    MPAC
 2155   REF 606  LAST 1157   00,3536  3 0154 1           CA      MPAC          SEE IF ARGUMENT GREATER THAN .5 IN
 2156                        00,3537  6 0000 1           DOUBLE                MAGNITUDE. IF SO, REDUCE IT TO LESS THAN
 2157   REF 195  LAST 1155   00,3540  54 001 1           TS      L             .5 (+-PI/2 SCALED) AS FOLLOWS'
 2158   REF   1              00,3541  1 3552 1           TCF     SN1

 2159   REF 315  LAST 1154   00,3542  50 000 1           INDEX   A             IF POSITIVE, FORM PI - X, IF NEGATIVE
 2160   REF   7  LAST 1052   00,3543  3 4674 0           CAF     NEG1/2 +1     USE -PI - X.
 2161                        00,3544  6 0000 1           DOUBLE
 2162                        00,3545  0 0006 1           EXTEND
 2163   REF 607  LAST 1157   00,3546  60 154 1           SU      MPAC          GUARANTEED NO OVERFLOW.
 2164   REF 608  LAST 1157   00,3547  54 154 0           TS      MPAC
 2165   REF 609  LAST 1157   00,3550  4 0155 1           CS      MPAC +1
 2166   REF 610  LAST 1157   00,3551  54 155 1           TS      MPAC +1
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2167                        00,3552  0 0006 1  SN1    EXTEND
2168  REP 611  LAST 1157    00,3553  3 0155 0         DCA     MPAC          SET UP TO EVALUATE HASTINGS POLYNOMIAL
2169  REP  17  LAST 1143    00,3554  52 134 0         DXCH    BUF2
2170  REP   5  LAST 1153    00,3555  0 3300 1         TC      DSQSUB        SQUARE MPAC.

2171  REP   5  LAST  849    00,3556  0 7171 1         TC      POLY          EVALUATE FOURTH ORDER POLYNOMIAL.
2172                        00,3557   00003 1         DEC     3
2173                        00,3560   14441 0         2DEC    +.3926990796
2173                        00,3561   37325 1
2174                        00,3562   53250 0         2DEC    -.6459637111
2174                        00,3563   60764 1
2175                        00,3564   12146 1         2DEC    +.318758717
2175                        00,3565   21276 1
2176                        00,3566   75466 1         2DEC    -.074780249
2176                        00,3567   71471 0
2177                        00,3570   00236 0         2DEC    +.009694988
2177                        00,3571   32757 0

2178  REP   1               00,3572  3 2470 0         CAF     LBUF2         MULTIPLY BY ARGUMENT AND SHIFT LEFT 2.
2179  REP  19  LAST 1119    00,3573  0 7055 0         TC      DMPSUB -1

2180                        00,3574  0 0006 1         EXTEND
2181  REP 612  LAST 1158    00,3575  3 0156 0         DCA     MPAC +1
2182  REP 613  LAST 1158    00,3576  20 156 1         DAS     MPAC +1
2183  REP 614  LAST 1158    00,3577  6 0154 1         AD      MPAC
2184  REP 615  LAST 1158    00,3600  26 154 0         ADS     MPAC          NEITHER SHIFT OVERFLOWS.
2185                        00,3601  0 0006 1         EXTEND
2186  REP 616  LAST 1158    00,3602  3 0156 0         DCA     MPAC +1
2187  REP 617  LAST 1158    00,3603  20 156 1         DAS     MPAC +1
2188  REP 618  LAST 1158    00,3604  6 0154 1         AD      MPAC
2189  REP 619  LAST 1158    00,3605  26 154 0         ADS     MPAC
2190  REP  47  LAST 1152    00,3606  1 6030 0         TCF     DANZIG
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P2191          . ARCSIN/ARCCOS ROUTINE.

2192  REP   1                 00,3607  3 3630 1  ARCSIN   CAP    LASINEX    COMPUTE ARCSIN BY USING THE IDENTITY
2193                          00,3610  1 3612 0            TCP    +2         ARCSIN(X) = PI/2 - ARCCOS(X).

2194  REP   1                 00,3611  3 3712 0  ARCCOS   CAP    LDANZIG    (EXITS IMMEDIATELY).
2195  REP   1                 00,3612  54 136 1           TS     ESCAPE
2196  REP   5  LAST 1157      00,3613  0 6672 1           TC     BRANCH     TEST SIGN OF INPUT.
2197  REP   1                 00,3614  1 3624 0           TCP    ACOSST     START IMMEDIATELY IF POSITIVE.
2198  REP   1                 00,3615  1 3726 0           TCP    ACOSZERO   ARCCOS(0) = PI/2 = .25.
2199                          00,3616  0 0006 1           EXTEND            IF NEGATIVE, USE THE IDENTITY
2200  REP 620  LAST 1158      00,3617  4 0155 1           DCS    MPAC       ARCCOS(X) = PI - ARCCOS(-X), FORCING
2201  REP 621  LAST 1159      00,3620  52 155 1           DXCH   MPAC       ARGUMENT POSITIVE.
2202  REP   1                 00,3621  3 3731 1           CAF    TCSUBTR    SET EXIT  TO DO ABOVE BEFORE
2203  REP   2  LAST 1159      00,3622  56 136 0           XCH    ESCAPE     ARCSIN/ARCCOS CONSIDERATIONS.
2204  REP   1                 00,3623  54 137 0           TS     ESCAPE2

2205  REP  20  LAST 1156      00,3624  4 4675 0  ACOSST   CS     HALF       TEST MAGNITUDE OF INPUT.
2206  REP 622  LAST 1159      00,3625  6 0154 1           AD     MPAC
2207  REP 316  LAST 1157      00,3626  10 000 0           CCS    A
2208  REP   1                 00,3627  1 3720 0           TCP    ACOSOVF    THIS IS PROBABLY AN OVERFLOW CASE.

2209  REP   1                 00,3630  1 3706 1  LASINEX  TCF    ASINEX

2210  REP   1                 00,3631  1 3641 0           TCP    ACOSST2    NO OVERFLOW - PROCEED.

2211  REP 623  LAST 1159      00,3632  10 155 1           CCS    MPAC +1    IF MAJOR PART IS .5, CALL ANSWER 0
2212  REP 238  LAST 1155      00,3633  3 4714 1           CAF    ZERO       UNLESS MINOR PART NEGATIVE.
2213  REP   1                 00,3634  1 3636 0           TCP    ACOS=0

2214  REP   2  LAST 1159      00,3635  1 3641 0           TCP    ACOSST2

2215  REP 624  LAST 1159      00,3636  54 155 1  ACOS=0   TS     MPAC +1
2216  REP 625  LAST 1159      00,3637  54 154 0           TS     MPAC
2217  REP   3  LAST 1159      00,3640  0 0136 0           TC     ESCAPE

2218                          00,3641  0 0006 1  ACOSST2  EXTEND            NOW THAT ARGUMENT IS IN PROPER RANGE,
2219  REP 626  LAST 1159      00,3642  4 0155 1           DCS    MPAC       BEGIN COMPUTATION. USE HASTINGS
2220  REP  21  LAST 1159      00,3643  6 4675 1           AD     HALF       APPROXIMATION ARCCOS(X) = SQRT(1-X)P(X)
2221  REP 627  LAST 1159      00,3644  52 155 1           DXCH   MPAC       IN A SCALED VERSION WHERE P(X) IS A
2222  REP  18  LAST 1158      00,3645  52 134 0           DXCH   BUF2       SEVENTH ORDER POLYNOMIAL.

2223  REP   3  LAST 1151      00,3646  0 3343 0           TC     SQRTSUB    RETURNS WITH NORMALIZED SQUARE ROOT.

2224  REP  62  LAST 1156      00,3647  10 135 1           CCS    MPTEMP     SEE IF UN-NORMALIZATION REQUIRED.
2225  REP   1                 00,3650  1 3713 0           TCP    ACOSSHR    IF SO.
```

```
2226  REP 628  LAST 1159   00,3651  52 155 1  ACOS3   DXCH  MPAC          SET UP FOR POLYNOMIAL EVALUATION.
2227  REP  19  LAST 1159   00,3652  52 134 0          DXCH  BUF2
2228  REP 629  LAST 1160   00,3653  52 155 1          DXCH  MPAC

2229  REP   6  LAST 1158   00,3654  0 7171 1          TC    POLY
2230                        00,3655   00006 1         DEC   6
2231                        00,3656   13240 0         2DEC  +.353553385     COEFFICIENTS ARE C 2(+I)/PISQRT(2) WHERE
2231                        00,3657   23630 0
2232                        00,3660   74721 0         2DEC* -.0483017006 B+1*              I
2232                        00,3661   47775 1
2233                        00,3662   02440 0         2DEC* +.0200273085 B+2*   WHERE C STANDS FOR ORIGINAL COEFFS.
2233                        00,3663   20237 0
2234                        00,3664   75067 1         2DEC* -.0112931863 B+3*
2234                        00,3665   70742 1
2235                        00,3666   03436 0         2DEC* +.00895311612 B+4*
2235                        00,3667   26756 1
2236                        00,3670   74037 0         2DEC* -.00384617957 B+5*
2236                        00,3671   57640 1
2237                        00,3672   03046 0         2DEC* +.001501297736 B+6*
2237                        00,3673   07143 0
2238                        00,3674   76654 1         2DEC* -.000284160334 B+7*
2238                        00,3675   42244 0

2239  REP   2  LAST 1158   00,3676  3 2470 0          CAP   LBUF2         DO FINAL MULTIPLY AND GO TO ANY
2240  REP  20  LAST 1158   00,3677  0 7055 0          TC    DMPSUB -1     EPILOGUE SEQUENCES.
2241  REP   4  LAST 1159   00,3700  0 0136 0          TC    ESCAPE

2242                        00,3701  0 0006 1  SUBTR   EXTEND              EPILOGUE FOR NEGATIVE INPUTS TO ARCCOS.
2243  REP 630  LAST 1160   00,3702  4 0155 1          DCS   MPAC
2244  REP  22  LAST 1159   00,3703  6 4675 1          AD    HALF          FORMS PI - ARCCOS(-X) = ARCCOS(X).
2245  REP 631  LAST 1160   00,3704  52 155 1          DXCH  MPAC
2246  REP   2  LAST 1159   00,3705  0 0137 1          TC    ESCAPE2       GO TO POSSIBLE ARCSIN EPILOGUE.

2247                        00,3706  0 0006 1  ASINEX  EXTEND
2248  REP 632  LAST 1160   00,3707  4 0155 1          DCS   MPAC          ARCSIN EPILOGUE - GET ARCSIN(X)
2249  REP   8  LAST 1157   00,3710  6 4676 1          AD    QUARTER       = PI/2 - ARCCOS(X).
2250  REP 633  LAST 1160   00,3711  52 155 1          DXCH  MPAC
2251  REP  48  LAST 1158   00,3712  1 6030 0  LDANZIG  TCF   DANZIG
```

```
2252   REF 317  LAST 1159   00,3713  50 000 1  ACOSSHR  INDEX  A        THE SHIFT RIGHT IS LESS THAN 14 SINCE
2253   REF  68  LAST 1148   00,3714   3 4675 1           CAF    BIT14    THE INPUT WAS NON-ZERO DP.
2254   REF  63  LAST 1159   00,3715  54 135 1           TS     MPTEMP
2255   REF   4  LAST 1125   00,3716   0 2073 1           TC     VSHRRND  DP SHIFT RIGHT AND ROUND.
2256   REF   1              00,3717   1 3651 1           TCF    ACOS3    PROCEED.

2257                        00,3720   0 0006 1  ACOSOVF  EXTEND          IF MAJOR PART WAS ONLY 1 MORE THAN .5,
2258   REF   2  LAST 1159   00,3721   1 3636 0           BZF    ACOS=0   CALL ANSWER ZERO.

2259   REF  33  LAST  782   00,3722   0 5537 0  ACOSABRT TC     ALARM    IF OVERFLOW, CALL ANSWER ZERO BUT
22591                       00,3723    01301 1           OCT    1301     SOUND AN ALARM.

2260   REF 239  LAST 1159   00,3724   3 4714 1           CAF    ZERO
22601  REF   3  LAST 1161   00,3725   1 3636 0           TCF    ACOS=0

2261   REF   9  LAST 1160   00,3726   3 4676 1  ACOSZERO CAF    QUARTER  ACOS(0) = PI/2.
2262   REF   4  LAST 1161   00,3727   1 3637 1           TCF    ACOS=0 +1SET MPAC AND EXIT VIA ESCAPE.

2263                        00,3730    77763 0  NEG12    DEC    -12
2264   REF   1              00,3731   1 3701 0  TCSUBTR  TCF    SUBTR
```

P2265 THE FOLLOWING INSTRUCTIONS ARE AVAILABLE FOR SETTING, MODIFYING, AND BRANCHING ON INDEX REGISTERS'

R2267 1. AXT ADDRESS TO INDEX TRUE.
R2268 1. AXC ADDRESS TO INDEX COMPLEMENTED.
R2269 3. LXA LOAD INDEX FROM ERASABLE.
R2270 4. LXC LOAD INDEX COMPLEMENTED FROM ERASABLE.
R2271 5. SXA STORE INDEX IN ERASABLE.
R2272 6. XCHX EXCHANGE INDEX REIGSTER WITH ERASABLE.

R2273 7. INCR INCREMENT INDEX REGISTER.
R2274 8. XAD ERASABLE ADD TO INDEX REGISTER.
R2275 9. XSU ERASABLE SUBTRACT FROM INDEX REGISTER.

R2276 10. TIX BRANCH ON INDEX REGISTER AND DECREMENT.

```
 2277                    01,2371                          BANK   01
 2278  REP  1                                             COUNT  01/INTER
 2279  REP  1                    01,2371  0 2466 1  AXT   TC     TAGSUB      SELECT APPROPRIATE INDEX REGISTER.
 2280  REP 22  LAST 1152         01,2372  3 0117 0        CA     POLISH
 2281  REP  4  LAST 1081         01,2373 50 130  0  XSTORE INDEX  INDEXLOC    CONTAINS C(FIXLOC) OR C(FIXLOC)+1.
 2282  REP 50  LAST 1091         01,2374 54 046  1        TS     X1
 2283  REP 49  LAST 1160         01,2375  1 6030 0        TCF    DANZIG

 2284  REP  2  LAST 1162         01,2376  0 2466 1  AXC   TC     TAGSUB
 2285  REP 23  LAST 1162         01,2377  4 0117 1        CS     POLISH
 2286  REP  1                    01,2400  0 2373 1        TC     XSTORE

 2287  REP  1                    01,2401  0 2454 0  LXA   TC     15ADRERS    LOAD INDEX REGISTER FROM ERASABLE.
 2288  REP 24  LAST 1162         01,2402 50 117  0        INDEX  POLISH
 2289                            01,2403  3 0000 1        CA     0
 2290  REP  2  LAST 1162         01,2404  1 2373 0        TCF    XSTORE

 2291  REP  2  LAST 1162         01,2405  0 2454 0  LXC   TC     15ADRERS    LOAD NDX REG FROM ERASABLE COMPLEMENTED.
 2292  REP 25  LAST 1162         01,2406 50 117  0        INDEX  POLISH
 2293                            01,2407  4 0000 0        CS     0
 2294  REP  3  LAST 1162         01,2410  1 2373 0        TCF    XSTORE

 2295  REP  3  LAST 1162         01,2411  0 2454 0  SXA   TC     15ADRERS    STORE INDEX REGISTER IN ERASABLE.
 2296  REP  5  LAST 1162         01,2412 50 130  0        INDEX  INDEXLOC
 2297  REP 51  LAST 1162         01,2413  3 0046 0        CA     X1
 2298  REP 26  LAST 1162         01,2414 50 117  0  MSTORE1 INDEX  POLISH
 2299                            01,2415 54 000  0        TS     0
 2300  REP 50  LAST 1162         01,2416  1 6030 0        TCF    DANZIG
```

```
2301  REF   4  LAST 1162   01,2417  0 2454 0  XCHX    TC      15ADRERS   EXCHANGE INDEX REGISTER WITH ERASABLE.
2302  REF  27  LAST 1162   01,2420  50 117 0          INDEX   POLISH
2303                       01,2421  3 0000 1          CA      0
2304  REF   6  LAST 1162   01,2422  50 130 0          INDEX   INDEXLOC
2305  REF  52  LAST 1162   01,2423  56 046 0          XCH     X1
2306  REF   1              01,2424  1 2414 0          TCF     MSTORE1

2307  REF   5  LAST 1163   01,2425  0 2454 0  XAD     TC      15ADRERS   ADD ERASABLE TO INDEX REGISTER.
2308  REF  28  LAST 1163   01,2426  50 117 0          INDEX   POLISH
2309                       01,2427  3 0000 1          CA      0
2310  REF   7  LAST 1163   01,2430  50 130 0  XAD2    INDEX   INDEXLOC
2311  REF  53  LAST 1163   01,2431  26 046 1          ADS     X1         IGNORING OVERFLOWS.
2312  REF  51  LAST 1162   01,2432  1 6030 0          TCF     DANZIG

2313  REF   3  LAST 1162   01,2433  0 2466 1  INCR    TC      TAGSUB     INCREMENT INDEX REGISTER.
2314  REF  29  LAST 1163   01,2434  3 0117 0          CA      POLISH
2315  REF   1              01,2435  1 2430 0          TCF     XAD2

2316  REF   6  LAST 1163   01,2436  0 2454 0  XSU     TC      15ADRERS   SUBTRACT ERASABLE FROM INDEX REGISTER.
2317  REF  30  LAST 1163   01,2437  50 117 0          INDEX   POLISH
2318                       01,2440  4 0000 0          CS      0
2319  REF   2  LAST 1163   01,2441  1 2430 0          TCF     XAD2
2320  REF   4  LAST 1163   01,2442  0 2466 1  TIX     TC      TAGSUB     BRANCH AND DECREMENT ON INDEX.
2321  REF   8  LAST 1163   01,2443  50 130 0          INDEX   INDEXLOC
2322  REF  37  LAST  891   01,2444  4 0050 0          CS      S1
2323  REF   9  LAST 1163   01,2445  50 130 0          INDEX   INDEXLOC
2324  REF  54  LAST 1163   01,2446  6 0046 0          AD      X1
2325                       01,2447  0 0006 1          EXTEND                NO OPERATION IF DECREMENTED INDEX IS
2326  REF  52  LAST 1163   01,2450  6 6030 1          BZMF    DANZIG        NEGATIVE OR ZERO.

2327  REF  10  LAST 1163   01,2451  50 130 0  DOTIXBR  INDEX   INDEXLOC
2328  REF  55  LAST 1163   01,2452  56 046 0          XCH     X1         IGNORING OVERFLOWS.

2329  REF   6  LAST 1152   01,2453  1 6615 1          TCF     GOTO       DO THE BRANCH USING THE CADR IN POLISH.
```

P2330 SUBROUTINE TO CONVERT AN ERASABLE ADDRESS (11 BITS) TO AN EBANK SETTING AND SUBADDRESS.

2332	REF 31	LAST 1163	01,2454	4 0117 1	15ADRERS	CS	POLISH		
2333	REF 3	LAST 1091	01,2455	6 4727 1		AD	DEC45		
2334	REF 318	LAST 1161	01,2456	10 000 0		CCS	A		DOES THE ADDRESS POINT TO THE WORK AREAw
2335	REF 31	LAST 1152	01,2457	3 0120 1		CA	FIXLOC		YES. ADD FIXLOC. EBANK OK AS IS.
2336			01,2460	1 2465 0		TCF	+5		
2337	REF 6	LAST 1091	01,2461	3 4744 1		CA	OCT1400		NO. SET EBANK d MAKE UP SUBADDRESS.
2338	REF 32	LAST 1164	01,2462	56 117 0		XCH	POLISH		
2339	REF 50	LAST 1099	01,2463	54 003 0		TS	EBANK		
2340	REF 12	LAST 1099	01,2464	7 4373 0		MASK	LOW8		
2341	REF 33	LAST 1164	01,2465	26 117 1	+5	ADS	POLISH		FALL INTO TAGSUB, AND RETURN VIA Q.

R2342 SUBROUTINE WHICH SETS THE ADDRESS OF THE SPECIFIED INDEX IN INDEXLOC. (ACTUALLY, THE ADDRESS -38D.)

2344	REF 32	LAST 1164	01,2466	3 0120 1	TAGSUB	CA	FIXLOC		
2345	REF 11	LAST 1163	01,2467	54 130 1		TS	INDEXLOC		
2346	REF 36	LAST 1131	01,2470	10 020 1		CCS	CYR		BIT 15 SPECIFIES INDEX.
2347	REF 12	LAST 1164	01,2471	24 130 0		INCR	INDEXLOC		0 MEANS USE X2.
2348	REF 271	LAST 1155	01,2472	0 0002 0		TC	Q		
2349	REF 272	LAST 1164	01,2473	0 0002 0		TC	Q		1 FOR X1.

```
P2350          MISCELLANEOUS OPERATION CODES WITH DIRECT ADDRESSES. INCLUDED HERE ARE'

R2352            1.  ITA          STORE QPRET (RETURN ADDRESS) IN ERASABLE.
R2354            2.  CALL         CALL A SUBROUTINE, LEAVING RETURN IN QPRET.
R2356            3.  RTB          RETURN TO BASIC LANGUAGE AT THE GIVEN ADDRESS.
R2358            4.  BHIZ         BRANCH IF THE HIGH ORDER OF MPAC IS ZERO (SINGLE PRECISION).
R2360            5.  BOV          BRANCH ON OVERFLOW.
R2361            6.  GOTO         SIMPLE SEQUENCE CHANGE.

 2362  REF  37  LAST 1164  01,2474  10 020 1  RTB/BHIZ CCS    CYR
 2363  REF  34  LAST 1164  01,2475  3 0117 0  RTB       CA     POLISH
 2364  REF   5  LAST  731  01,2476  0 4560 0            TC     SWCALL   -1     SO A BTC Q8 FROM ROUTINE LEADS TO DANZIG

 2365  REF 634  LAST 1160  01,2477  10 154 0  BHIZ      CCS    MPAC
 2366  REF  53  LAST 1163  01,2500  1 6030 0             TCF    DANZIG
 2367  REF   7  LAST 1163  01,2501  1 6615 1             TCF    GOTO
 2368  REF  54  LAST 1165  01,2502  1 6030 0             TCF    DANZIG
 2369  REF   8  LAST 1165  01,2503  1 6615 1             TCF    GOTO

 2370  REF   9  LAST 1153  01,2504  10 121 1  BOV(B)    CCS    OVFIND          BRANCH ON OVERFLOW TO BASIC OR INTERP.
 2371                       01,2505  1 2507 0             TCF    +2
 2372  REF  55  LAST 1165  01,2506  1 6030 0             TCF    DANZIG
 2373  REF  10  LAST 1165  01,2507  54 121 1             TS     OVFIND
 2374  REF  38  LAST 1165  01,2510  10 020 1             CCS    CYR
 2375  REF   1              01,2511  1 2475 1             TCF    RTB             IF BASIC.
 2376                       01,2512   00360 1  B5TOB8    OCT    360
 2377  REF   9  LAST 1165  01,2513  1 6615 1             TCF    GOTO
```

2378	REF	39	LAST 1165	01,2514	10 020 1	BZE/GOTO	CCS	CYR
2379	REF	6	LAST 1159	01,2515	0 6672 1		TC	BRANCH
2380	REF	56	LAST 1165	01,2516	1 6030 0		TCF	DANZIG
2381	REF	10	LAST 1165	01,2517	1 6615 1		TCF	GOTO
2382	REF	57	LAST 1166	01,2520	1 6030 0		TCF	DANZIG
2383	REF	40	LAST 1166	01,2521	10 020 1	BPL/BMN	CCS	CYR
2384	REF	1		01,2522	1 2530 1		TCF	BPL
2385				01,2523	12000 1	$5B_{10}$	DEC	5 B+10
2386	REF	7	LAST 1166	01,2524	0 6672 1		TC	BRANCH
2387	REF	58	LAST 1166	01,2525	1 6030 0		TCF	DANZIG
2388	REF	59	LAST 1166	01,2526	1 6030 0		TCF	DANZIG
2389	REF	11	LAST 1166	01,2527	1 6615 1		TCF	GOTO
2390	REF	8	LAST 1166	01,2530	0 6672 1	BPL	TC	BRANCH
2391	REF	12	LAST 1166	01,2531	1 6615 1		TCF	GOTO
2392	REF	13	LAST 1166	01,2532	1 6615 1		TCF	GOTO
2393	REF	60	LAST 1166	01,2533	1 6030 0		TCF	DANZIG
2394	REF	41	LAST 1166	01,2534	10 020 1	CALL/ITA	CCS	CYR
2395	REF	1		01,2535	1 6607 1		TCF	CALL
2396	REF	7	LAST 357	01,2536	0 5640 0		TC	CCSHOLE
2397	REF	7	LAST 1163	01,2537	0 2454 0		TC	15ADRERS
2398	REF	33	LAST 1164	01,2540	50 120 1		INDEX	FIXLOC
2399	REF	19	LAST 1152	01,2541	3 0052 0		CA	QPRET
2400	REF	2	LAST 1163	01,2542	1 2414 0		TCF	MSTORE1

SEE WHICH OP-CODE IS DESIRED.
DO BZE.

DO GOTO.

SHIFTS OP CODE IN SWITCH INSTRUCTION ADR

DO BMN.

ONLY IF NNZ.

IF POSITIVE OR ZERO.

STORE QPRET. (TAGSUB AFTER 15ADRERS IS SLOW IN THIS CASE, BUT SAVES STORAGE.)

```
P2401          THE FOLLOWING OPERATIONS ARE AVAILABLE FOR ALTERING AND TESTING INTERPRETIVE SWITCHES'

R2403  00      BONSET          SET A SWITCH AND DO A GOTO IF IT WAS ON.
R2404  01      SETGO           SET A SWITCH AND DO A GOTO.
R2405  02      BOFSET          SET A SWITCH AND DO A GOTO IF IT WAS OFF
R2406  03      SET             SET A SWITCH.

R2407  04      BONINV          INVERT A SWITCH AND BRANCH IF IT WAS ON.
R2408  05      INVGO           INVERT A SWITCH AND DO A GOTO.
R2409  06      BOFINV          INVERT A SWITCH AND BRANCH IF IT WAS OFF
R2410  07      INVERT          INVERT A SWITCH.

R2411  10      BONCLR          CLEAR A SWITCH AND BRANCH IF IT WAS ON.
R2412  11      CLRGO           CLEAR A SWITCH AND DO A GOTO.
R2413  12      BOFCLR          CLEAR A SWITCH AND BRANCH IF IT WAS OFF.
R2414  13      CLEAR           CLEAR A SWITCH.

R2415  14      BON             BRANCH IF A SWITCH WAS ON.
R2416  16      BOFF            BRANCH IF A SWITCH WAS OFF.
R2417          THE ADDRESS SUPPLIED WITH THE SWITCH INSTRUCTION IS INTERPRETED AS FOLLOWS'

R2419          BITS 1-4    SWITCH BIT NUMBER (1-15).
R2420          BITS 5-8    SWITCH OPERATION NUMBER.
R2421          BITS 9-     SWITCH WORD NUMBER (UP TO 64 SWITCH WORDS).

R2422          THE ADDRESS ITSELF IS MADE UP BY THE YUL SYSTEM ASSEMBLER. THE BRANCH INSTRUCTIONS REQUIRE TWO
R2424  ADDRESSES, THE SECOND TAKEN AS THE DIRECT (OR INDIRECT IF IN ERASABLE) ADDRESS OF THE BRANCH.
 2426  REF   3  LAST  977   01,2543  3 4721 1  SWITCHES CAF   LOW4      LEAVE THE SWITCH BIT IN  SWBIT .
 2427  REF  35  LAST 1165   01,2544  7 0117 1           MASK  POLISH
 2428  REF 319  LAST 1164   01,2545  50 000 1           INDEX A
 2429  REF  46  LAST 1151   01,2546  3 4674 0           CAF   BIT15     (NUMBER FROM LEFT TO RIGHT.)
 2430  REF   1               01,2547  54 131 0           TS    SWBIT

 2431  REF  51  LAST 1067   01,2550  3 4704 0           CAF   BIT7      LEAVE THE SWITCH NUMBER IN SWWORD.
 2432                        01,2551  0 0006 1           EXTEND
 2433  REF  36  LAST 1167   01,2552  7 0117 1           MP    POLISH
 2434  REF   1               01,2553  54 130 1           TS    SWWORD

 2435                        01,2554  0 0004 0           INHINT          DURING SWITCH CHANGE SO RUPT CAN USE TOO
 2436  REF 320  LAST 1167   01,2555  50 000 1           INDEX A         LEAVE THE SWITCH WORD ITSELF IN L.
 2437  REF  49  LAST  798   01,2556  3 0074 1           CA    STATE
 2438  REF 273  LAST 1164   01,2557  54 002 1           TS    Q         Q WILL BE USED AS A CHANNEL.
```

```
2439  REF  31  LAST 1037   01,2560  3 4700 1          CAF    BIT11
2440                       01,2561  0 0006 1          EXTEND
2441  REF  37  LAST 1167   01,2562  7 0117 1          MP     POLISH
2442  REF   1              01,2563  7 2623 0          MASK   B3TOB4
2443  REF 321  LAST 1167   01,2564  50 000 1          INDEX  A
2444                       01,2565  1 2566 1          TCF    +1

2445  REF   2  LAST 1167   01,2566  3 0131 1  +1      CA     SWBIT
2446                       01,2567  0 0006 1          EXTEND
2447  REF   1              01,2570  04 002 1          ROR    QCHAN
2448  REF   1              01,2571  1 2600 1          TCF    SWSTORE

2449  REF   3  LAST 1168   01,2572  3 0131 1  +5      CA     SWBIT
2450                       01,2573  0 0006 1          EXTEND
2451  REF   2  LAST 1168   01,2574  06 002 0          RXOR   QCHAN
2452  REF   2  LAST 1168   01,2575  1 2600 1          TCF    SWSTORE

2453  REF   4  LAST 1168   01,2576  4 0131 0  +9D     CS     SWBIT
2454  REF 274  LAST 1167   01,2577  7 0002 1          MASK   Q
2455  REF   2  LAST 1167   01,2600  50 130 0  SWSTORE  INDEX  SWWORD
2456  REF  50  LAST 1167   01,2601  54 074 0          TS     STATE
```

DISPATCH SWITCH BIT OPERATION AS IN BITS 7-8 OF POLISH. GETS 4X2-BIT CODE.

00 - SET SWITCH IN QUESTION.

01 - INVERT SWITCH.

10 - CLEAR.

NEW SWITCH WORD.

2457				01,2602	0 0003 1	+13D	RELINT		11 - NOOP.
2458	REP	41	LAST 1004	01,2603	3 4676 1		CAF	BIT13	
2459				01,2604	0 0006 1		EXTEND		DISPATCH SEQUCE CHANGING OR BRANCHING CODE.
2460	REP	38	LAST 1168	01,2605	7 0117 1		MP	POLISH	
2461	REP	2	LAST 1168	01,2606	7 2623 0		MASK	B_3TOB_4	
2462	REP	322	LAST 1168	01,2607	50 000 1		INDEX	A	
2463				01,2610	1 2611 1		TCF	+1	ORIGINALLY STORED IN BITS 5-6.
2464	REP	275	LAST 1168	01,2611	4 0002 1	+1	CS	Q	00 - BRANCH IF ON.
2465	REP	5	LAST 1168	01,2612	7 0131 0	TEST	MASK	SWBIT	
2466	REP	323	LAST 1169	01,2613	10 000 0		CCS	A	
2467	REP	1		01,2614	1 2624 1		TCF	SWSKIP	
2468	REP	1		01,2615	1 6664 1	+5	TCF	SWBRANCH	01 - GO TO.
2469	REP	2	LAST 1169	01,2616	1 2624 1		TCF	SWSKIP	HERE ONLY ON BIT 15.
2470	REP	8	LAST 1166	01,2617	0 5640 0		TC	CCSHOLE	
2471	REP	9	LAST 1169	01,2620	0 5640 0		TC	CCSHOLE	
2472	REP	276	LAST 1169	01,2621	3 0002 0	+9D	CA	Q	10 - BRANCH IF OFF.
2473	REP	1		01,2622	1 2612 1		TCF	TEST	
2474				01,2623	00014 1	B_3TOB_4	OCT	0014	
2475	REP	27	LAST 1100	01,2624	24 164 1	SWSKIP	INCR	LOC	
2476	REP	1		01,2543		SW/	EQUALS	SWITCHES	
2477	REP	61	LAST 1166	01,2625	1 6030 0	+13D	TCF	DANZIG	11 - NOOP.

L FIXED-FIXED CONSTANT POOL USER'S PAGE NO. 1 E0 S3

```
0001                          4671                    BLOCK   02
00015 REF  1                                          COUNT   02/FCONS
R00016  THE FOLLOWING TABLE OF 18 VALUES IS INDEXED. DO NOT INSERT OR REMOVE ANY QUANTITIES.
0002
0003                          4671  37777 1 DPOSMAX OCT   37777          MUST PRECEDE POSMAX
                              4672  37777 1 POSMAX  OCT   37777
0004  REF  8  LAST 1157      4673          LIMITS  =     NEG1/2
0007
A0008                         4673  57777 1 NEG1/2  OCT   -20000        USED BY SIN ROUTINE (MUST BE TWO
R0009          BIT TABLE                                                 LOCATIONS IN FRONT OF BIT14)
0010
0011                          4674  40000 0 BIT15   OCT   40000
0012                          4675  20000 0 BIT14   OCT   20000
0013                          4676  10000 0 BIT13   OCT   10000
0014                          4677  04000 0 BIT12   OCT   04000
0015                          4700  02000 0 BIT11   OCT   02000
0016                          4701  01000 0 BIT10   OCT   01000
0017                          4702  00400 0 BIT9    OCT   00400
0018                          4703  00200 0 BIT8    OCT   00200
0019                          4704  00100 0 BIT7    OCT   00100
0020                          4705  00040 0 BIT6    OCT   00040
0021                          4706  00020 0 BIT5    OCT   00020
0022                          4707  00010 0 BIT4    OCT   00010
0023                          4710  00004 0 BIT3    OCT   00004
0024                          4711  00002 0 BIT2    OCT   00002
                              4712  00001 0 BIT1    OCT   00001
R0025  DO NOT DESTROY THIS COMBINATION, SINCE IT IS USED IN DOUBLE PRECISION INSTRUCTIONS.
0027                          4713  77777 0 NEG0    OCT   -0             MUST PRECEDE ZERO
0028                          4714  00000 1 ZERO    OCT   0              MUST FOLLOW NEG0
A0029                                       BIT1    OCT   00001
A0030                                       NO.WDS  OCT   2              INTERPRETER
A0031                                       OCTAL3  OCT   3              INTERPRETER
A0032                                       R3D1    OCT   4              PINBALL
0033                          4715  00005 1 FIVE    OCT   5
A0034                                       REVCNT  OCT   6              INTERPRETER
0035                          4716  00007 0 SEVEN   OCT   7
A0036                                       BIT4    OCT   00010
A0037                                       R2D1    OCT   11             PINBALL
00375 REF  6  LAST  369       4334          OCT11   =     R2D1           P20S
A0038                                       BINCON  DEC   10             PINBALL          (OCTAL 12)
0039                          4717  00013 0 ELEVEN  DEC   11
A0040                                       OCT14   OCT   14             ALARM AND ABORT (FILLER)
00401                         4720  00015 0 OCT15   OCT   15
A0041                                       R1D1    OCT   16             PINBALL
```

```
 0043                          4721   00017 1  LOW4      OCT   17
A0044                                         BIT5      OCT   00020
A0045                                         MD1       OCT   21      PINBALL
A0046                                         VD1       OCT   23      PINBALL
A0047                                         OCT24     OCT   24      SERVICE ROUTINES
A0048                                         MD1       OCT   25      PINBALL
 00485                        4722   00030 1  BITS4d5   OCT   30
A0049                                         OCT31     OCT   31      SERVICE ROUTINES
 0050                         4723   00032 0  CALLCODE  OCT   00032
A0051                                         LOW5      OCT   37      PINBALL
A0052                                         33DEC     DEC   33      PINBALL          (OCTAL 41)
A0053                                         34DEC     DEC   34      PINBALL          (OCTAL 42)
 0054                         4724   00045 0  TBUILDPX  DEC   37      BUILDUP FOR CONVIENCE IN DAPTESTING
 0055                         4725   00046 0  TDECAYPX  DEC   38      CONVENIENCE FOR DAPTESTING
A0056                                         BIT6      OCT   00040
 0057                         4726   00050 1  OCT50     OCT   50
 0058                         4727   00055 1  DEC45     DEC   45
 0059                         4730   00060 1  SUPER011  OCT   60      BITS FOR SUPERBNK SETTING 011.
 0060                         4731   00062 0  .5SEC     DEC   50
A0061                                         BIT7      OCT   00100

 0062  REF  52  LAST 1167     4704                     SUPER100  =     BIT7    BITS FOR SUPERBNK SETTING 100
A0063                                                                          (LAST 4K OF ROPE)
 0064                         4732   00120 1  SUPER101  OCT   120     BITS FOR SUPERBNK SETTING 101
A0065                                         OCT121    OCT   121     SERVICE ROUTINES
A0066                                                                          (FIRST 8K OF ACM)
 0067                         4733   00140 1  SUPER110  OCT   140     BITS FOR SUPERBNK SETTING 110.
A0068                                                                          (LAST 8K OF ACM)
 0069                         4734   00144 0  1SEC      DEC   100
A0070                                         LOW7      OCT   177     INTERPRETER
A0071                                         BIT8      OCT   00200
A0072                                         OT215     OCT   215     ALARM AND ABORT
A0073                                         8,5       OCT   00220   P20-P25 SUNDANCE
 0074                         4735   00310 0  2SECS     DEC   200
A0075                                         LOW8      OCT   377     PINBALL
A0076                                         BIT9      OCT   00400
 0077                         4736   00401 1  GN/CCODE  OCT   00401   SET S/C CONTROL SWITCH TO G/N
 0079                         4737   00454 1  3SECS     DEC   300
 0080                         4740   00620 0  4SECS     DEC   400
 00801                        4741   00777 0  LOW9      OCT   777
A0081                                         BIT10     OCT   01000
A0082                                         5.5DEGS   DEC   .03056  P20-P25 SUNDANCE  (OCTAL 00765)
A0083                                         OCT1103   OCT   1103    ALARM AND ABORT
 0084                         4742   01124 1  C5/2      DEC   .0363551                  (OCTAL 01124)
 0085                         4743   01211 1  V05N09    VN    0509    (SAME AS OCTAL 1211)
 0086                         4744   01400 1  OCT1400   OCT   01400
 00865                        4745   01426 0  V06N22    VN    0622
A0087                                         MID5      OCT   1740    PINBALL
 00875                        4746   01776 0  BITS2-10  OCT   1776
 0088                         4747   01777 1  LOW10     OCT   1777
```

L FIXED-FIXED CONSTANT POOL USER'S PAGE NO. 3 E0 S3

```
A0089                                  BIT11    OCT   02000
A0090                                  2K+3     OCT   2003     PINBALL
 0091                  4750  02177 1   LOW7+2K  OCT   2177     OP CODE MASK + BANK 1 FBANK SETTING.
 0092                  4751  02400 1   EBANK5   OCT   02400
 0093                  4752  03000 1   PRIO3    OCT   03000
 0094                  4753  03400 0   EBANK7   OCT   03400
A0095                                  LOW11    OCT   3777     PINBALL
A0096                                  BIT12    OCT   04000
A0097                                  RELTAB   OCT   04025    T4RUPT
 0098                  4754  05000 1   PRIO5    OCT   05000
 0099                  4755  06000 1   PRIO6    OCT   06000
 0100                  4756  07000 0   PRIO7    OCT   07000

A0102                                  BIT13    OCT   10000
A0103                                           OCT   10003    T4RUPT     RELTAB +1D
A0104                                  13,7,2   OCT   10102    P20-P25 SUNDANCE
 0105                  4757  11000 1   PRIO11   OCT   11000
A0106                                  PRIO12   OCT   12000    BANKCALL
 0107                  4760  13000 0   PRIO13   OCT   13000
 0108                  4761  14000 1   PRIO14   OCT   14000
A0109                                           OCT   14031    T4RUPT     RELTAB +2D
 0110                  4762  15000 0   PRIO15   OCT   15000
 0111                  4763  16000 0   PRIO16   OCT   16000
A0112                                  85DEGS   DEC   .45556   P20-P25 SUNDANCE   (OCTAL 16450)
 0113                  4764  17000 1   PRIO17   OCT   17000
 0114                  4765  17770 1   OCT17770 OCT   17770
A0115                                  BIT14    OCT   20000
A0116                                           OCT   20033    T4RUPT     RELTAB +3D
 0117                  4766  21000 1   PRIO21   OCT   21000
 01175                 7657                     BLOCK 03
 01176 REF  1                                    COUNT 03/FCONS

 0118                  7657  22000 1   PRIO22   OCT   22000    SERVICE ROUTINES
 0119                  7660  23000 0   PRIO23   OCT   23000
 0120                  7661  24000 1   PRIO24   OCT   24000
A0121                                  5/8+1    OCT   24001    SINGLE PRECISION SUBROUTINES
A0122                                           OCT   24017    T4RUPT     RELTAB +4D
 0123                  7662  25000 0   PRIO25   OCT   25000
 0124                  7663  26000 0   PRIO26   OCT   26000
 0125                  7664  27000 1   PRIO27   OCT   27000
A0126                                  CHRPRIO  OCT   30000    PINBALL
A0127                                           OCT   30036    T4RUPT     RELTAB +5D
 0128                  7665  31000 0   PRIO31   OCT   31000
 0129                  7666  31103 1   C1/2     DEC   .7853134                (OCTAL 31103)
 0130                  7667  32000 0   PRIO32   OCT   32000
 0131                  7670  33000 1   PRIO33   OCT   33000
 0132                  7671  34000 0   PRIO34   OCT   34000
A0133                                           OCT   34034    T4RUPT     RELTAB +6D
 0134                  7672  35000 1   PRIO35   OCT   35000
 0135                  7673  36000 1   PRIO36   OCT   36000
```

L FIXED-FIXED CONSTANT POOL USER'S PAGE NO. 4 E0 S3

0136		7674	37000 0	PRIO37	OCT	37000	
0137		7675	37401 0	63/64+1	OCT	37401	
A0138				MID7	OCT	37600	PINBALL
0139		7676	37766 1	OCT37766	OCT	37766	
0140		7677	37774 1	OCT37774	OCT	37774	
0141		7700	37776 0	OCT37776	OCT	37776	
A01411				DPOSMAX	OCT	37777	
A0142				BIT15	OCT	40000	
A0143				OCT40001	OCT	40001	INTERPRETER (CS 1 INSTRUCTION)
0144		7701	40014 0	DLOADCOD	OCT	40014	
0145		7702	40015 1	DLOAD*	OCT	40015	
A0146					OCT	40023	T4RUPT RELTAB +7D
01465		7703	40040 1	BIT15+6	OCT	40040	
01466		7704	40200 1	OCT40200	OCT	40200	
A0147					OCT	44035	T4RUPT RELTAB +8D
A0148					OCT	50037	T4RUPT RELTAB +9D
A0149					OCT	54000	T4RUPT RELTAB +10D
01495		7705	57777 1	-BIT14	OCT	57777	
A0150				RELTAB11	OCT	60000	T4RUPT
0151		7706	65552 0	C3/2	DEC	-.3216147	(OCTAL 65552)
0152		7707	70000 0	13,14,15	OCT	70000	
0153		7710	73777 1	-1/8	OCT	73777	
0154		7711	74000 1	HIGH4	OCT	74000	
0155		7712	74056 1	-ENDERAS	DEC	-2001	(OCTAL 74056)
A0156				HI5	OCT	76000	PINBALL
0157		7713	77700 0	HIGH9	OCT	77700	
A0158				-ENDVAC	DEC	-45	INTERPRETER (OCTAL 77722)
A0159				-OCT10	OCT	-10	(OCT 77767)
A0161				NEG4	DEC	-4	(OCTAL 77773)
0162		7714	77774 0	NEG3	DEC	-3	
0163		7715	77775 1	NEG2	OCT	77775	
0164		7716	77776 1	NEGONE	DEC	-1	

L FIXED-FIXED CONSTANT POOL USER'S PAGE NO. 5 E0 S3

P0165 DEFINED BY EQUALS

R0166 IT WOULD BE TO THE USERS ADVANTAGE TO OCCASIONALLY CHECK ANY OF THESE SYMBOLS IN ORDER TO PREVENT ANY
R0168 ACCIDENTAL DEFINITION CHANGES.

0169	REF	5	LAST 330	7716	MINUS1	=	NEG1	
0170	REF	28	LAST 1134	7716	NEG1	=	NEGONE	
0171	REF	75	LAST 1079	4712	ONE	=	BIT1	
0172	REF	43	LAST 1059	4711	TWO	=	BIT2	
0173	REF	1		6214	THREE	=	OCTAL3	
0174	REF	41	LAST 1103	6214	LOW2	=	THREE	
0175	REF	32	LAST 1045	4710	FOUR	=	BIT3	
0176	REF	2	LAST 1083	6211	SIX	=	REVCNT	
0177	REF	17	LAST 1154	4716	LOW3	=	SEVEN	
0178	REF	39	LAST 1051	4707	EIGHT	=	BIT4	
0179	REF	7	LAST 1170	4334	NINE	=	R2D1	
0180	REF	3	LAST 381	4377	TEN	=	BINCON	
0181	REF	9	LAST 1030	4717	NOUTCON	=	ELEVEN	
0182	REF	18	LAST 902	4374	OCT23	=	VD1	
01825	REF	2	LAST 370	4376	OCT25	=	MD1	
0183	REF	36	LAST 1130	4701	PRIO1	=	BIT10	
0184	REF	7	LAST 1164	4744	EBANK3	=	OCT1400	
0185	REF	32	LAST 1168	4700	PRIO2	=	BIT11	
0186	REF	1		4732	OCT120	=	SUPER101	
0187	REF	1		4733	OCT140.	=	SUPER110	
0188	REF	33	LAST 1174	4700	2K	=	BIT11	
0189	REF	34	LAST 1174	4700	EBANK4	=	BIT11	
0190	REF	30	LAST 1043	4677	PRIO4	=	BIT12	
0191	REF	2	LAST 496	4752	EBANK6	=	PRIO3	
0192	REF	42	LAST 1169	4676	QUARTER	=	BIT13	
0193	REF	43	LAST 1174	4676	PRIO10	=	BIT13	
01935	REF	1		7632	OCT10001	=	CCSL	
0194	REF	23	LAST 1160	4675	POS1/2	=	HALF	
0195	REF	69	LAST 1161	4675	PRIO20	=	BIT14	
0196	REF	70	LAST 1174	4675	HALF	=	BIT14	
0197	REF	5	LAST 380	4371	PRIO30	=	CHRPRIO	
0198	REF	13	LAST 1101	4371	BIT13-14	=	PRIO30	INTERPRETER USES IN PROCESSING STORECODE
01985	REF	3	LAST 1086	6440	OCT30002	=	TLOAD +1	
0199	REF	8	LAST 1071	7671	B12T14	=	PRIO34	
0200	REF	47	LAST 1167	4674	NEGMAX	=	BIT15	
0201	REF	48	LAST 1174	4674	VLOADCOD	=	BIT15	
0202	REF	1		6056	VLOAD*	=	OCT40001	
0203	REF	3	LAST 538	4105	OCT60000	=	RELTAB11	
0204	REF	5	LAST 328	4364	BANKMASK	=	HI5	

L INTERPRETIVE CONSTANTS USER=S PAGE NO. 1 E0 S3

```
0001  REP   1              26,2000                    SETLOC  INTPRET1
0002                       26,3321                    BANK

0003  REP   1                                         COUNT   23/ICNS

0004                       26,3321   10000 0  DP1/4TH  2DEC    .25
0004                       26,3322   00000 1
0005                       26,3323   00000 1  UNITZ    2DEC    0
0005                       26,3324   00000 1
0006                       26,3325   00000 1  UNITY    2DEC    0
0006                       26,3326   00000 1
0007                       26,3327   20000 0  UNITX    2DEC    .5
0007                       26,3330   00000 1
0008                       26,3331   00000 1  ZEROVECS 2DEC    0
0008                       26,3332   00000 1
0009                       26,3333   00000 1           2DEC    0
0009                       26,3334   00000 1
0010                       26,3335   00000 1           2DEC    0
0010                       26,3336   00000 1
0011  REP   7  LAST  672   26,3327              DPHALF   =       UNITX
0012                       26,3337   37777 1  DPPOSMAX OCT     37777
0013                       26,3340   37777 1           OCT     37777
```

L INTERPRETIVE CONSTANTS

P0014 INTERPRETIVE CONSTANTS IN THE OTHER HALF-MEMORY

```
0015  REF  1                04,2000                          SETLOC INTPRET2
0016                        04,3447                          BANK
0017  REF  1                                                 COUNT  14/ICONS
0018                        04,3447  00000 1  ZUNIT   2DEC   0
0018                        04,3450  00000 1
0019                        04,3451  00000 1  YUNIT   2DEC   0
0019                        04,3452  00000 1
0020                        04,3453  20000 0  XUNIT   2DEC   .5
0020                        04,3454  00000 1
0021                        04,3455  00000 1  ZEROVEC 2DEC   0
0021                        04,3456  00000 1
0022                        04,3457  00000 1          2DEC   0
0022                        04,3460  00000 1
0023                        04,3461  00000 1          2DEC   0
0023                        04,3462  00000 1
0024                        04,3463  77777 0          OCT    77777
0025                        04,3464  77771 0  DEC-6    DEC    -6          -0,-6,-12 MUST REMAIN IN THIS ORDER
0026                        04,3465  77763 0  DEC-12   DEC    -12
0027                        04,3466  37777 1  LODPMAX  2OCT   3777737777  THESE TWO CONSTANTS MUST REMAIN
0027                        04,3467  37777 1
0028                        04,3470  37777 1  LODPMAX1 2OCT   3777737777  ADJACENT AND THE SAME FOR INTEGRATION
0028                        04,3471  37777 1
0029  REF  5  LAST  722     04,3455           ZERODP   =      ZEROVEC
0030  REF  3  LAST   32     04,3453           HALFDP   =      XUNIT
```

L SINGLE PRECISION SUBROUTINES USER'S PAGE NO. 1 E0 S3

```
0001                          4767                                BLOCK  02
R0002  SINGLE PRECISION SINE AND COSINE

                                                                  COUNT  02/INTER
00025  REF   1                                                    AD     HALF      ARGUMENTS SCALED AT PI
0003   REF  24  LAST 1174     4767  6 4675 1  SPCOS              TS     TEMK
0004   REF   1                4770  55∝075 0  SPSIN              TCF    SPT
0005   REF   1                4771  1 4773 1                     CS     TEMK
0006   REF   2  LAST 1177     4772  4 1075 0
0007                          4773  6 0000 1  SPT                DOUBLE
0008   REF   3  LAST 1177     4774  55∝075 0                     TS     TEMK
0009   REF   1                4775  1 5006 0                     TCF    POLLEY
0010   REF   4  LAST 1177     4776  57∝075 1                     XCH    TEMK
0011   REF   5  LAST 1177     4777  51∝075 1                     INDEX  TEMK
0012   REF   6  LAST 1103     5000  6 4673 1                     AD     LIMITS
0013                          5001  4 0000 0                     COM
0014   REF   6  LAST 1177     5002  6 1075 1                     AD     TEMK
0015   REF   7  LAST 1177     5003  55∝075 0                     TS     TEMK
0016   REF   2  LAST 1177     5004  1 5006 0                     TCF    POLLEY
0017   REF   1                5005  1 5024 0                     TCF    ARG90
0018                          5006  0 0006 1  POLLEY             EXTEND
0019   REF   8  LAST 1177     5007  7 1075 0                     MP     TEMK
0020   REF   1                5010  55∝076 0                     TS     SQ
0021                          5011  0 0006 1                     EXTEND
0022   REF   1                5012  7 4742 0                     MP     C5/2
0023   REF   1                5013  6 7706 1                     AD     C3/2
0024                          5014  0 0006 1                     EXTEND
0025   REF   2  LAST 1177     5015  7 1076 0                     MP     SQ
0026   REF   1                5016  6 7666 0                     AD     C1/2
0027                          5017  0 0006 1                     EXTEND
0028   REF   9  LAST 1177     5020  7 1075 0                     MP     TEMK
0029                          5021  20 001 1                     DDOUBL
0030   REF  10  LAST 1177     5022  55∝075 0                     TS     TEMK
0031   REF 277  LAST 1169     5023  0 0002 0                     TC     Q
0032   REF 324  LAST 1169     5024  50 000 1  ARG90              INDEX  A
0033   REF   7  LAST 1177     5025  4 4673 0                     CS     LIMITS
0034   REF 278  LAST 1177     5026  0 0002 0                     TC     Q         RESULT SCALED AT 1
R0040          SPROOT WAS DELETED IN REV 51 OF MASTER. ASS. CONT. HAS CARDS.
```

```
0001
R0002          5027                                  BLOCK  02
               TO ENTER A JOB REQUEST REQUIRING NO VAC AREA'

00025  REP  1                                        COUNT  02/EXEC

00029
0003   REP  1          5027  0 0004 0  NOVAC   INHINT
00031  REP  3  LAST 411 5030  6 5121 0          AD     FAKEPRET   LOC(MPAC +6) - LOC(QPRET)
               5031  54 063 0          TS     NEWPRIO    PRIORITY OF NEW JOB + NOVAC C(FIXLOC)
0004
0005   REP 279 LAST 1177 5032  0 0006 1          EXTEND
0006               5033  5 0002 0          INDEX  Q          Q WILL BE UNDISTURBED THROUGHOUT.
0007   REP  1          5034  3 0001 0          DCA    0          2CADR OF JOB ENTERED.
0008   REP  1          5035  52 066 0          DXCH   NEWLOC
0009   REP 24  LAST 1120 5036  3 5120 1          CAF    EXECBANK
0010   REP  1          5037  56 004 0          XCH    FBANK
0011   REP  1          5040  54 061 1          TS     EXECTEM1
                       5041  1 2650 1          TCF    NOVAC2     ENTER EXECUTIVE BANK.

R0012          TO ENTER A JOB REQUEST REQUIRING A VAC AREA - E.G., ALL (PARTIALLY) INTERPRETIVE JOBS.

0014
00145  REP  4  LAST 1178 5042  0 0004 0  FINDVAC INHINT
0015               5043  54 063 0          TS     NEWPRIO
0016   REP 280 LAST 1178 5044  0 0006 1          EXTEND
0017               5045  5 0002 0          INDEX  Q
0018   REP  2  LAST 1178 5046  3 0001 0          DCA    0
0019   REP  2  LAST 1178 5047  52 066 0  SPVACIN DXCH   NEWLOC
0020   REP 25  LAST 1178 5050  3 5120 1          CAF    EXECBANK
0021   REP  1          5051  56 004 0          XCH    FBANK
                       5052  1 2626 0          TCF    FINDVAC2   OFF TO EXECUTIVE SWITCHED-BANK.

R00211         TO ENTER A FINDVAC WITH THE PRIORITY IN NEWPRIO TO THE 2CADR ARRIVING IN A AND L'

R002125        USERS OF SPVAC MUST INHINT BEFORE STORING IN NEWPRIO.

00213  REP 281 LAST 1178 5053  56 002 0  SPVAC  XCH    Q
00214  REP  5  LAST 1020 5054  6 7715 0          AD     NEG2
00215  REP 282 LAST 1178 5055  56 002 0          XCH    Q
00216  REP  1          5056  1 5047 0          TCF    SPVACIN

R0022          TO SUSPEND A BASIC JOB SO A HIGHER PRIORITY JOB MAY BE SERVICED'

0024   REP 283 LAST 1178 5057  22 002 0  CHANG1  LXCH   Q
0025   REP  3  LAST 1178 5060  3 5120 1          CAF    EXECBANK
0026   REP 20  LAST 1100 5061  56 006 1          XCH    BBANK
0027   REP  1          5062  1 2727 0          TCF    CHANJOB

R0030          TO SUSPEND AN INTERPRETIVE JOB'

0031   REP  28 LAST 1169 5063  4 0164 0  CHANG2  CS     LOC        NEGATIVE LOC SHOWS JOB = INTERPRETIVE.
R00315         ITRACE (4) REFERS TO &CHANG28.
```

L EXECUTIVE USER=S PAGE NO. 2 E0 S3

```
0032   REF 196  LAST 1157     5064  54 001 1          TS     L
0033   REF   4  LAST 1178     5065  3 5120 1   +2     CAP    EXECBANK
00335  REF  21  LAST 1178     5066  54 006 0           TS     BBANK
0034   REF   2  LAST 1178     5067  1 2726 1           TCF    CHANJOB -1
```

```
P0035           TO VOLUNTARILY SUSPEND A JOB UNTIL THE COMPLETION OF SOME ANTICIPATED EVENT (I/O EVENT ETC.)'

 0037   REF  29  LAST 1178     5070  54 164 0  JOBSLEEP TS    LOC
 0038   REF   5  LAST 1179     5071  3 5120 1           CAF   EXECBANK
 0039   REF  26  LAST 1178     5072  54 004 1           TS    FBANK
 0040   REF   1                5073  1 3017 0           TCF   JOBSLP1

R0041           TO AWAKEN A JOB PUT TO SLEEP IN THE ABOVE FASHION'

 0042                          5074  0 0004 0  JOBWAKE  INHINT
 00421  REF   3  LAST 1178     5075  54 065 0           TS    NEWLOC
 0043   REF  59  LAST 1117     5076  4 4711 0           CS    TWO         EXIT IS VIA FINDVAC/NOVAC PROCEDURES.
 0044   REF 284  LAST 1178     5077  26 002 1           ADS   Q
 0045   REF   6  LAST 1180     5100  3 5120 1           CAF   EXECBANK
 0046   REF  27  LAST 1180     5101  56 004 0           XCH   FBANK
 0047   REF   1                5102  1 3044 0           TCF   JOBWAKE2

R0048           TO CHANGE THE PRIORITY OF A JOB CURRENTLY UNDER EXECUTION'

 0049                          5103  0 0004 0  PRIOCHNG INHINT
 0050   REF   5  LAST 1178     5104  54 063 0           TS    NEWPRIO     NEW PRIORITY ARRIVES IN A. RETURNS TO
 0051   REF   7  LAST 1180     5105  3 5120 1           CAF   EXECBANK    CALLER AS SOON AS NEW JOB PRIORITY IS
 0052   REF  22  LAST 1179     5106  56 006 1           XCH   BBANK       HIGHEST. PREPARE FOR POSSIBLE BASIC-
 0053   REF   9  LAST 1100     5107  54 165 1           TS    BANKSET     STYLE CHANGE-JOB.
 0054   REF 285  LAST 1180     5110  3 0002 0           CA    Q
 0055   REF   1                5111  1 3113 0           TCF   PRIOCH2

R0058           TO REMOVE A JOB FROM EXECUTIVE CONSIDERATIONS'

 0059   REF   8  LAST 1180     5112  3 5120 1  ENDOFJOB CAF   EXECBANK
 0060   REF  28  LAST 1180     5113  54 004 1           TS    FBANK
 0061   REF   1                5114  1 3124 1           TCF   ENDJOB1

 0062   REF   2  LAST 1178     5115  3 0061 0  ENDFIND  CA    EXECTEM1    RETURN TO CALLER AFTER JOB ENTRY
 0063   REF  29  LAST 1180     5116  54 004 1           TS    FBANK       COMPLETE.
 0064   REF   1                5117  1 6710 0           TCF   Q+2
 0066   REF   2  LAST 1178     5120   02626 1  EXECBANK CADR  FINDVAC2

 00665  REF 635  LAST 1165     5121   00110 1  FAKEPRET ADRES  MPAC -36D   LOC(MPAC +6) - LOC(OPRET)
```

L EXECUTIVE

```
P0067           LOCATE AN AVAILABLE VAC AREA.

0068                              01,2626                    BANK    01
00685  REF   1                                               COUNT   01/EXEC

0069   REF   3  LAST 1180   01,2626  54 061 1  FINDVAC2  TS      EXECTEM1     (SAVE CALLER'S BANK FIRST.)
0070   REF   4  LAST  217   01,2627  10 400 1            CCS     VAC1USE
0071   REF   1              01,2630  1 2643 0            TCF     VACFOUND
0072   REF   3  LAST  217   01,2631  10 454 0            CCS     VAC2USE
0073   REF   2  LAST 1181   01,2632  1 2643 0            TCF     VACFOUND
0074   REF   3  LAST  217   01,2633  10 530 0            CCS     VAC3USE
0075   REF   3  LAST 1181   01,2634  1 2643 0            TCF     VACFOUND
0076   REF   3  LAST  217   01,2635  10 604 1            CCS     VAC4USE
0077   REF   4  LAST 1181   01,2636  1 2643 0            TCF     VACFOUND
0078   REF   3  LAST  217   01,2637  10 660 0            CCS     VAC5USE
0079   REF   5  LAST 1181   01,2640  1 2643 0            TCF     VACFOUND
0080   REF   4  LAST  561   01,2641  0 5604 0            TC      BAILOUT
0081                        01,2642   01201 0            OCT     1201         NO VAC AREAS.

0082   REF  60  LAST 1180   01,2643  6 4711 1  VACFOUND  AD      TWO          RESERVE THIS VAC AREA BY STORING A ZERO
0083                        01,2644  22 007 0            ZL                   IN ITS VAC USE REGISTER AND STORE THE
0084   REF 325  LAST 1177   01,2645  50 000 1            INDEX   A            ADDRESS OF THE FIRST WORD OF IT IN THE
0085                        01,2646  21'777 0            LXCH    0 -1         LOW NINE BITS OF THE PRIORITY WORD.
0086   REF   6  LAST 1180   01,2647  26 063 0            ADS     NEWPRIO

0087   REF 240  LAST 1161   01,2650  3 4714 1  NOVAC2    CAF     ZERO         NOVAC ENTERS HERE. FIND A CORE SET.
0088   REF   5  LAST  415   01,2651  54 064 1            TS      LOCCTR
0089   REF   1              01,2652  3 2657 1            CAF     NO.CORES     SEVEN SETS OF ELEVEN REGISTERS EACH.
0090   REF   1              01,2653  54 062 1  NOVAC3    TS      EXECTEM2
0091   REF   6  LAST 1181   01,2654  50 064 0            INDEX   LOCCTR       EACH PRIORITY REGISTER CONTAINS -0 IF
0092   REF   8  LAST  187   01,2655  10 187 0            CCS     PRIORITY     THE CORRESPONDING CORE SET IS AVAILABLE.
0093   REF   1              01,2656  1 2717 0            TCF     NEXTCORE
0094                        01,2657   00006 1  NO.CORES  DEC     6            AN ACTIVE JOB HAS A POSITIVE PRIORITY
0095   REF   2  LAST 1181   01,2660  1 2717 0            TCF     NEXTCORE     BUT A DORMANT JOB'S PRIORITY IS NEGATIVE
A0096
```

L EXECUTIVE

USER'S PAGE NO. 5 E0 S3

```
0097  REF   7  LAST 1181   01,2661  3 0063 1  CORFOUND CA    NEWPRIO
0098  REF   7  LAST 1181   01,2662  50 064 0            INDEX  LOCCTR
0099  REF   9  LAST 1181   01,2663  54 167 0            TS     PRIORITY
0100  REF   4  LAST  228   01,2664  7 4741 0            MASK   LOW9
0101  REF   8  LAST 1182   01,2665  50 064 0            INDEX  LOCCTR
0102  REF  19  LAST 1152   01,2666  54 166 1            TS     PUSHLOC

0103  REF   9  LAST 1182   01,2667  10 064 1            CCS    LOCCTR
0104  REF   1              01,2670  1 2704 1            TCF    SETLOC
0105  REF  11  LAST 1165   01,2671  54 121 1            TS     OVFIND
0106  REF  20  LAST 1182   01,2672  3 0166 0            CA     PUSHLOC
0107  REF  34  LAST 1166   01,2673  54 120 0            TS     FIXLOC

0108  REF   6  LAST 1078   01,2674  10 067 1  SPECTEST CCS    NEWJOB
0109  REF   2  LAST 1182   01,2675  1 2704 1            TCF    SETLOC
0110  REF  10  LAST 1169   01,2676  0 5640 0            TC     CCSHOLE
0111  REF  11  LAST 1182   01,2677  0 5640 0            TC     CCSHOLE
0112  REF   7  LAST 1182   01,2700  54 067 1            TS     NEWJOB
0113  REF   4  LAST 1180   01,2701  52 066 0            DXCH   NEWLOC
0114  REF  30  LAST 1180   01,2702  52 165 1            DXCH   LOC
0115  REF   1              01,2703  1 5115 0            TCF    ENDFIND

0116  REF   5  LAST 1182   01,2704  52 066 0  SETLOC    DXCH   NEWLOC
0117  REF  10  LAST 1182   01,2705  50 064 0            INDEX  LOCCTR
0118  REF  31  LAST 1182   01,2706  52 165 1            DXCH   LOC
0119  REF   8  LAST 1182   01,2707  50 067 0            INDEX  NEWJOB
0120  REF  10  LAST 1182   01,2710  4 0167 0            CS     PRIORITY
0121  REF   8  LAST 1182   01,2711  6 0063 1            AD     NEWPRIO
0122                       01,2712  0 0006 1            EXTEND
0123  REF   2  LAST 1182   01,2713  6 5115 1            BZMF   ENDFIND
0124  REF  11  LAST 1182   01,2714  3 0064 0            CA     LOCCTR
0125  REF   9  LAST 1182   01,2715  54 067 1            TS     NEWJOB
0126  REF   3  LAST 1182   01,2716  1 5115 0            TCF    ENDFIND

0127  REF   1              01,2717  3 3054 0  NEXTCORE  CAF    CORE INC
0128  REF  12  LAST 1182   01,2720  26 064 1            ADS    LOCCTR
0129  REF   2  LAST 1181   01,2721  10 062 1            CCS    EXECTEM2
0130  REF   1              01,2722  1 2653 1            TCF    NOVAC3
0131  REF   5  LAST 1181   01,2723  0 5604 0            TC     BAILOUT
0132                       01,2724  01202 0             OCT    1202
```

SET THE PRIORITY OF THIS JOB IN THE CORE SET'S PRIORITY REGISTER AND SET THE JOB'S PUSH-DOWN POINTER AT THE BEGINNING OF THE WORK AREA AND OVERFLOW INDICATOR

OFF TO PREPARE FOR INTERPRETIVE PROGRAMS

IF CORE SET ZERO IS BEING LOADED, SET UP OVFIND AND FIXLOC IMMEDIATELY .

SEE IF ANY ACTIVE JOBS WAITING (RARE). MUST BE AWAKENED BUT UNCHANGED JOB.

+0 SHOWS ACTIVE JOB ALREADY SET.

SET UP THE LOCATION REGISTERS FOR THIS

THIS INDEX INSTRUCTION INSURES THAT THE HIGHEST ACTIVE PRIORITY WILL BE COMPARED WITH THE NEW PRIORITY TO SEE IF NEWJOB SHOULD BE SET TO SIGNAL A SWITCH.

LOCCTR IS LEFT SET AT THIS CORE SET IF THE CALLER WANTS TO LOAD ANY MPAC REGISTERS, ETC.

NO CORE SETS.

P0133 THE FOLLOWING ROUTINE SWAPS CORE SET 0 WITH THAT WHOSE RELATIVE ADDRESS IS IN NEWJOB.

```
01345  REF  32  LAST 1182   01,2725  22 164 1   -2       LXCH   LOC
0135   REF  10  LAST 1180   01,2726  30 165 0   -1       CAE    BANKSET        BANKSET, NOT BBANK, HAS RIGHT CONTENTS.
0136                        01,2727  0 0004 0   CHANJOB  INHINT
01352                       01,2730  0 0006 1            EXTEND
01364  REF  14  LAST 1076   01,2731  04 007 1            ROR    SUPERBNK       PICK UP CURRENT SBANK FOR BBCON
01366  REF 197  LAST 1179   01,2732  56 001 0            XCH    L              LOC IN A AND BBCON IN L.
01368  REF  10  LAST 1182   01,2733  50 067 0   +4       INDEX  NEWJOB         SWAP LOC AND BANKSET.
0137   REF  33  LAST 1183   01,2734  52 165 1            DXCH   LOC
0138   REF  34  LAST 1183   01,2735  52 165 1            DXCH   LOC

01382  REF  11  LAST 1183   01,2736  30 165 0            CAE    BANKSET
01384                       01,2737  0 0006 1            EXTEND
01388  REF  15  LAST 1183   01,2740  01 007 1            WRITE  SUPERBNK       SET SBANK FOR NEW JOB.
0139   REF 636  LAST 1180   01,2741  52 155 1            DXCH   MPAC           SWAP MULTI-PURPOSE ACCUMULATOR AREAS.
0140   REF  11  LAST 1183   01,2742  50 067 0            INDEX  NEWJOB
0141   REF 637  LAST 1183   01,2743  52 155 1            DXCH   MPAC
0142   REF 638  LAST 1183   01,2744  52 155 1            DXCH   MPAC
0143   REF 639  LAST 1183   01,2745  52 157 0            DXCH   MPAC +2
0144   REF  12  LAST 1183   01,2746  50 067 0            INDEX  NEWJOB
0145   REF 640  LAST 1183   01,2747  52 157 0            DXCH   MPAC +2
0146   REF 641  LAST 1183   01,2750  52 157 0            DXCH   MPAC +2.
0147   REF 642  LAST 1183   01,2751  52 161 0            DXCH   MPAC +4
0148   REF  13  LAST 1183   01,2752  50 067 0            INDEX  NEWJOB
0149   REF 643  LAST 1183   01,2753  52 161 0            DXCH   MPAC +4
0150   REF 644  LAST 1183   01,2754  52 161 0            DXCH   MPAC +4
0151   REF 645  LAST 1183   01,2755  52 163 1            DXCH   MPAC +6
0152   REF  14  LAST 1183   01,2756  50 067 0            INDEX  NEWJOB
0153   REF 646  LAST 1183   01,2757  52 163 1            DXCH   MPAC +6
0154   REF 647  LAST 1183   01,2760  52 163 1            DXCH   MPAC +6

0155   REF 241  LAST 1181   01,2761  3 4714 1            CAF    ZERO
0156   REF  12  LAST 1182   01,2762  56 121 0            XCH    OVFIND         MAKE PUSHLOC NEGATIVE IF OVFIND NZ.
0157                        01,2763  0 0006 1            EXTEND
0158                        01,2764  1 2767 1            BZF    +3
0159   REF  21  LAST 1182   01,2765  4 0166 1            CS     PUSHLOC
0160   REF  22  LAST 1183   01,2766  54 166 1            TS     PUSHLOC

0161   REF  23  LAST 1183   01,2767  52 167 0            DXCH   PUSHLOC
0162   REF  15  LAST 1183   01,2770  50 067 0            INDEX  NEWJOB
0163   REF  24  LAST 1183   01,2771  52 167 0            DXCH   PUSHLOC
0164   REF  25  LAST 1183   01,2772  52 167 0            DXCH   PUSHLOC         SWAPS PUSHLOC AND PRIORITY.
0165   REF   5  LAST 1182   01,2773  3 4741 1            CAF    LOW9            SET FIXLOC TO BASE OF VAC AREA.
0166   REF  11  LAST 1182   01,2774  7 0167 0            MASK   PRIORITY
0167   REF  35  LAST 1182   01,2775  54 120 0            TS     FIXLOC

0168   REF  26  LAST 1183   01,2776  10 166 1            CCS    PUSHLOC         SET OVERFLOW INDICATOR ACCORDING TO
0169   REF 242  LAST 1183   01,2777  3 4714 1            CAF    ZERO
0170   REF   1              01,3000  1 3005 0            TCF    ENDPRCHG -1
```

L EXECUTIVE


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0171  REF  27  LAST 1183   01,3001  4 0166 1          CS      PUSHLOC
0172  REF  28  LAST 1184   01,3002  54 166 1          TS      PUSHLOC
0173  REF 141  LAST 1147   01,3003  3 4712 1          CAF     ONE
0174  REF  13  LAST 1183   01,3004  56 121 0          XCH     OVFIND
0175  REF  16  LAST 1183   01,3005  54 067 1          TS      NEWJOB

0176                       01,3006  0 0003 1  ENDPROG  RELINT
0177  REF  35  LAST 1183   01,3007  52 165 1          DXCH    LOC
0178                       01,3010  0 0006 1          EXTEND
0179                       01,3011  6 3013 0          BZMF    +2
0180                       01,3012  52 006 0          DTCB
```

BASIC JOBS HAVE POSITIVE ADDRESSES, SO
DISPATCH WITH A DTCB.
IF INTERPRETIVE, SET UP E2BANK, ETC.

```
0181                        01,3013  4 0000 0          COM                 EPILOGUE TO JOB CHANGE FOR INTERPRETIVE
0182   REF 142  LAST 1184   01,3014  6 4712 1          AD      ONE
0183   REF  36  LAST 1184   01,3015  54 164 0          TS      LOC         RESUME.
0186   REF   1              01,3016  1 6017 0          TCF     INTRSM

R0187          COMPLETE JOBSLEEP PREPARATIONS.

0188                        01,3017  0 0004 0 JOBSLP1  INHINT
0189   REF  12  LAST 1183   01,3020  4 0167 0          CS      PRIORITY    NNZ PRIORITY SHOWS JOB ASLEEP.
0190   REF  13  LAST 1185   01,3021  54 167 0          TS      PRIORITY
0191   REF   8  LAST 1119   01,3022  3 6043 0          CAF     LOW7
0192   REF  23  LAST 1180   01,3023  7 0006 0          MASK    BBANK
01921                       01,3024  0 0006 1          EXTEND
01922  REF  16  LAST 1183   01,3025  04 007 1          ROR     SUPERBNK    SAVE OLD SUPERBANK VALUE.
0193   REF  12  LAST 1183   01,3026  54 165 1          TS      BANKSET
0194   REF 243  LAST 1183   01,3027  4 4714 0          CS      ZERO
0195   REF 111  LAST 1155   01,3030  54 131 0 JOBSLP2  TS      BUF +1      HOLDS - HIGHEST PRIORITY.
0196   REF   1              01,3031  1 3141 1          TCF     EJSCAN      SCAN FOR HIGHEST PRIORITY ALA ENDOFJOB.

01961                       01,3032  0 0004 0 NUCHANG2 INHINT              QUICK... DONT LET NEWJOB CHANGE TO +0 .
019611 REF  17  LAST 1184   01,3033  10 067 1          CCS     NEWJOB
019612                      01,3034  1 3037 1          TCF     +3          NEWJOB STILL PNZ
019613                      01,3035  0 0003 1          RELINT              NEWJOB HAS CHANGED TO +0. WAKE UP JOB
019614 REF   1              01,3036  1 3233 1          TCF     ADVAN +2    VIA NUDIRECT. (VERY RARE CASE.)

01962  REF  61  LAST 1181   01,3037  3 4711 1          CAF     TWO
01963                       01,3040  0 0006 1          EXTEND
01964  REF  30  LAST  906   01,3041  05 011 1          WOR     DSALMOUT    TURN ON ACTIVITY LIGHT
01965  REF  37  LAST 1185   01,3042  52 165 1          DXCH    LOC         AND SAVE ADDRESS INFO FOR BENEFIT OF
01966  REF   3  LAST 1179   01,3043  1 2733 0          TCF     CHANJOB + 4  POSSIBLE SLEEPING JOB.
```

```
P0197          TO WAKE UP A JOB, EACH CORE SET IS FOUND TO LOCATE ALL JOBS WHICH ARE ASLEEP. IF THE FCADR IN THE
R0199  LOC REGISTER OF ANY SUCH JOB MATCHES THAT SUPPLIED BY THE CALLER, THAT JOB IS AWAKENED. IF NO JOB IS FOUND,
R0201  LOCCTR IS SET TO -1 AND NO FURTHER ACTION TAKES PLACE.

0202  REF   4  LAST 1181  01,3044  54 061 1  JOBWAKE2 TS    EXECTEM1
0203  REF 244  LAST 1185  01,3045  3 4714 1            CAF   ZERO          BEGIN CORE SET SCAN.
0204  REF  13  LAST 1182  01,3046  54 064 1            TS    LOCCTR
0205  REF   2  LAST 1181  01,3047  3 2657 1            CAF   NO.CORES
0206  REF   3  LAST 1182  01,3050  54 062 1  JOBWAKE4 TS    EXECTEM2
0207  REF  14  LAST 1186  01,3051  50 064 0            INDEX LOCCTR
0208  REF  14  LAST 1185  01,3052  10 167 0            CCS   PRIORITY
0209  REF   1              01,3053  1 3056 0            TCF   JOBWAKE3      ACTIVE JOB - CHECK NEXT CORE SET.
0210                       01,3054   00014 1  COREINC DEC   12            12 REGISTERS PER CORE SET.
0211  REF   1              01,3055  1 3065 0            TCF   WAKETEST      SLEEPING JOB - SEE IF CADR MATCHES.

0212  REF   2  LAST 1182  01,3056  3 3054 0  JOBWAKE3 CAF   CORE INC
0213  REF  15  LAST 1186  01,3057  26 064 1            ADS   LOCCTR
0214  REF   4  LAST 1186  01,3060  10 062 1            CCS   EXECTEM2
0215  REF   1              01,3061  1 3050 0            TCF   JOBWAKE4
0216  REF 143  LAST 1185  01,3062  4 4712 0            CS    ONE           EXIT IF SLEEPING JOB NOT FOUND.
0217  REF  16  LAST 1186  01,3063  54 064 1            TS    LOCCTR
0218  REF   4  LAST 1182  01,3064  1 5115 0            TCF   ENDFIND

0219  REF   6  LAST 1182  01,3065  4 0065 0  WAKETEST CS    NEWLOC
0220  REF  17  LAST 1186  01,3066  50 064 0            INDEX LOCCTR
0221  REF  38  LAST 1185  01,3067  6 0164 1            AD    LOC
0222                       01,3070  0 0006 1            EXTEND
0223                       01,3071  1 3073 1            BZF   +2            IF MATCH.
0224  REF   2  LAST 1186  01,3072  1 3056 0            TCF   JOBWAKE3      EXAMINE NEXT CORE SET IF NO MATCH.

0225  REF  18  LAST 1186  01,3073  50 064 0            INDEX LOCCTR        RE-COMPLEMENT PRIORITY TO SHOW JOB AWAKE
0226  REF  15  LAST 1186  01,3074  4 0167 0            CS    PRIORITY
0227  REF   9  LAST 1182  01,3075  54 063 0            TS    NEWPRIO
0228  REF  19  LAST 1186  01,3076  50 064 0            INDEX LOCCTR
0229  REF  16  LAST 1186  01,3077  54 167 0            TS    PRIORITY

0230  REF   1              01,3100  4 4364 0            CS    FBANKMSK
0231  REF   7  LAST 1186  01,3101  7 0065 0            MASK  NEWLOC        MAKE UP THE 2CADR OF THE WAKE ADDRESS
0232  REF   3  LAST 1098  01,3102  6 4700 1            AD    2K            USING THE CADR IN NEWLOC AND THE EBANK
0233  REF   8  LAST 1186  01,3103  56 065 1            XCH   NEWLOC        HALF OF BBANK SAVED IN BANKSET.
0234  REF   2  LAST 1186  01,3104  7 4364 0            MASK  FBANKMSK
0235  REF  20  LAST 1186  01,3105  50 064 0            INDEX LOCCTR
0236  REF  13  LAST 1185  01,3106  6 0165 0            AD    BANKSET
0237  REF   9  LAST 1186  01,3107  54 066 0            TS    NEWLOC +1

0238  REF  21  LAST 1186  01,3110  10 064 1            CCS   LOCCTR        SPECIAL TREATMENT IF THIS JOB WAS
0239  REF   3  LAST 1182  01,3111  1 2704 1            TCF   SETLOC        ALREADY IN THE RUN (0) POSITION.
0240  REF   1              01,3112  1 2674 1            TCF   SPECTEST
```

P0241 PRIORITY CHANGE. CHANGE THE CONTENTS OF PRIORITY AND SCAN FOR THE JOB OF HIGHEST PRIORITY.

```
0243   REF  39  LAST 1186   01,3113  54 164 0  PRIOCH2  TS      LOC
0244   REF 245  LAST 1186   01,3114  3 4714 1           CAF     ZERO        SET FLAG TO TELL ENDJOB SCANNER IF THIS
0245   REF 112  LAST 1185   01,3115  54 130 1           TS      BUF         JOB IS STILL HIGHEST PRIORITY.
0246   REF   6  LAST 1183   01,3116  3 4741 1           CAF     LOW9
0247   REF  17  LAST 1186   01,3117  7 0167 0           MASK    PRIORITY
0248   REF  10  LAST 1186   01,3120  6 0063 1           AD      NEWPRIO
0249   REF  18  LAST 1187   01,3121  54 167 0           TS      PRIORITY
0250                        01,3122  4 0000 0           COM
0251   REF   1              01,3123  1 3030 0           TCF     JOBSLP2     AND TO EJSCAN.
```

```
P0252          RELEASE THIS CORE SET AND VAC AREA AND SCAN FOR THE JOB OF HIGHEST ACTIVE PRIORITY.

0254                                01,3124  0 0004 0  ENDJOB1  INHINT
0255    REF 246  LAST 1187          01,3125  4 4714 0            CS     ZERO
0256    REF 113  LAST 1187          01,3126  54 131 0            TS     BUF +1
0257    REF  19  LAST 1187          01,3127  56 167 1            XCH    PRIORITY
0258    REF   7  LAST 1187          01,3130  7 4741 0            MASK   LOW9
02581   REF 198  LAST 1183          01,3131  54 001 1            TS     L

02582   REF   2  LAST 1178          01,3132  4 5121 1            CS     FAKEPRET
025821  REF 199  LAST 1188          01,3133  6 0001 0            AD     L

02583                               01,3134  0 0006 1            EXTEND
02584   REF   2  LAST 1185          01,3135  6 3141 0            BZMF   EJSCAN          NOVAC ENDOFJOB

0259    REF 200  LAST 1188          01,3136  10 001 1            CCS    L
0260    REF 326  LAST 1181          01,3137  50 000 1            INDEX  A
0261                                01,3140  54 000 0            TS     0

0262    REF  20  LAST 1188          01,3141  10 203 1  EJSCAN    CCS    PRIORITY +12D
0263    REF   1                     01,3142  0 3206 0            TC     EJ1
0264    REF  12  LAST 1182          01,3143  0 5640 0            TC     CCSHOLE
0265                                01,3144  1 3145 0            TCF    +1

0266    REF  21  LAST 1188          01,3145  10 217 1            CCS    PRIORITY +24D   EXAMINE EACH PRIORITY REGISTER TO FIND
0267    REF   2  LAST 1188          01,3146  0 3206 0            TC     EJ1             THE JOB OF HIGHEST ACTIVE PRIORITY.
0268    REF  13  LAST 1188          01,3147  0 5640 0            TC     CCSHOLE
0269                                01,3150  1 3151 0            TCF    +1

0270    REF  22  LAST 1188          01,3151  10 233 1            CCS    PRIORITY +36D
0271    REF   3  LAST 1188          01,3152  0 3206 0            TC     EJ1
0272    REF  23  LAST 1188          01,3153   67610 1  -CCSPR    -CCS   PRIORITY
0273                                01,3154  1 3155 1            TCF    +1

0274    REF  24  LAST 1188          01,3155  10 247 1            CCS    PRIORITY +48D
0275    REF   4  LAST 1188          01,3156  0 3206 0            TC     EJ1
0276    REF  14  LAST 1188          01,3157  0 5640 0            TC     CCSHOLE
0277                                01,3160  1 3161 0            TCF    +1

0278    REF  25  LAST 1188          01,3161  10 263 1            CCS    PRIORITY +60D
0279    REF   5  LAST 1188          01,3162  0 3206 0            TC     EJ1
0280    REF  15  LAST 1188          01,3163  0 5640 0            TC     CCSHOLE
0281                                01,3164  1 3165 1            TCF    +1

0282    REF  26  LAST 1188          01,3165  10 277 1            CCS    PRIORITY +72D
0283    REF   6  LAST 1188          01,3166  0 3206 0            TC     EJ1
0284    REF  16  LAST 1188          01,3167  0 5640 0            TC     CCSHOLE
0285                                01,3170  1 3171 1            TCF    +1
```

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P0286           EVALUATE THE RESULTS OF THE SCAN.

0287  REF 114  LAST 1188  01,3171  10 131 0        CCS   BUF +1      SEE IF THERE ARE ANY ACTIVE JOBS WAITING
0288  REF  17  LAST 1188  01,3172  0 5640 0        TC    CCSHOLE
0289  REF  18  LAST 1189  01,3173  0 5640 0        TC    CCSHOLE

0290                       01,3174  1 3176 0        TCF   +2
0291  REF   2  LAST  181  01,3175  1 3223 0        TCF   DUMMYJOB
0292  REF 115  LAST 1189  01,3176  10 130 1        CCS   BUF          BUF IS ZERO IF THIS IS A PRIOCHNG AND
0293                       01,3177  1 3201 0        TCF   +2           CHANGED PRIORITY IS STILL HIGHEST.
0294  REF   2  LAST 1183  01,3200  1 3005 0        TCF   ENDPRCHG -1

0295  REF 327  LAST 1188  01,3201  50 000 1        INDEX A            OTHERWISE, SET NEWJOB TO THE RELATIVE
0296                       01,3202  2=7777 0        CAF   0 -1         ADDRESS OF THE NEW JOB'S CORE SET.
0297  REF   1              01,3203  6 3153 0        AD    -CCSPR
0298  REF  18  LAST 1185  01,3204  54 067 1        TS    NEWJOB
0299  REF   4  LAST 1185  01,3205  1 2725 1        TCF   CHANJOB -2

0300  REF 116  LAST 1189  01,3206  54 132 0  EJ1   TS    BUF +2
0301  REF 117  LAST 1189  01,3207  6 0131 1        AD    BUF +1       - OLD HIGH PRIORITY.
0302  REF 328  LAST 1189  01,3210  10 000 0        CCS   A
0303  REF 118  LAST 1189  01,3211  4 0132 0        CS    BUF +2
0304  REF   1              01,3212  1 3216 0        TCF   EJ2          NEW HIGH PRIORITY.
0305                       01,3213  13 214 1        NOOP
0306  REF 286  LAST 1180  01,3214  50 002 0        INDEX Q
0307                       01,3215  0 0002 0        TC    2            PROCEED WITH SEARCH.

0308  REF 119  LAST 1189  01,3216  54 131 0  EJ2   TS    BUF +1
0309                       01,3217  0 0006 1        EXTEND
0310  REF 120  LAST 1189  01,3220  22 130 0        QXCH  BUF          FOR LOCATING CCS PRIORITY + X INSTR.
0311  REF 121  LAST 1189  01,3221  50 130 0        INDEX BUF
0312                       01,3222  0 0002 0        TC    2
```

```
P0314          IDLING AND COMPUTER ACTIVITY (GREEN) LIGHT MAINTENANCE. THE IDLING ROUTINE IS NOT A JOB IN ITSELF,
R0316  BUT RATHER A SUBROUTINE OF THE EXECUTIVE.

 0318  REF   4 LAST  257      1361                          EBANK= SELFRET        SELF-CHECK STORAGE IN EBANK.

 0319  REF 247 LAST 1188  01,3223  4 4714 0  DUMMYJOB CS    ZERO
 0320  REF  19 LAST 1189  01,3224  54 067 1           TS    NEWJOB                SET NEWJOB TO -0 FOR IDLING.
 0321                     01,3225  0 0003 1           RELINT
 0322  REF  62 LAST 1185  01,3226  4 4711 0           CS    TWO
 0323                     01,3227  0 0006 1           EXTEND                      TURN OFF THE ACTIVITY LIGHT.
 0324  REF  31 LAST 1185  01,3230  03 011 1           WAND  DSALMOUT
 0328  REF  20 LAST 1190  01,3231  10 067 1  ADVAN    CCS   NEWJOB               IS A NEWJOB ACTIVE +
 0329  REF   1            01,3232  1 3032 1           TCF   NUCHANG2              YES... ONE REQUIRING A CHANGE JOB.
 0330  REF  63 LAST 1190  01,3233  3 4711 1           CAF   TWO                   NEW JOB ALREADY IN POSITION FOR
 0331  REF   1            01,3234  1 3242 1           TCF   NUDIRECT              EXECUTION.

 03317 REF   5 LAST 1190  01,3235  3 1361 1           CA    SELFRET
 03318 REF 201 LAST 1188  01,3236  54 001 1           TS    L                     PUT RETURN ADDRESS IN L.
 0332  REF   1            01,3237  3 3241 0           CAF   SELFBANK
 0333  REF   4 LAST  622  01,3240  1 5123 0           TCF   SUPDXCHZ + 1          AND DISPATCH JOB.

 03338 REF   6 LAST 1190      1361                      EBANK= SELFRET
 0334  REF   3 LAST  257  01,3241   66102 1  SELFBANK  BBCON  SELFCHK

 0335                     01,3242  0 0006 1  NUDIRECT  EXTEND
 0336  REF  32 LAST 1190  01,3243  05 011 1           WOR   DSALMOUT              TURN THE GREEN LIGHT BACK ON.
 0337  REF  40 LAST 1187  01,3244  52 165 1           DXCH  LOC
 03372 REF   5 LAST 1190  01,3245  1 5122 1           TCF   SUPDXCHZ              JOBS STARTED IN THIS FASHION MUST BE

 03378                        5122                    BLOCK 2                     IN FIXED-FIXED SO OTHERS MAY USE.

 03379  REF  2 LAST 1178 TO 1181*   59    59*         COUNT 02/EXEC

R033791 SUPDXCHZ - ROUTINE TO TRANSFER TO SUPERBANK.
R033792 CALLING SEQUENCE
A033793
                                                      TCF   SUPDXCHZ              WITH 2CADR OF DESIRED LOCATION IN A + L.

 0338  REF 202 LAST 1190      5122  56 001 0  SUPDXCHZ XCH   L
 03381                        5123  0 0006 1  +1       EXTEND                    BASIC.
 03382 REF  17 LAST 1185      5124  01 007 1           WRITE SUPERBNK
 03383 REF  24 LAST 1185      5125  54 006 0           TS    BBANK
 03384 REF 203 LAST 1190      5126  0 0001 0           TC    L

 0339                         5127  77677 1  NEG100   OCT   77677
                                                              %
```

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DATE - 10 OCTOBER 1966
LOG SECTION - WAITLIST
ASSEMBLY SUNBURST REV 5

```
R0001   PROGRAM DESCRIPTION
R0003   MOD NO - 2
R0005   MOD BY - MILLER   (DTMAX INCREASED TO 162.5 SEC)
R00072  MOD 3 BY KERNAN  (INHINT INSERTED AT WAITLIST)  2/28/68 SKIPPER REV 4

R00073  MOD 4BY KERNAN (TWIDDLE IN 54)  3/28/68 SKIPPER REV 13.
R000799

R0008   FUNCTIONAL DESCRIPTION-
R0009           PART OF A SECTION OF PROGRAMS,-WAITLIST, TASKOVER, T3RUPT, USED  TO CALL A PROGRAM, (CALLED A TASK),
R0011     WHICH IS TO BEGIN IN C(A) CENTISECONDS.  WAITLIST UPDATES TIME3, LST1 AND LST2. THE MEANING OF THESE LISTS
R0013     FOLLOW.

R0014                   C(TIME3)  = 16384 -(T1-T) CENTISECONDS, (T=PRESENT TIME, T1-TIME FOR TASK1)
R0016

R0017                                C(LST1)     = -(T2-T1)+1
R0018                                C(LST1 +1)  = -(T3-T2)+1
R0019                                C(LST1 +2)  = -(T4-T3)+1
R0020                                      .
R0021                                      .
R0022                                C(LST1 +6)  = -(T8-T7)+1
R0023                                C(LST1 +7)  = -(T9-T8)+1

R0024                                C(LST2)     = 2CADR OF TASK1
R0025                                C(LST2 +2)  = 2CADR OF TASK2
R0026                                      .
R0027                                      .
R0028                                C(LST2 +14)= 2CADR OF TASK8
R0029                                C(LST2 +16)= 2CADR OF TASK9

R0030   WARNINGS-
R0031   --------
R0032               1) 1 +- C(A) +- 16250D (1 CENTISECOND TO 162.5 SEC)
R0033               2) 9 TASKS MAXIMUM
R0034               3) TASKS CALLED UNDER INTERRUPT INHIBITED
R0035               4) TASKS END BY TC TASKOVER

R0036   CALLING SEQUENCE-

R0037               L-1    CA     DELTAT   (TIME IN CENTISECONDS TO TASK START)
R0039               L      TC     WAITLIST
R0040               L+1    2CADR  DESIRED TASK
R0041               L+2    (MINOR OF 2CADR)
R0042               L+3    RELINT          (RETURNS HERE)

R00421  TWIDDLE-
R00422  -------
R00423              TWIDDLE IS FOR USE WHEN THE TASK BEING SET UP IS IN THE SAME EBANK AND FBANK AS THE USER.  IN
R00425              SUCH CASES, IT IMPROVES UPON WAITLIST BY ELIMINATING THE NEED FOR THE ARCON HALF OF THE 2CADR,
```

```
R00427              SAVING A WORD.  TWIDDLE IS LIKE WAITLIST IN EVERY RESPECT EXCEPT CALLING SEQUENCE, TO WIT-

R0043               L-1   CA    DELTAT
R00431              L     TC    TWIDDLE
R00432              L+1   ADRES DESIRED TASK
R00433              L+2   RELINT                (RETURNS HERE)

R00439 NORMAL EXIT MODES-

R0044               AT L+3 OF CALLING SEQUENCE

R0045  ALARM OR ABORT EXIT MODES-

R0046               TC    ABORT
R0047               OCT   1203   (WAITLIST OVERFLOW - TOO MANY TASKS)

R0048  ERASABLE INITIALIZATION REQUIRED-

R0049               ACCOMPLISHED BY FRESH START,--LST2,..., LST2 +16 =ENDTASK
R0050                                            LST1,..., LST1 +7  =NEG1/2

R0051  OUTPUT--

R0052               LST1 AND LST2 UPDATED WITH NEW TASK AND ASSOCIATED TIME.
R0053  DEBRIS-

R0054               CENTRALS- A,Q,L
R0055               OTHER  - WAITEXIT, WAITADR, WAITTEMP, WAITBANK
R0056  DETAILED ANALYSIS OF TIMING-

R0057       CONTROL WILL NOT BE RETURNED TO THE SPECIFIED ADDRESS (2CADR)  IN EXACTLY DELTA T CENTISECONDS.
R0059    THE APPROXIMATE TIME MAY BE CALCULATED AS FOLLOWS

R0060           LET TO = THE TIME OF THE TC WAITLIST
R0061           LET TS = TO +147U + COUNTER INCREMENTS (SET UP TIME)
R0062           LET X  = TS -(100TS)/100  (VARIANCE FROM COUNTERS)
R0063           LET Y  = LENGTH OF TIME OF INHIBIT INTERRUPT AFTER T3RUPT
R0064           LET Z  = LENGTH OF TIME TO PROCESS TASKS WHICH ARE DUE THIS T3RUPT BUT DISPATCHED EARLIER.
R0066    (Z=0, USUALLY)
R0067           LET DELTD = THE ACTUAL TIME TAKEN TO GIVE CONTROL TO 2CADR
R0068         THEN  DELTD = TS+DELTA T -X +Y +Z +1.05MS* +COUNTERS*
R0069    *-THE TIME TAKEN BY WAITLIST ITSELF AND THE COUNTER TICKING DURING THIS WAITLIST TIME.
R0071

R0072       IN SHORT, THE ACTUAL TIME TO RETURN CONTROL TO A 2CADR IS AUGMENTED BY THE TIME TO SET UP THE TASK'S
R0074    INTERRUPT, ALL COUNTERS TICKING, THE T3RUPT PROCESSING TIME, THE WAITLIST PROCESSING TIME AND THE POSSIBILITY
R0076    OF OTHER TASKS INHIBITING THE INTERRUPT.
0077                        5130                    BLOCK 02
```

```
0078   REF  14  LAST  189   E3,1400                          EBANK= LST1          TASK  LISTS IN SWITCHED E BANK.

0079   REF   1                                               COUNT  02/WAIT

00795                                5130   0 0004 0  TWIDDLE  INHINT
0080   REF 204  LAST 1190            5131   54 001 1           TS     L           SAVE DELAY TIME IN L
0081   REF  35  LAST 1155            5132   3 4672 0           CA     POSMAX
0082   REF 287  LAST 1189            5133   26 002 1           ADS    Q           CREATING OVERFLOW AND Q-1 IN Q
0083   REF  25  LAST 1190            5134   3 0006 1           CA     BBANK
00832                                5135   0 0006 1           EXTEND
00834  REF  18  LAST 1190            5136   04 007 1           ROR    SUPERBNK
0084   REF 205  LAST 1193            5137   56 001 0           XCH    L

00849                                5140   0 0004 0  WAITLIST INHINT
0085   REF 288  LAST 1193            5141   56 002 0           XCH    Q           SAVE DELTA T IN Q AND RETURN IN
0086   REF   1                      5142   54 061 1           TS     WAITEXIT    WAITEXIT.
0087                                5143   0 0006 1           EXTEND
0088   REF   2  LAST 1193            5144   5 0061 0           INDEX  WAITEXIT    IF TWIDDLING, THE TS SKIPS TO HERE
0089                                5145   3 0001 0           DCA    0           PICK UP 2CADR OF TASK.
0090   REF   1                      5146   54 063 0  -1       TS     WAITADR     BBCON WILL REMAIN IN L
0091   REF   1                      5147   3 5155 0  DLY2     CAF    WAITBB      ENTRY FROM FIXDELAY AND VARDELAY.
0092   REF  26  LAST 1193            5150   56 006 1           XCH    BBANK
0093   REF   1                      5151   1 3246 0           TCF    WAIT2

R0094          RETURN TO CALLER AFTER TASK INSERTION'

0095   REF   3  LAST 1193            5152   52 062 1  LVWTLIST DXCH   WAITEXIT
0096   REF  64  LAST 1190            5153   6 4711 1           AD     TWO
0097                                5154   52 006 0           DTCB

0099   REF  15  LAST 1193   E3,1400                          EBANK= LST1
0100   REF   2  LAST 1193            5155    02063 0  WAITBB   BBCON  WAIT2

R0101          RETURN TO CALLER +2 AFTER WAITING DT SPECIFIED AT CALLER +1.

0102   REF 289  LAST 1193            5156   50 002 0  FIXDELAY INDEX  Q           BOTH ROUTINES MUST BE CALLED UNDER
0103                                5157   3 0000 1           CAF    0           WAITLIST CONTROL AND TERMINATE THE TASK
0104   REF 290  LAST 1193            5160   24 002 0           INCR   Q           IN WHICH THEY WERE CALLED.

R0105          RETURN TO CALLER +1 AFTER WAITING THE DT AS ARRIVING IN A.

0106   REF 291  LAST 1193            5161   56 002 0  VARDELAY XCH    Q           DT TO Q. TASK ADRES TO WAITADR.
0107   REF   2  LAST 1193            5162   54 063 0           TS     WAITADR
0108   REF  27  LAST 1193            5163   3 0006 1           CA     BBANK       BBANK IS SAVED DURING DELAY.
0109                                5164   0 0006 1           EXTEND
0110   REF  19  LAST 1193            5165   04 007 1           ROR    SUPERBNK    ADD SBANK TO BBCON.
0111   REF 206  LAST 1193            5166   54 001 1           TS     L
0112   REF   1                      5167   3 5172 0           CAF    DELAYEX
0113   REF   4  LAST 1193            5170   54 061 1           TS     WAITEXIT    GO TO TASKOVER AFTER TASK ENTRY.
0114   REF   1                      5171   1 5147 1           TCF    DLY2
```

L WAITLIST

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0115 REP 56 LAST 1059 5172 1 5211 1 DELAYEX TCP TASKOVER -2 RETURNS TO TASKOVER

R0116 ENDTASK MUST BE ENTERED IN FIXED-FIXED SO IT IS DISTINGUISHABLE BY ITS ADRES ALONE.

```
0118  REF  16  LAST 1193   E3,1400                          EBANK= LST1
0119  REF   1               5173   72602 0  ENDTASK -2CADR  SVCT3
0119  REF   1               5174   73714 1

0120  REF  18  LAST 1038    5175   10 076 1  SVCT3   CCS    FLAGWRD2     DRIFT FLAG
0121  REF  57  LAST 1194    5176   1 5213 0          TCF    TASKOVER
0122  REF  58  LAST 1195    5177   1 5213 0          TCF    TASKOVER
0123                        5200   1 5201 0          TCF    +1

01231 REF   2  LAST  188    5201   11"322 1          CCS    IMUCADR      DON'T DO NBDONLY IF SOMEONE ELSE IS IN
01232 REF  59  LAST 1195    5202   1 5213 0          TCF    TASKOVER     IMUSTALL.
01233                       5203   1 5206 1          TCF    +3
01234 REF  60  LAST 1195    5204   1 5213 0          TCF    TASKOVER
01235 REF  61  LAST 1195    5205   1 5213 0          TCF    TASKOVER

0124  REF   1               5206   3 7672 0    +3    CAF    PRIO35       COMPENSATE FOR NBD COEFFICIENTS ONLY.
0125  REF  30  LAST  986    5207   0 5027 1          TC     NOVAC            ENABLE EVERY 81.93 SECONDS
0126  REF   7  LAST  776   E3,1460                   EBANK= NBDX
0127  REF   1               5210    03542 1          2CADR  NBDONLY
0127  REF   1               5211    14063 1
0128  REF  62  LAST 1195    5212   1 5213 0          TCF    TASKOVER
```

```
P0129          BEGIN TASK INSERTION.

 0130
 0131  REF  1                  01,3246                    BANK   01
                                                         COUNT  01/WAIT

 0132  REF  1                  01,3246  54 062 1  WAIT2   TS     WAITBANK      BBANK OF CALLING PROGRAM.
 0133  REF  2  LAST  186       01,3247  4 0026 1          CS     TIME3
 0134  REF 27  LAST 1128       01,3250  6 4703 1          AD     BIT8          BIT 8 = OCT 200
 0135  REF 329 LAST 1189       01,3251  10 000 0          CCS    A             TEST 200 - C(TIME3).  IF POSITIVE,
A0136                                                                          C(TIME3) = T - T1, INSTEAD OF 1.0 - (T1 - T).  THE FOLLOWING FOUR
A0137                                                                          ORDERS SET C(A) = TD - T1 + 1 IN EITHER CASE.
A0138

 0139  REF  2  LAST 1174       01,3252  6 6056 1          AD     OCT40001      OVERFLOW HAS OCCURRED.  SET C(A) =
 0140  REF 330 LAST 1196       01,3253  4 0000 0          CS     A             T - T1 + 1.0 - 201

R0141  NORMAL CASE (C(A) NNZ) YIELDS SAME C(A)'  -( -(1.0-(T1-T)) + 200) - 1

 0142  REF  1                  01,3254  6 3402 1          AD     OCT40201
 0143  REF 292  LAST 1193      01,3255  6 0002 0          AD     Q             RESULT = TD - T1 + 1.

 0144  REF 331  LAST 1196      01,3256  10 000 0          CCS    A             TEST TD - T1 + 1

 0145  REF  17  LAST 1195      01,3257  6 1400 1          AD     LST1
 0146  REF   1                 01,3260  1 3322 0          TCF    WTLST5        IF TD - T1 POS, GO TO WTLST5 WITH
                                                                               C(A) = (TD - T1) + C(LST1) = TD-T2+1
 0147
 0148  REF 293  LAST 1196      01,3261  13 262 0          NOOP
                               01,3262  4 0002 1          CS     Q

R0149  NOTE THAT THIS PROGRAM SECTION IS NEVER ENTERED WHEN T-T1 G/E -1,
R0150  SINCE TD-T1+1 = (TD-T) + (T-T1+1), AND DELTA T = TD-T G/E +1 .  (G/E
R0151  SYMBOL MEANS GREATER THAN OR EQUAL TO).  THUS THERE NEED BE NO CON-
R0152  CERN OVER A PREVIOUS OR IMMINENT OVERFLOW OF TIME3 HERE.

 0153  REF   8  LAST 1057      01,3263  6 4675 1          AD     POS1/2
 0154  REF   9  LAST 1196      01,3264  6 4675 1          AD     POS1/2        WHEN TD IS NEXT, FORM QUANTITY
 0155  REF   3  LAST 1196      01,3265  56 026 0          XCH    TIME3           1.0 - DELTA T = 1.0 - (TD - T)
 0156  REF  12  LAST 1118      01,3266  6 4674 0          AD     NEGMAX
 0157  REF 294  LAST 1196      01,3267  6 0002 0          AD     Q
 0158                          01,3270  0 0006 1          EXTEND                1.0 - DELTAT T NOW COMPLETE.
 0159                          01,3271  22 007 0          QXCH   7              ZERO INDEX Q.
                                                                               (ZQ)
```

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```
0160  REF  18  LAST 1196   01,3272  57=400 1  WTLST4  XCH   LST1
0161  REF  19  LAST 1197   01,3273  57=401 0          XCH   LST1 +1
0162  REF  20  LAST 1197   01,3274  57=402 0          XCH   LST1 +2
0163  REF  21  LAST 1197   01,3275  57=403 1          XCH   LST1 +3
0164  REF  22  LAST 1197   01,3276  57=404 0          XCH   LST1 +4
0165  REF  23  LAST 1197   01,3277  57=405 1          XCH   LST1 +5
0166  REF  24  LAST 1197   01,3300  57=406 1          XCH   LST1 +6
0167  REF  25  LAST 1197   01,3301  57=407 0          XCH   LST1 +7

0168  REF   3  LAST 1193   01,3302  3 0063 1          CA    WAITADR    (MINOR PART OF TASK CADR HAS BEEN IN L.)
0169  REF 295  LAST 1196   01,3303  50 002 0          INDEX Q
0170                       01,3304  1 3305 0          TCF   +1

0171  REF  19  LAST  187   01,3305  53=411 0          DXCH  LST2
0172  REF  20  LAST 1197   01,3306  53=413 1          DXCH  LST2 +2
0173  REF  21  LAST 1197   01,3307  53=415 1          DXCH  LST2 +4
0174  REF  22  LAST 1197   01,3310  53=417 0          DXCH  LST2 +6
0175  REF  23  LAST 1197   01,3311  53=421 0          DXCH  LST2 +8D
0176  REF  24  LAST 1197   01,3312  53=423 1          DXCH  LST2 +10D   AT END, CHECK THAT C(LST2+10) IS STD
0177  REF  25  LAST 1197   01,3313  53=425 1          DXCH  LST2 +12D
0178  REF  26  LAST 1197   01,3314  53=427 0          DXCH  LST2 +14D
0179  REF  27  LAST 1197   01,3315  53=431 1          DXCH  LST2 +16D
0180  REF   3  LAST  187   01,3316  6 5173 1          AD    ENDTASK      END ITEM, AS CHECK FOR EXCEEDING
A0181                                                                   THE LENGTH OF THE LIST.
0182                       01,3317  0 0006 1          EXTEND             DUMMY TASK ADRES SHOULD BE IN FIXED-
0183  REF   1              01,3320  1 5152 0          BZF   LVWTLIST     FIXED SO ITS ADRES ALONE DISTINGUISHES
0184  REF   1              01,3321  1 3375 1          TCF   WTABORT      IT.
```

```
0185  REF 332  LAST 1196    01,3322  10 000 0  WTLST5   CCS   A        TEST  TD - T2 + 1
0186  REF  26  LAST 1197    01,3323  6 1401 0           AD    LST1 +1
0187                        01,3324  1 3330 0           TCF   +4
0188  REF 144  LAST 1186    01,3325  6 4712 1           AD    ONE
0189  REF   1               01,3326  0 3403 0           TC    WTLST2
0190                        01,3327   00001 0           OCT   1

0191  REF 333  LAST 1198    01,3330  10 000 0  +4       CCS   A        TEST  TD - T3 + 1
0192  REF  27  LAST 1198    01,3331  6 1402 0           AD    LST1 +2
0193                        01,3332  1 3336 0           TCF   +4
0194  REF 145  LAST 1198    01,3333  6 4712 1           AD    ONE
0195  REF   2  LAST 1198    01,3334  0 3403 0           TC    WTLST2
0196                        01,3335   00002 0           OCT   2

0197  REF 334  LAST 1198    01,3336  10 000 0  +4       CCS   A        TEST  TD - T4 + 1
0198  REF  28  LAST 1198    01,3337  6 1403 1           AD    LST1 +3
0199                        01,3340  1 3344 0           TCF   +4
0200  REF 146  LAST 1198    01,3341  6 4712 1           AD    ONE
0201  REF   3  LAST 1198    01,3342  0 3403 0           TC    WTLST2
0202                        01,3343   00003 1           OCT   3

0203  REF 335  LAST 1198    01,3344  10 000 0  +4       CCS   A        TEST  TD - T5 + 1
0204  REF  29  LAST 1198    01,3345  6 1404 0           AD    LST1 +4
0205                        01,3346  1 3352 1           TCF   +4
0206  REF 147  LAST 1198    01,3347  6 4712 1           AD    ONE
0207  REF   4  LAST 1198    01,3350  0 3403 0           TC    WTLST2
0208                        01,3351   00004 0           OCT   4

0209  REF 336  LAST 1198    01,3352  10 000 0  +4       CCS   A        TEST  TD - T6 + 1
0210  REF  30  LAST 1198    01,3353  6 1405 1           AD    LST1 +5
0211                        01,3354  1 3360 0           TCF   +4
0212  REF 148  LAST 1198    01,3355  6 4712 1           AD    ONE
0213  REF   5  LAST 1198    01,3356  0 3403 0           TC    WTLST2
0214                        01,3357   00005 1           OCT   5

0215  REF 337  LAST 1198    01,3360  10 000 0  +4       CCS   A        TEST  TD - T7 + 1
0216  REF  31  LAST 1198    01,3361  6 1406 1           AD    LST1 +6
0217                        01,3362  1 3366 0           TCF   +4
0218  REF 149  LAST 1198    01,3363  6 4712 1           AD    ONE
0219  REF   6  LAST 1198    01,3364  0 3403 0           TC    WTLST2
0220                        01,3365   00006 1           OCT   6
```

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```
0221  REP 338  LAST 1198   01,3366  10 000 0   +4         CCS   A
0222  REP  32  LAST 1198   01,3367  6 1407 0              AD    LST1 +7
0223                       01,3370  1 3374 0              TCF   +4
0224  REP 150  LAST 1198   01,3371  6 4712 1              AD    ONE
0225  REP   7  LAST 1198   01,3372  0 3403 0              TC    WTLST2
0226                       01,3373   00007 0              OCT   7

0227  REP 339  LAST 1199   01,3374  10 000 0   +4         CCS   A
0228  REP   8  LAST 1182   01,3375  0 5604 0   WTABORT    TC    BAILOUT     NO ROOM IN THE INN.
0229                       01,3376   01203 1              OCT   1203

0230  REP 151  LAST 1199   01,3377  6 4712 1              AD    ONE
0231  REP   8  LAST 1199   01,3400  0 3403 0              TC    WTLST2
0232                       01,3401   00010 0              OCT   10

0233                       01,3402   40201 0   OCT40201   OCT   40201
```

P0234 THE ENTRY TO WTLST2 JUST PRECEDING OCT N IS FOR T LE TD LE T $_{N+1}$ -1.
R0235 $_{N}$

R0236 (LE MEANS LESS THAN OR EQUAL TO). AT ENTRY, C(A) = -(TD - T $_{N+1}$ + 1)
R0237

R0238 THE LST1 ENTRY -(T $_{N+1}$ - T $_{N}$ +1) IS TO BE REPLACED BY -(TD - T $_{N}$ + 1), AND
R0239

R0240 THE ENTRY -(T $_{N+1}$ - TD + 1) IS TO BE INSERTED IMMEDIATELY FOLLOWING.
R0241

```
0242  REF   1                01,3403  54 064 1  WTLST2  TS      WAITTEMP      C(A) = -(TD - T    + 1)
0243  REF 296  LAST 1197     01,3404  50 002 0           INDEX   Q                                  N+1
0244                         01,3405  3 0000 1           CAF     0
0245  REF 297  LAST 1200     01,3406  54 002 1           TS      Q             INDEX VALUE INTO Q.

0246  REF 152  LAST 1199     01,3407  3 4712 1           CAF     ONE
0247  REF   2  LAST 1200     01,3410  6 0064 0           AD      WAITTEMP
0248  REF 298  LAST 1200     01,3411  50 002 0           INDEX   Q             C(A) = -(TD - T ) + 1.
0249  REF  33  LAST 1199     01,3412  27∝377 1           ADS     LST1 -1                          N

0250  REF   3  LAST 1200     01,3413  4 0064 1           CS      WAITTEMP
0251  REF 299  LAST 1200     01,3414  50 002 0           INDEX   Q
0252  REF   1                01,3415  1 3272 1           TCF     WTLST4
```

R0253 C(TIME3) = 1.0 - (T1 - T)

R0254 C(LST1) = - (T2 - T1) + 1
R0255 C(LST1+1) = - (T3 - T2) + 1
R0256 C(LST1+2) = - (T4 - T3) + 1
R0257 C(LST1+3) = - (T5 - T4) + 1
R0258 C(LST1+4) = - (T6 - T5) + 1

R0259 C(LST2) = 2CADR TASK1
R0260 C(LST2+2) = 2CADR TASK2
R0261 C(LST2+4) = 2CADR TASK3
R0262 C(LST2+6) = 2CADR TASK4
R0263 C(LST2+8) = 2CADR TASK5
R0264 C(LST2+10) = 2CADR TASK6

P0265 ENTERS HERE ON T3 RUPT TO DISPATCH WAITLISTED TASK.

```
0266                        01,3416  0 0006 1  T3RUPT    EXTEND
0267  REF  20  LAST 1193   01,3417  04 007 1            ROR     SUPERBNK     READ CURRENT SUPERBANK VALUE AND
0268  REF  22  LAST 1066   01,3420  54 016 1            TS      BANKRUPT     SAVE WITH E AND F BANK VALUES.
0269                        01,3421  0 0006 1            EXTEND
0270  REF  18  LAST 1066   01,3422  22 012 1            QXCH    QRUPT

0271  REF   9  LAST 1170   01,3423  3 4673 1  T3RUPT2   CAF     NEG1/2       DISPATCH WAITLIST TASK.
0272  REF  34  LAST 1200   01,3424  57=407 0            XCH     LST1 +7
0273  REF  35  LAST 1201   01,3425  57=406 1            XCH     LST1 +6
0274  REF  36  LAST 1201   01,3426  57=405 1            XCH     LST1 +5
0275  REF  37  LAST 1201   01,3427  57=404 0            XCH     LST1 +4      1. MOVE UP LST1 CONTENTS, ENTERING
0276  REF  38  LAST 1201   01,3430  57=403 1            XCH     LST1 +3         A VALUE OF 1/2 +1 AT THE BOTTOM
0277  REF  39  LAST 1201   01,3431  57=402 0            XCH     LST1 +2         FOR T6-T5, CORRESPONDING TO THE
0278  REF  40  LAST 1201   01,3432  57=401 0            XCH     LST1 +1         INTERVAL 81.91 SEC FOR ENDTASK.
0279  REF  41  LAST 1201   01,3433  57=400 1            XCH     LST1
0280  REF  36  LAST 1193   01,3434  6 4672 0            AD      POSMAX       2. SET T3 = 1.0 - T2 -T USING LIST 1.
0281  REF   4  LAST 1196   01,3435  26 026 1            ADS     TIME3        SO T3 WONT TICK DURING UPDATE.
0282  REF   3  LAST  577   01,3436  54 734 0            TS      RUPTAGN
0283  REF 248  LAST 1190   01,3437  4 4714 0            CS      ZERO
0284  REF   4  LAST 1201   01,3440  54 734 0            TS      RUPTAGN      SETS RUPTAGN TO +1 ON OVERFLOW.

0285                        01,3441  0 0006 1            EXTEND               DISPATCH TASK.
0286  REF   4  LAST 1197   01,3442  4 5174 1            DCS     ENDTASK
0287  REF  28  LAST 1197   01,3443  53=431 1            DXCH    LST2 +16D
0288  REF  29  LAST 1201   01,3444  53=427 0            DXCH    LST2 +14D
0289  REF  30  LAST 1201   01,3445  53=425 1            DXCH    LST2 +12D
0290  REF  31  LAST 1201   01,3446  53=423 1            DXCH    LST2 +10D
0291  REF  32  LAST 1201   01,3447  53=421 0            DXCH    LST2 +8D
0292  REF  33  LAST 1201   01,3450  53=417 0            DXCH    LST2 +6
0293  REF  34  LAST 1201   01,3451  53=415 1            DXCH    LST2 +4
0294  REF  35  LAST 1201   01,3452  53=413 1            DXCH    LST2 +2
0295  REF  36  LAST 1201   01,3453  53=411 0            DXCH    LST2

0296  REF 207  LAST 1193   01,3454  56 001 0            XCH     L
0297                        01,3455  0 0006 1            EXTEND
0298  REF  21  LAST 1201   01,3456  01 007 1            WRITE   SUPERBNK     SET SUPERBANK FROM BBCON OF 2CADR
0299  REF 208  LAST 1201   01,3457  56 001 0            XCH     L            RESTORE TO L FOR DXCH Z.
0300                        01,3460  52 006 0            DTCB
```

```
L       WAITLIST

P0301           RETURN, AFTER EXECUTION OF T3 OVERFLOW TASK'

0302
0303  REP   2 LAST 1193 TO 1196'    5213
                                     51    51*          BLOCK  02
                                                        COUNT  02/WAIT
0304  REP   5 LAST 1201        5213  10 T34 0  TASKOVER CCS    RUPTAGN
0305  REP   2 LAST 1193        5214  3 5155 0          CAF    WAITBB
0306  REP  28 LAST 1193        5215  54 006 0          TS     BBANK
0307  REP   1                  5216  1 3423 0          TCF    T3RUPT2
0308  REP  23 LAST 1201        5217  3 0016 0          CA     BANKRUPT
0309                           5220  0 0006 1          EXTEND
0310  REP  22 LAST 1201        5221  01 007 1          WRITE  SUPERBNK
0311                           5222  0 0006 1  RESUME  EXTEND
0312  REP  19 LAST 1201        5223  22 012 1          QXCH   QRUPT
0313  REP  24 LAST 1202        5224  3 0016 0  NOQRSM  CA     BANKRUPT
0314  REP  29 LAST 1202        5225  56 006 1          XCH    BBANK
0315  REP  11 LAST  128        5226  52 011 0  NOQBRSM DXCH   ARUPT
03155                          5227  0 0003 1          RELINT
0316                           5230  5 0017 1          RESUME
```

IF +1 RETURN TO T3RUPT, IF -0 RESUME.

DISPATCH NEXT TASK IF IT WAS DUE.

RESTORE SUPERBANK BEFORE RESUME IS DONE

L WAITLIST USER'S PAGE NO. 13 E3 S3

```
P0317   LONGCALL

R0318   PROGRAM DESCRIPTION                          DATE- 17 MARCH 1967
R0319   PROGRAM WRITTEN BY W.H. VANDEVER             LOG SECTION WAITLIST
R0320   MOD BY- R. MELANSON TO ADD DOCUMENTATION     ASSEMBLY SUNDISK REV. 100

R0321   FUNCTIONAL DESCRIPTION-
R0322   LONGCALL IS CALLED WITH THE DELTA TIME ARRIVING IN A,L SCALED AS TIME2,TIME1 WITH THE 2CADR OF THE TASK
R0324   IMMEDIATELY FOLLOWING THE TC LONGCALL.  FOR EXAMPLE, IT MIGHT BE DONE AS FOLLOWS WHERE TIMELOC IS THE NAME OF
R0326   A DP REGISTER CONTAINING A DELTA TIME AND WHERE TASKTODO IS THE NAME OF THE LOCATION AT WHICH LONGCALL IS TO
R0328   START

R0329   CALLING SEQUENCE-
A0330                                           EXTEND
A0331                                           DCA     TIMELOC
A0332                                           TC      LONGCALL
A0333                                           2CADR   TASKTODO

R0334   NORMAL EXIT MODE-
R0335      1). TC    WAITLIST
R0336      2). DTCB  (TO L+3 OF CALLING ROUTINE 1ST PASS THRU LONGCYCL)
R0337      3). DTCB  (TO TASKOVER ON SUBSEQUENT PASSES THRU LONGCYCL)

R0338   ALARM OR ABORT EXIT MODE-
R0339      NONE

R0340   OUTPUT-
R0341      LONGTIME AND LONGTIME+1 = DELTA TIME
R0342      LONGEXIT AND LONGEXIT+1 = RETURN 2CADR
R0343      LONGCADR AND LONGCADR+1 = TASK 2CADR
R0344      A = SINGLE PRECISION TIME FOR WAITLIST

R0345   ERASABLE INITIALIZATION-
R0346      A = MOST SIGNIFICANT PART OF DELTA TIME
R0347      L = LEAST SIGNIFICANT PART OF DELTA TIME
R0348      Q = ADDRESS OF 2CADR TASK VALUE

R0349   DEBRIS-
R0350      A,Q,L
R0351      LONGCADR AND LONGCADR+1
R0352      LONGEXIT AND LONGEXIT+1
R0353      LONGTIME AND LONGTIME+1

R0354   *** THE FOLLOWING IS TO BE IN FIXED-FIXED AND UNSWITCHED ERRASIBLE ***

 0355                        5231                        BLOCK  02
 0356   REF  42  LAST 1201  E3,1400                      EBANK= LST1
 0357   REF   1              5231  53=140 1  LONGCALL DXCH   LONGTIME      OBTAIN THE DELTA TIME

 0358                        5232  0 0006 1            EXTEND               OBTAIN THE 2CADR
```

```
 0359  REF 300  LAST 1200      5233  5 0002 0          NDX   Q
 0360                          5234  3 0001 0          DCA   0
 0361  REF   1                 5235  53=134 1          DXCH  LONGCADR

 0362                          5236  0 0006 1          EXTEND
 0363  REF   1                 5237  3 5242 0          DCA   LGCL2CDR      NOW GO TO THE APPROPRIATE SWITCHED BANK
 0364                          5240  52 006 0          DTCB                  FOR THE REST OF LONGCALL

 0365  REF  43  LAST 1203  E3,1400                     EBANK= LST1
 0366  REF   1               5241  03461 1  LGCL2CDR  2CADR  LNGCALL2
 0366  REF   1               5242  02063 0

R0367  *** THE FOLLOWING MAY BE IN A SWITCHED BANK, INCLUDING ITS ERASABLE ***

 0368                  01,3461                         BANK  01
 0369  REF   2 LAST 1196 TO 1202'   139   139*        COUNT 01/WAIT

 0370  REF   1               01,3461  23=435 1  LNGCALL2 LXCH  LONGEXIT +1   SAVE THE CORRECT BB FOR RETURN
 0371  REF  65  LAST 1193    01,3462  3 4711 1          CA    TWO             OBTAIN THE RETURN ADDRESS
 0372  REF 301  LAST 1204    01,3463  26 002 1          ADS   Q
 0373  REF   2  LAST 1204    01,3464  55=434 1          TS    LONGEXIT

R0374          *** WAITLIST TASK LONGCYCL ***
 0375                  01,3465  0 0006 1  LONGCYCL EXTEND
 0376  REF   1         01,3466  4 3477 1          DCS   DPBIT14             CAN WE SUCCESFULLY TAKE ABOUT 1.25
 0377  REF   2  LAST 1203    01,3467  21=140 1          DAS   LONGTIME          MINUTES OFF OF LONGTIME

 0378  REF   3  LAST 1204    01,3470  11=140 1          CCS   LONGTIME +1      THE REASONING BEHIND THIS PART IS
 0379  REF   1               01,3471  1 3510 1          TCF   MUCHTIME          INVOLVED, TAKING INTO ACCOUNT THAT THE
A0380                                                                          WORDS MAY NOT BE SIGNED CORRECTED (DP
A0381                                                                          BASIC INSTRUCTIONS
A0382                                                                          DO NOT SIGN CORRECT) AND THAT WE SUBTRAC
A0383                                                                          TED BIT14 (1 OVER HALF THE POS. VALUE
A0384                                                                          REPRESENTIBLE IN SINGLE WORD)
 0385                  01,3472  13 473 0          NOOP                        CAN'T GET HERE  **********
 0386                  01,3473  1 3474 1          TCF   +1
 0387  REF   4  LAST 1204    01,3474  11=137 1          CCS   LONGTIME
 0388  REF   2  LAST 1204    01,3475  1 3510 1          TCF   MUCHTIME
 0389                  01,3476   00000 1  DPBIT14  OCT   00000
 0390                  01,3477   20000 0          OCT   20000

A0391                                                                          LONGCALL
 0392  REF  71  LAST 1174    01,3500  3 4675 1  LASTTIME CA    BIT14           GET BACK THE CORRECT DELTA TFOR WAITLIST
 0393  REF   5  LAST 1204    01,3501  27=140 1          ADS   LONGTIME +1
 0395  REF  50  LAST 1058    01,3502  0 5140 1          TC    WAITLIST
 0396  REF  44  LAST 1204  E3,1400                     EBANK= LST1
 0397  REF   1               01,3503   03515 0          2CADR GETCADR         THE ENTRY TO OUR LONGCADR
 0397  REF   1               01,3504   02063 0

 0399  REF   1               01,3505  3 3517 1  LONGRTRN CA    TSKOVCDR        SET IT UP SO THAT ONLY THE FIRST EXIT IS
```

L WAITLIST

```
0400  REF   3  LAST 1204   01,3506  53=435 0          DXCH   LONGEXIT     TO THE CALLER OF LONGCALL.
0401                       01,3507  52 006 0          DTCB                THE REST ARE TO TASKOVER

0402  REF  72  LAST 1204   01,3510  3 4675 1  MUCHTIME CA     BIT14       WE HAVE OVER OUR ABOUT 1.25 MINUTES
0404  REF  51  LAST 1204   01,3511  0 5140 1          TC     WAITLIST    SO SET UP FOR ANOTHER CYCLE THROUGH HERE
0405  REF  45  LAST 1204   E3,1400                    EBANK= LST1
0406  REF   1               01,3512   03465 0         2CADR  LONGCYCL
0406  REF   1               01,3513   02063 0

0408  REF   1               01,3514  1 3505 0          TCF    LONGRTRN    NOW EXIT PROPERLY

R0409                *** WAITLIST TASK  GETCADR ***
0410  REF   2  LAST 1204   01,3515  53=134 1  GETCADR  DXCH   LONGCADR    GET THE LONGCALL THAT WE WISHED TO START
0411                       01,3516  52 006 0          DTCB                AND TRANSFER CONTROL TO IT

0412  REF  63  LAST 1195   01,3517   05213 1  TSKOVCDR GENADR TASKOVER
```

```
L       LATITUDE LONGITUDE SUBROUTINES

R0001   SUBROUTINE TO CONVERT RAD VECTOR AT GIVEN TIME TO LAT,LONG AND ALT

R0002   CALLING SEQUENCE

R0003     L-1     CALL
R0004     L               LAT-LONG
R0005   SUBROUTINES USED

R0006     R-TO-RP,ARCTAN,SETGAMMA,SETRE
R0007   ERASABLE INIT. REQ.

R0008     AXO,-AYO,AZO,TEPHEM (SET AT LAUNCH TIME)
R0009   ALPHAV = POSITION VECTOR METERS B-29
R0010     MPAC-- TIME  (CSECS B-28)
R0011     ERADFLAG =1, TO COMPUTE EARTH RADIUS, =0 FOR FIXED EARTH RADIUS
R0012     LUNAFLAG=0 FOR EARTH,1 FOR MOON
R0013   OUTPUT

R0014     LATITUDE IN LAT   (REVS. B-0)
R0015     LONGITUDE IN LONG   (REVS. B-0)
R0016   ALTITUDE IN ALT METERS B-29
 0017
 0018   REF   1                 30,3776                 BANK    30
 0019                           13,2000                 SETLOC  LATLONG
                                13,2322                 BANK

 0020   REF   1                                         COUNT   13/LT-LG

 0021   REF  19  LAST  894      E4,1551                 EBANK=  ALPHAV
 0022
 0023   REF   1                 13,2322   40220 0  LAT-LONG STQ    SETPD
 0024                           13,2323   02242 1           INCORPEX
 0025                           13,2324   00001 0           0D
 0026   REF  20  LAST 1206      13,2325   24007 0           STOVL   6D
 0027                           13,2326   02152 0           ALPHAV
 0028   REF   2  LAST   88      13,2327   51406 1           PUSH    ABVAL
 0029   REF   6  LAST 1176      13,2330   16310 1           STODL   ALPHAM
 0030                           13,2331   11456 0           ZEROVEC
 0031   REF  24  LAST  894      13,2332   71414 0           BOFF    COS
 0032   REF   1                 13,2333   01743 0           LUNAFLAG
 0033                           13,2334   26335 0           CALLRTRP
 0034   REF   3  LAST  599      13,2335   77624 1  CALLRTRP CALL
 0035                           13,2336   55366 1           R-TO-RP
 0036   REF  21  LAST 1206      13,2337   77656 1           UNIT
 0037   REF   1                 13,2340   36152 1           STCALL  ALPHAV
 0038                           13,2341   26523 1           SETGAMMA
 0039   REF   2  LAST  592      13,2342   77624 1           CALL
 0040                           13,2343   26533 0           SETRE
 0041   REF  22  LAST 1206      13,2344   63545 0           DLOAD   DSQ
 0042                           13,2345   02152 0           ALPHAV
 0043   REF  23  LAST 1206      13,2346   63525 0           PDDL    DSQ
                                13,2347   02154 0           ALPHAV +2
```

SAVE TIME IN 6-7D FOR R-TO-RP

0-5D= R FOR R-TO-RP
ABS. VALUE OF R FOR ALT FORMULA BELOW
SET MPAC=0 FOR EARTH,NON-ZERO FOR MOON
USE COS(0) TO GET NON-ZERO IN MPAC
0=EARTH,1=MOON

RP VECTOR CONVERTED FROM R B-29
UNIT RP B-1
U2= 1/2 SINL FOR SETRE SUBR BELOW
SET GAMMA=B_2/A_2 FOR EARTH,=1 FOR MOON
SCALED B-1
CALC RE METERS B-29

L LATITUDE LONGITUDE SUBROUTINES USER=S PAGE NO. 2 E4 S3

```
0044                          13,2350   75415 0     DAD     SQRT
0045                          13,2351   76405 1     DMP     SL1R
0046  REP   1                 13,2352   00011 1             GAMRP
0047  REP   5  LAST  838      13,2353   14021 1     STODL   COSTH          COS(LAT) B-1
0048  REP  24  LAST 1206      13,2354   02156 1             ALPHAV +4
0049  REP   5  LAST  838      13,2355   34023 1     STCALL  SINTH          SIN(LAT) B-1
0050  REP   1                 13,2356   26463 1             ARCTAN
0051  REP  14  LAST  890      13,2357   15104 0     STODL   LAT            LAT B0
0052  REP  25  LAST 1207      13,2360   02152 0             ALPHAV
0053  REP   6  LAST 1207      13,2361   14021 1     STODL   COSTH          COS(LONG) B-1
0054  REP  26  LAST 1207      13,2362   02154 0             ALPHAV +2
0055  REP   6  LAST 1207      13,2363   34023 1     STCALL  SINTH          SIN(LONG) B-1
0056  REP   2  LAST 1207      13,2364   26463 1             ARCTAN
0057  REP  10  LAST  889      13,2365   15106 1     STODL   LONG           LONG. REVS B-0 IN RANGE -1/2 TO 1/2
0058  REP   3  LAST 1206      13,2366   02310 1             ALPHAM
0059                          13,2367   77625 0     DSU                    ALT= R-RE METERS B-29
0060  REP   7  LAST  764      13,2370   02241 1             ERADM
0061  REP   7  LAST  634      13,2371   35110 1     STCALL  ALT            EXIT WITH ALT METERS B-29
0062  REP   2  LAST 1206      13,2372   02242 1             INCORPEX
```

```
L       LATITUDE LONGITUDE SUBROUTINES

P0063   SUBROUTINE TO CONVERT LAT,LONG,ALT AT GIVEN TIME TO RADIUS VECTOR
R0064   CALLING SEQUENCE

R0065     L-1    CALL
R0066     L              LALOTORV
R0067   SUBROUTINES USED

R0068     SETGAMMA,SETRE,RP-TO-R
R0069   ERASABLE INIT. REQ.

R0070     AXO,AYO,AZO,TEPHEM  SET AT LAUNCH TIME
R0071     LAT-- LATITUDE  (REVS B0)
R0072     LONG-- LONGITUDE  (REVS B0)
R0073   ALT--ALTITUDE (METERS) B-29
R0074     MPAC-- TIME  (CSECS B-28)
R0075     ERADFLAG =1 TO COMPUTE EARTH RADIUS, =0 FOR FIXED EARTH RADIUS
R0076    LUNAFLAG=0 FOR EARTH,1 FOR MOON
R0077   OUTPUT

R0078   R-VECTOR IN ALPHAV (METERS B-29)
 0079
 0080   REF   3  LAST 1207   13,2373   40220 0  LALOTORV STQ     SETPD      LAT,LONG,ALT TO R VECTOR
 0081                        13,2374   02242 1                   INCORPEX
 0082                        13,2375   00001 0                   0D
 0083   REF   2  LAST 1206   13,2376   34007 1                   6D         6-7D= TIME FOR RP-TO-R
 0084                        13,2377   26523 1           STCALL  SETGAMMA   GAMMA=B2/A2 FOR EARTH,1 FOR MOON B-1
 0085   REF  15  LAST 1207   13,2400   73545 1           DLOAD   SIN                COS(LONG)COS(LAT) IN MPAC
 0086                        13,2401   01104 0                   LAT        UNIT RP= SIN(LONG)COS(LAT)      2-3D
 0087   REF   2  LAST 1207   13,2402   65275 1           DMPR    PDDL       PD 2     GAMMA*SIN(LAT)         0-1D
 0088   REF  16  LAST 1208   13,2403   00011 1                   GAMRP
 0089                        13,2404   01104 0                   LAT             0-1D= GAMMA*SIN(LAT) B-2
 0090   REF  11  LAST 1207   13,2405   65346 0           COS     PDDL       PD 4     2-3D=COS(LAT) B-1 TEMPORARILY
 0091                        13,2406   01106 1                   LONG
 0092                        13,2407   57356 0           SIN     DMPR       PD 2
 0093   REF  17  LAST 1208   13,2410   71525 0           PDDL    COS        PD 4     2-3D=SIN(LONG)COS(LAT) B-2
 0094                        13,2411   01104 0                   LAT
 0095   REF  12  LAST 1208   13,2412   71525 0           PDDL    COS        PD 6      4-5D=COS(LAT) B-1 TEMPORARILY
 0096                        13,2413   01106 1                   LONG
 0097                        13,2414   55475 1           DMPR    VDEF       PD 4     MPAC= COS(LONG)COS(LAT) B-2
 0098   REF  27  LAST 1207   13,2415   41456 0           UNIT    PUSH       0-5D= UNIT RP FOR RP-TO-R SUBR.
 0099   REF   3  LAST 1206   13,2416   36152 1           STCALL  ALPHAV     ALPHAV +4= SINL FOR SETRE SUBR.
 0100                        13,2417   26533 0                   SETRE      RE METERS B-29
 0101   REF   7  LAST 1206   13,2420   43145 0           DLOAD   BOFF       SET MPAC=0 FOR EARTH,NON-ZERO FOR MOON
 0102   REF  25  LAST 1206   13,2421   11456 0                   ZEROVEC
 0103   REF   1              13,2422   01743 0                   LUNAFLAG
 0104                        13,2423   26425 0                   CALLRPRT
 0105                        13,2424   77746 1           COS
                             13,2425   77624 1  CALLRPRT CALL                USE COS(0) TO GET NON-ZERO IN MPAC
 0106   REF   7  LAST  894   13,2426   55341 1                   RP-TO-R    EXIT WITH UNIT R VECTOR IN MPAC
 0107   REF  28  LAST 1208   13,2427   16152 0           STODL   ALPHAV
 0108   REF   8  LAST 1207   13,2430   02241 1                   ERADM
```

```
 0109                          13,2431   74215 1          DAD     VXSC          (RE + ALT)(UNIT R) METERS B-30
 0110   REF   8  LAST 1207     13,2432   01110 0                  ALT
 0111   REF  29  LAST 1208     13,2433   02152 0                  ALPHAV
 0112                          13,2434   77772 0          VSL1                  R METERS B-29
 0113   REF  30  LAST 1209     13,2435   36152 1          STCALL ALPHAV         EXIT WITH R IN METERS B-29
 0114   REF   4  LAST 1208     13,2436   02242 1                 INCORPEX
R0115   SUBROUTINE TO COMPUTE EARTH RADIUS

R0116   INPUT

R0117     1/2 SIN LAT IN ALPHAV +4

R0118   OUTPUT

R0119     EARTH RADIUS IN ERADM AND MPAC  (METERS B-29)

 0120                          13,2437   63545 0  GETERAD  DLOAD   DSQ
 0121   REF  31  LAST 1209     13,2440   02156 1                   ALPHAV +4     SIN**2(L)
 0122                          13,2441   44352 0          SL1      BDSU
 0123   REF   1                13,2442   11454 1                   DP1/2         COS**2(L)
 0124                          13,2443   44275 1          DMPR     BDSU
 0125   REF   1                13,2444   26460 1                   EE
 0126   REF   2  LAST 1209     13,2445   11454 1                   DP1/2
 0127                          13,2446   75465 1          BDDV     SQRT
 0128   REF   1                13,2447   26454 0                   B2XSC
 0129                          13,2450   77622 1          SR4R
 0130   REF   9  LAST 1208     13,2451   02241 1          STORE    ERADM
 0131                          13,2452   77616 0          RVQ

R01311  THE FOLLOWING CONSTANTS WERE COMPUTED WITH A=6378166,B=6356784 METERS
R01312  B2XSC= B**2 SCALED B-51
R01313  B2/A2= B**2/A**2 SCALED B-1
R01314  EE=(1-B**2/A**2) SCALED B-0
 0132                          13,2453   00446 1  B2XSC    2DEC    .0179450689     B**2 SCALED B-51
 0132                          13,2454   00305 1
 0133   REF   4  LAST 1176     04,3453            DP1/2    =       XUNIT
 0134                          13,2455   17711 0  B2/A2     2DEC    .9933064884 B-1 GAMMA= B**2/A**2 B-1
 0134                          13,2456   05254 1
 0135                          13,2457   00155 0  EE       2DEC    6.6935116 E-3   (1-B**2/A**2) B-0
 0135                          13,2460   25250 1
 0136                          13,2461   00302 0  ERAD     2DEC    6373338 B-29    PAD RADIUS
 0136                          13,2462   17755 0
```

```
P0137  ARCTAN SUBROUTINE
R0138  CALLING SEQUENCE

R0139    SIN THETA IN SINTH B-1
R0140    COS THETA IN COSTH B-1
R0141    CALL ARCTAN

R0142  OUTPUT
R0143    ARCTAN THETA IN MPAC AND THETA B-0 IN RANGE -1/2 TO +1/2
 0144
 0145  REP   1              13,2463   77600 1  ARCTAN    BOV
 0146                       13,2464   26465 1                CLROVFLW
 0147  REP   7  LAST 1207   13,2465   63545 0  CLROVFLW  DLOAD  DSQ
 0148                       13,2466   00023 0                SINTH
 0149  REP   7  LAST 1207   13,2467   63525 0           PDDL   DSQ
 0150                       13,2470   00021 1                COSTH
 0151                       13,2471   77615 0           DAD
 0152  REP   1              13,2472   75454 0           BZE    SQRT
 0153                       13,2473   26511 0                  ARCTANXX     ATAN=0/0  SET THETA=0
 0154  REP   8  LAST 1210   13,2474   40065 0           BDDV   BOV
 0155  REP   1              13,2475   00023 0                  SINTH
 0156                       13,2476   26516 1                  ATAN=90
 0157  REP   4  LAST  715   13,2477   67542 0           SR1    ASIN
 0158                       13,2500   00025 0           STORE  THETA
 0159  REP   8  LAST 1210   13,2501   50125 1           PDDL   BMN
 0160  REP   1              13,2502   00021 1                  COSTH
 0161                       13,2503   26505 0                  NEGCOS
 0162                       13,2504   43545 1           DLOAD  RVQ
 0163                       13,2505   57545 1  NEGCOS   DLOAD  DCOMP
 0164  REP   1              13,2506   43244 1           BPL    DAD
 0165  REP   3  LAST 1209   13,2507   26513 1                  NEGOUT
 0166  REP   5  LAST 1210   13,2510   11454 1                  DP1/2
 0167                       13,2511   00025 0  ARCTANXX  STORE  THETA
                            13,2512   77616 0           RVQ

 0168                       13,2513   52025 1  NEGOUT    DSU    GOTO
 0169  REP   4  LAST 1210   13,2514   11454 1                  DP1/2
 0170  REP   2  LAST 1210   13,2515   26511 0                  ARCTANXX
 0171                       13,2516   75345 1  ATAN=90   DLOAD  SIGN
 0172  REP   1              13,2517   11502 0                  LODP1/4
 0173  REP   9  LAST 1210   13,2520   00023 0                  SINTH
 0174  REP   6  LAST 1210   13,2521   00025 0           STORE  THETA
 0175                       13,2522   77616 0           RVQ

 0176  REP   2  LAST  708   04,3455             2DZERO  =      DPZERO
```

```
P0177   ..... SETGAMMA SUBROUTINE .....
R0178   SUBROUTINE TO SET GAMMA FOR THE LAT-LONG AND LALOTORV SUBROUTINES

R0179    GAMMA = B**2/A**2 FOR EARTH (B-1)
R0180    GAMMA = 1 FOR MOON (B-1)

R0181   CALLING SEQUENCE
R0182    L       CALL
R0183    L+1             SETGAMMA

R0184   INPUT
R0185    LUNAFLAG=0 FOR EARTH,=1 FOR MOON

R0186   OUTPUT
R0187    GAMMA IN GAMRP  (B-1)

 0188                          13,2523   43145 0  SETGAMMA DLOAD  BOFF            BRANCH FOR EARTH
 0189   REF   1                13,2524   26456 1                  B2/A2           EARTH GAMMA
 0190   REF  26  LAST 1208     13,2525   01743 0                  LUNAFLAG
 0191   REF   1                13,2526   26531 1                  SETGMEX
 0192                          13,2527   77735 0           SLOAD
 0193   REF   1                13,2530   11454 1                  1B1             MOON GAMMA
 0194   REF   3  LAST 1208     13,2531   00011 1  SETGMEX  STORE  GAMRP
 0195                          13,2532   77616 0           RVQ
 0196                             0010           GAMRP    =      8D
```

```
P0197   .....SETRE SUBROUTINE .....
R0198   SUBROUTINE TO SET RE (EARTH OR MOON RADIUS)

R0199   RE= RM FOR MOON
R0200    RE= RREF FOR FIXED EARTH RADIUS OR COMPUTED RF FOR FISCHER ELLIPSOID

R0201   CALLING SEQUENCE
R0202    L       CALL
R0203    L+1             SETRE

R0204   SUBROUTINES USED
R0205    GETERAD

R0206   INPUT
R0207    ERADFLAG=0 FOR FIXED RE, 1 FOR COMPUTED RE
R0208    ALPHAV +4= 1/2 SINL IF GETERAD IS CALLED
R0209    LUNAFLAG=0 FOR EARTH,=1 FOR MOON

R0210   OUTPUT
R0211    ERADM= 504RM FOR MOON (METERS B-29)
R0212    ERADM= ERAD OR COMPUTED RF FOR EARTH (METERS B-29)

 0213                          13,2533  71220 1  SETRE   STQ     DLOAD
 0214   REF   1                13,2534  00051 0          SETREX
 0215   REF   1                13,2535  26560 0          504RM
 0216                          13,2536  71214 0          BON     DLOAD           BRANCH FOR MOON
 0217   REF  27  LAST 1211     13,2537  01703 1          LUNAFLAG
 0218   REF   1                13,2540  26550 0          TSTRLSRM
 0219   REF   1                13,2541  26462 0          ERAD
 0220                          13,2542  45014 0          BOFF    CALL            ERADFLAG=0 FOR FIXED RE,1 FOR COMPUTED
 0221   REF  14  LAST  890     13,2543  00742 0          ERADFLAG
 0222   REF   1                13,2544  26546 1          SETRXX
 0223   REF   4  LAST  846     13,2545  26437 0          GETERAD
 0224   REF  10  LAST 1209     13,2546  36241 0  SETRXX  STCALL ERADM            EXIT WITH RE OR RM METERS B-29
 0225   REF   2  LAST 1212     13,2547  00051 0          SETREX
 0226                          13,2550  77214 0  TSTRLSRM BON    VLOAD           ERADFLAG=0,SET R0=RLS
 0227   REF  15  LAST 1212     13,2551  00702 1          ERADFLAG                        =1     R0=RM
 0228   REF   2  LAST 1212     13,2552  26546 1          SETRXX
 0229   REF   9  LAST  889     13,2553  02026 1          RLS
 0230                          13,2554  64446 0          ABVAL   SR2R            SCALE FROM B-27 TO B-29
 0231                          13,2555  77650 1          GOTO
 0232   REF   3  LAST 1212     13,2556  26546 1          SETRXX
 0233   REF  12  LAST  708       0051           SETREX  =       S2
 0234                          13,2557  00065 1  504RM   2DEC    1738090 B-29    METERS B-29 (MOON RADIUS)
 0234                          13,2560  01265 1
```