PDP11/04

CPU TEST

MD-11-DGKAA-A

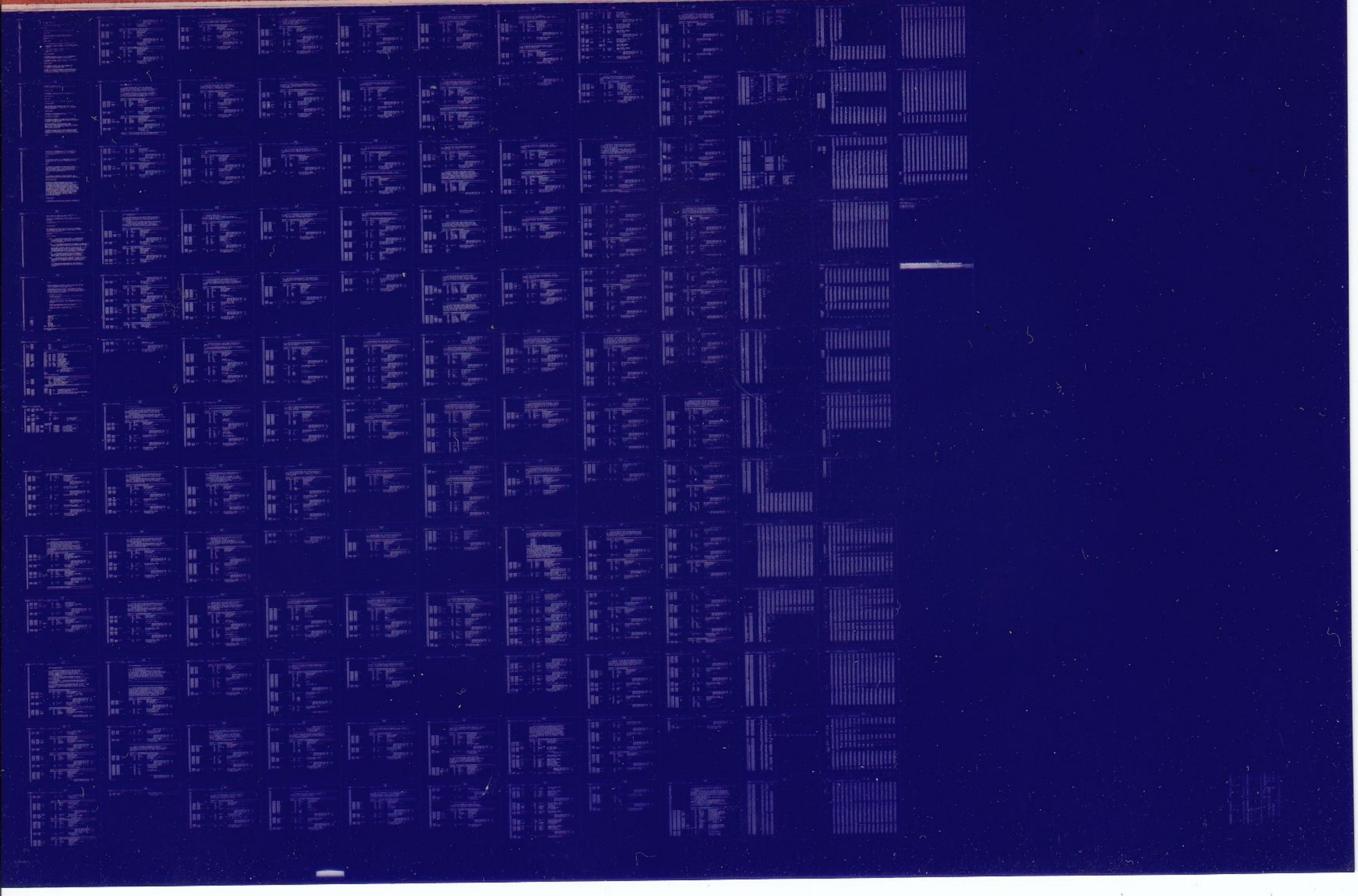
EP-DGKAA-A-DL-A

FICHE 1 OF 1

NOV 1976

digital

MADE IN US



2.0 OPERATING INSTRUCTIONS

2.1 LOADING AND STARTING PROCEDURES

2.1.1 LOADING

USE NORMAL PROCEDURES FOR LOADING ABSOLUTE BINARY TAPES.

2.1.2 NORMAL START

THIS IS THE PROCEDURE FOR NORMAL PROGRAM RUNNING (I.E., STARTING WITH TEST 1 AND EXECUTING ENTIRE DIAGNOSTIC).

LOAD ADDRESS = 200
START

2.1.3 SUBTEST START

THIS IS THE PROCEDURE FOR STARTING AT A SUBTEST OTHER THAN 1.

1. LOAD $TESTN (IN MAILBOX SECTION) WITH THE NUMBER OF SUBTEST MINUS ONE (IN OCTAL) FOR EXAMPLE, TO START AT SUBTEST 10C, $TESTN=77.

2. LOAD STARTING ADDRESS OF SUBTEST IN LOC. 216

3. LOAD ADDRESS = ADDRESS OF SUBTEST
   START

2.2 SPECIAL ENVIRONMENTS

THIS PROGRAM IS WRITTEN TO COMPLY WITH ALL THE REQUIREMENTS OF THE APT INTERFACE SPECIFICATION. IT WILL RUN UNDER APT IN EITHER QUICK VERIFY, PROGRAM OR RUN-TIME MODES.

THIS PROGRAM IS WRITTEN TO COMPLY WITH ALL OF THE REQUIREMENTS OF PROGRAMS TO RUN UNDER THE ACT11 MONITOR.

2.3 PROGRAM OPTIONS

THIS PROGRAM IS INTENDED TO BE A BASIC PROCESSOR TEST.
IT IS INTENDED TO BE THE LOWEST LEVEL DIAGNOSTIC RUN.
IT PROVIDES FOR NO SELECTABLE OPTIONS.

IN ORDER THAT THE TEST BE RUNNABLE ON A PROCESSOR WITHOUT A TELETYPE, IT IS POSSIBLE TO SUPPRESS THE END OF PASS MESSAGE. IF NO TELETYPE IS AVAILABLE, ALTER THE BYTE, $ENVM, WHICH IS LOCATED IN THE APT MAILBOX. SETTING $ENVM TO 40(8) WILL

SUPPRESS ALL CONSOLE OUTPUT.
THE EXACT LOCATION OF THIS BYTE CAN BE FOUND IN THE SYMBOL TABLE AT THE END OF THE LISTING.

2.4 EXECUTION TIMES

THE DIAGNOSTIC COMPLETES ONE PASS IN LESS THAN 1 SEC.
THE PROGRAM WILL RUN CONTINUOUSLY UNTIL EXTERNALLY HALTED.

3.0 ERROR INFORMATION

3.1 ERROR TYPES

THERE ARE TWO BASIC TYPES OF ERRORS IN THE DIAGNOSTIC.

3.1.1 FUNCTIONAL ERRORS

THESE ARE ERRORS WHICH REPRESENT A MALFUNCTION OF AN INSTRUCTION OR SEQUENCE OF INSTRUCTION. (E.G., THE PROPER CONDITION CODE NOT SET OR IMPROPER RESULT OF AN ARITHMETIC OR LOGICAL OPERATION).

3.1.2 SEQUENCE ERRORS

THE RESULT OF A TESTS BEING EXECUTED OUT OF SEQUENCE. (E.G. WILD MACHINE OR IMPROPER BRANCH OR JUMP).

3.2 ERROR REPORTING PROCEDURES

THE DIAGNOSTIC RESPONDS TO THE DETECTION OF ALL ERRORS BY STORING CERTAIN INFORMATION IN MEMORY AND HALTING THE PROCESSOR. THE INFORMATION STORED IN MEMORY CAN BE USED BY THE OPERATOR TO IDENTIFY THE ERROR DETECTED.

CERTAIN FAILURES WILL CAUSE THE PROESSOR TO HANG.
THIS TYPE OF FAILURE IS INDICATED IF THE PROGRAM
DOES NOT PRINT ITS END OF PASS INDICATION WITHIN A REASONABLE
AMOUNT OF TIME. (FIRST MESSAGE SHOULD APPEAR WITHIN 1 SEC.)

3.3 ERROR DESCRIPTOR INFORMATION

THE DIAGNOSTIC MAILBOX HOLDS THE ERROR INFORMATION NECESSARY TO IDENTIFY THE DETECTED ERROR. THIS INFORMATION HAS BEEN DESIGNED FOR COMPLIANCE WITH THE APT TO DIAGNOSTIC INTERFACE SPECIFICATION. IT IS THE PRIMARY MEDIUM FOR IDENTIFYING ERRORS.

3.2.1 $MSGTYP

THIS LOCATION IS INCREMENTED FROM ZERO TO ONE BEFORE THE PROGRAM COMES TO A PROGRAMMED HALT. IF THIS LOCATION IS NOT ONE, THEN THE DIAGNOSTIC HAS COME TO AN UNPROGRAMMED HALT. CHECK THE STACK AND PC FOR A CLUE TO THE CAUSE. SUSPECT A TRAP.

3.2.2 $FATAL

THIS LOCATION IS LOADED WITH A NUMBER BEFORE A HALT IS EXECUTED. EACH PROGRAMMED HALT HAS A UNIQUE NUMBER ASSOCIATED WITH IT WHICH CAN BE USED TO IDENTIFY THE ERROR WHICH HAS BEEN DETECTED.

3.2.3 $PASS

THIS LOCATION IS INCREMENTED FOR EVERY COMPLETE PASS OF THE DIAGNOSTIC. MONITORING THIS LOCATION WILL INDICATE WHETHER OR NOT THE PROGRAM IS HUNG. IT WILL ALSO INDICATE THE NUMBER OF SUCCESSFUL PASSES COMPLETED BEFORE THE ERROR HALT. A HIGH PASS COUNT MIGHT INDICATE THAT THE ERROR HALT IS ASSOCIATED WITH AN INTERMITTANT FAULT.

3.2.4 $TESTN

THIS LOCATION IS INCREMENTED IN EACH NEW SUBTEST. THIS SHOULD INDICATE THE TEST BEING EXECUTED WHEN THE ERROR WAS DETECTED. THIS LOCATION IS ALSO USED TO DETECT A SEQUENCE ERROR.

3.4 ERROR IDENTIFICATION

BECAUSE OF THE OVERHEAD ASSOCIATED WITH EACH HALT IN AN APT COMPATIBLE PROGRAM THE SEQUENCE CHECK CODE WILL SHARE THE ERROR HALT OF FUNCTIONAL ERROR WITHIN EACH SUBTEST.
TO DETERMINE WHICH ERROR IS BEING REPORTED, LOCATIONS $FATAL AND $TESTN ARE USED TOGETHER. WHEN AN ERROR HALT OCCURS, CHECK, $FATAL TO DETERMINE THE NUMBER OF THE ERROR DETECTED. NOW, CHECK THAT THE TEST NUMBER WHERE THIS ERROR IS DETECTED CORRESPONDS TO THE VALUE IN $TESTN. IF THESE AGREE THE ERROR WAS A FUNCTIONAL ERROR AS DESCRIBED IN THE LISTINGS. IF THESE NUMBERS DO NOT AGREE, THEN A SEQUENCE ERROR WAS DETECTED. IN THIS CASE $TESTN WILL CONTAIN ONE MORE THAN THE NUMBER OF THE LAST TEST SUCCESSFULLY COMPLETED. SEQUENCE ERRORS WHICH SHARE THE ERROR HALTS OF FUNCTIONAL ERRORS WILL ALWAYS BE REPORTED BY THE LAST HALT IN THE SUBTEST IN WHICH THEY WERE DISCOVERED.

4.0 PROGRESS REPORT

AT THE END OF EACH SUCCESSFUL PASS THE PROGRAM INCREMENTS THE LOCATION $PASS WHICH IS IN THE APT MAILBOX. THIS LOCATION WIL

ALWAYS CONTAIN THE NUMBER OF SUCCESSFUL PASSES COMPLETED.
$PASS IS RESET WITH EVERY RETART FROM LOC. 200.

ADDITIONALLY, THE MESSAGE END OF DGKAA IS PRINTED ON THE CONSOLE TELETYPE AFTER THE FIRST PASS AND FOLLOWING EVERY 400TH PASS THEREAFTER.

IF NO TELETYPE IS AVAILABLE, THE CONSOLE OUTPUT MUST BE SUPPRESSED. (SEE SECTION 2.3)

5.0 TROUBLE SHOOTING

WHEN THE PROGRAM DISCOVERS A FAULT IT WILL HALT. TO DETERMINE THE CAUSE OF THE HALT, THE DIAGNOSTIC PROVIDES ERROR INFORMATION. THIS INFORMATION IS STORED IN THE APT MAILBOX AND IS THE PRIMARY SOURCE OF ERROR IDENTIFICATION.

UPON FINDING AN ERROR, THE FOLLOWING PROCEDURE SHOULD AID IN ISOLATING THE FAULT.

5.1 CHECK THE MAILBOX

1. $MSGTY — THIS LOCATION SHOULD CONTAIN A 1. IF THE PROCESSOR HALTS AND THIS LOCATION IS ZERO, THEN THE PROCESSOR HAS COME TO AN UNEXPECTED HALT. FIRST SUSPECT A TRAP. CHECK THE PC AND IF A TRAP CHECK R6 AND THE STACK FOR THE LOCATION OF THE FAILING INSTRUCTION.

2. $FATAL — THIS LOCATION IS USED TO HOLD THE NUMBER OF THE ERROR WHICH HAS DETECTED. EACH ERROR BEING CHECKED BY THE DIAGNOSTIC IS ASSIGNED A UNIQUE NUMBER WHICH IS STORED IN $FATAL WHEN THAT ERROR IS DETECTED.

   WHEN AN ERROR IS DETECTED, CHECK THE LISTING TO SEE THAT THE ERROR NUMBER STORED IN $FATAL IS ONE WHICH IS DETECTED IN THE TEST WHOSE NUMBER IS IN $TESTN. IF THERE IS A DISAGREEMENT THEN THE ERROR BEING REPORTED IS A SEQUENCE ERROR. $TESTN CONTAINS ONE MORE THAN THE LAST TEST WHICH WAS SUCCESSFULLY COMPLETED.

3. $TESTN — THIS LOCATION IS USED TO INDICATE THE NUMBER OF THE TEST WHICH WAS BEING EXECUTED WHEN THE FUALT WAS DETECTED. $TESTN IS USED IN CONJUCTION WITH $FATAL TO DISTINGUISH BETWEEN SEQUENCE AND FUNCTONAL ERRORS. (SEE 2. THIS SECTION)

4. $PASS — THIS LOCATION IS USED TO INDICATE THE NUMBER OF SUCCESSFUL PASSES WHICH THE DIAGNOSTIC HAS COMPLETED. THIS WILL GIVE AN INDICATION THAT THE DIAGNOSTIC HAS NOT JUST BEEN HUNG IN A LOOP IF NOT TELETYPE IS AVAILABLE TO REPORT THE PRINTED PROGRESS REPORTS.

   IF AN ERROR HAS BEEN DETECTED $PASS WILL SHOW WHETHER IT WAS A HARD ERROR DISCOVERED DURING THE FIRST TRY OR WHETHER IT WAS INTERMITTANT OR DEVERLOPED DURING THE RUNNING OF THE DIAGNOSTIC.

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                                5.2     SCOPING
                                        -------

                                WHILE THIS DIAGNOSTIC IS PRIMARILY INTENDED TO BE A FAULT DETECTION
                                PROGRAM, PROVISIONS ARE MADE TO ASSIST A TECHNICIAN WHO MIGHT WANT
                                TO USE THE PROGRAM AS A TROUBLE SHOOTING TEST.

                                THE PROCEDURE FOR SCOPING A SUBTEST INVOLVES MODIFYING SEVERAL
                                MEMORY LOCATIONS IN THE TEST ITSELF.  THE PHILOSOPHY IS TO PROVIDE
                                A SCOPING LOOP WHICH WILL INCLUDE THE CODE WHERE THE ERROR WAS DETECTED.
                                THE LOOP IS SET UP SO THAT THE LOOP WILL NOT BE TERMINATED SHOULD
                                THE ERROR INTERMITTANTLY DISAPPEAR.

                                THE PROCEDURE IS AS FOLLOWS:

                                1.  DETERMINE WHICH ERROR IS TO BE SCOPED.  USE $FATAL AND $TESTN
                                    FOR THIS (SEE ABOVE)

                                2.  LOCATE THE ERROR ROUTINE IN THE LISTING.

                                3.  CLEAR THE RIGHT BYTE OF THE CONDITIONAL BRANCH INSTRUCTION
                                    ASSOCIATED WITH THE ERROR.  (THIS IS MARKED WITH <===='S IN THE
                                    LISTING.)

                                4.  REPLACE THE INSTRUCTION FOLLOWING <MOV #XXX,-(R2)) WITH THE
                                    SCOPING BRANCH PROVIDED IN THE LISTING COMMENTS.

                                5.  RESTART THE PROGRAM.  THE PROGRAM MAY BE RESTARTED FROM THE
                                    BEGINNING OR FROM THE SUBTEST (SEE 2.0).

                        6.0     LISTING
                                -------


                                %
                                .TITLE  MAINDEC-11-DGKAA  11/04 CPU TEST
                                .ENABLE ABS
000500                          STBOT=500
                                .NLIST  CND,MC,MD
                                .LIST   ME
000240                          SCOPE=NOP
000007                          R7=%7
000006                          R6=%6
177776                          PS=177776
177564                          TPS=177564
177566                          TPB=177566
                        .MCALL  .$APTHDR,.$APTBLS,.$ACT11
                        .SBTTL  ACT11 HOOKS

                        ;*****************************************************************************
                        ;HOOKS REQUIRED BY ACT11
000400C                         $SVPC=.                 ;SAVE PC
```

```
                    000046
000046  015264
                    000052
000052  000000
                    000400
                    000300
                                .=46
                                $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN  SE P
                                .=52
                                .WORD   0               ;;2)SET LOC.52 TO ZERO
                                .=$SVPC                 ;; RESTORE PC
                                .=300
                            .SBTTL  APT MAILBOX-ETABLE

                            ;*****************************************************************************
                            .EVEN
000300                      $MAIL:                      ;;APT MAILBOX
000300  000000             $MSGTY: .WORD   AMSGTY      ;;MESSAGE TYPE CODE
000302  000000             $FATAL: .WORD   AFATAL      ;;FATAL ERROR NUMBER
000304  000000             $TESTN: .WORD   ATESTN      ;;TEST NUMBER
000306  000000             $PASS:  .WORD   APASS       ;;PASS COUNT
000310  000000             $DEVCT: .WORD   ADEVCT      ;;DEVICE COUNT
000312  000000             $UNIT:  .WORD   AUNIT       ;;I/O UNIT NUMBER
000314  000000             $MSGAD: .WORD   AMSGAD      ;;MESSAGE ADDRESS
000316  000000             $MSGLG: .WORD   AMSGLG      ;;MESSAGE LENGTH
000320                      $ETABLE:                    ;;APT ENVIRONMENT TABLE
000320     000              $ENV:   .BYTE   AENV        ;;ENVIRONMENT BYTE
000321     000              $ENVM:  .BYTE   AENVM       ;;ENVIRONMENT MODE BITS
000322  000000             $SWREG: .WORD   ASWREG      ;;APT SWITCH REGISTER
000324  000000             $USWR:  .WORD   AUSWR       ;;USER SWITCHES
000326  000000             $CPUOP: .WORD   ACPUOP      ;;CPU TYPE,OPTIONS
                            ;*                          BITS 15-11=CPU TYPE
                            ;*                                  11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
                            ;*                                  11/70=06,PDQ=07,Q=10
                            ;*                          BIT 10=REAL TIME CLOCK
                            ;*                          BIT  9=FLOATING POINT PROCESSOR
                            ;*                          BIT  8=MEMORY MANAGEMENT
000330                      $ETEND:
                            .MEXIT
                            .SBTTL  APT PARAMETER BLOCK

                            ;*****************************************************************************
                            ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                            ;*****************************************************************************
                                    .$X=.       ;;SAVE CURRENT LOCATION
                                    .=24        ;;SET POWER FAIL TO POINT TO START OF PROGRAM
                                    200         ;;FOR APT START UP
                                    .=44        ;;POINT TO APT INDIRECT ADDRESS PNTR.
                                    $APTHDR     ;;POINT TO APT HEADER BLOCK
                                    .=.$X       ;;RESET LOCATION COUNTER
                            ;*****************************************************************************
                            ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                            ;INTERFACE SPEC.

000330                      $APTHD:
000330  000000             $HIBTS: .WORD   0           ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
000332  000300             $MBADR: .WORD   $MAIL       ;;ADDRESS OF APT MAILBOX (BITS 0-15)
000334  000002             $TSTM:  .WORD   2           ;;RUN TIM OF LONGEST TEST
000336  000002             $PASTM: .WORD   2           ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
000340  000000             $UNITM: .WORD   0           ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
000342  000014                     .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
                    000370          .=370
```

```
000370  000000  000000  000000          0,0,0,0,0,0
000376  000000  000000  000000
000404  000001  000001  177777          1,1,-1
        000500                          .=500
                                ;*****************************************************************************
                                ;SET UP STARTING ADDRESS
        000500                  $X=.
        000200                  .=200
000200  000167  000274          JMP     START

000204  012706  000500          MOV     #STBOT,R6               ;SET STACK POINTER
000210  012702  000304          MOV     #$TESTN,R2              ;SET MAILBOX POINTER
000214  000137                  JMP     @(PC)+                  ;JUMP TO SUBTEST
000216  000000                  0                               ;ADDR. OF SUBTEST GOES HERE

        000500                  .=.$X
        000302          $ERROR=$FATAL
        000304          $TSTNM=$TESTN
000500  012737  015426  000024  START:  MOV     #PWRDN,@#24             ;SET UP FOR POWER FAIL
000506  012737  000000  000306          MOV     #0,@#$PASS      ;CLEAR PASS COUNT
000514  012737  177777  015310          MOV     #-1,@#PASSPT    ;SET PRINT COUNTER
000522  012706  000500          RESTRT: MOV     #STBOT,R6       ;INITIALIZE STACK POINTER
000526  012702  000304                  MOV     #$TESTN,R2      ;SET UP POINTER TO MESSAGE TYPE
000532  012737  000000  000304          MOV     #0,@#$TSTNM     ;CLEAR TEST NUMBER
000540  012737  000000  000302          MOV     #0,@#$ERROR     ;CLEAR ERROR NUMBER
000546  012737  000000  000300          MOV     #0,@#$MSGTY     ;CLEAR MESSAGE TYPE(FOR APT)
```

```
                                ;*****************************************************************
                                ;TEST 1 CHECK BRANCHES ON Z BIT
                                ;*****************************************************************
000554  005212                  TST1:   INC     (R2)            ;UPDATE TEST NUMBER
000556  022712  000001                  CMP     #1,(R2)         ;SEQUENCE ERROR?
000562  001024                          BNE     TST2-10         ;BR TO ERROR HALT ON SEQ ERROR
000564  000257                          CCC                     ;CLEAR ALL CONDITION CODES
000566  001401                          BEQ     BR1             ;SHOULD BRANCH
000570  000404                          BR      BR2             ;BAD BRANCH OF Z-BIT
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
                                                                ;           BRANCH INSTRUCTION AND            <====
                                                                ;           REPLACE THE MOVE INSTRUCTION      <====
                                                                ;           FOLLOWING W/ 774                  ====
000572                          BR1:
000572  012742  000001                  MOV     #1,-(R2)        ;MOVE TO MAILBOX #  *******  1  *******
000576  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
000600  000000                          HALT                    ;SHOULD HAVE BRANCHED: Z=0
000602                          BR2:
000602  001004                          BNE     BR3
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
                                                                ;           CONDITIONAL BRANCH INST. AND      <====
                                                                ;           REPLACE THE MOVE INSTRUCTION      <====
                                                                ;           WHICH FOLLOWS W/ 770              <====
000604  012742  000002                  MOV     #2,-(R2)        ;MOVE TO MAILBOX #  *******  2  *******
000610  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
000612  000000                          HALT                    ;
000614  000264                  BR3:    SEZ
000616  001001                          BNE     BR4
000620  000404                          BR      BR5
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
                                                                ;           BRANCH INSTRUCTION AND            <====
                                                                ;           REPLACE THE MOVE INSTRUCTION      <====
                                                                ;           FOLLOWING W/ 760                  <====
000622                          BR4:
000622  012742  000003                  MOV     #3,-(R2)        ;MOVE TO MAILBOX #  *******  3  *******
000626  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
000630  000000                          HALT                    ;SHOULD NOT HAVE BRANCHED HERE ON Z=1
000632                          BR5:
000632  001404                          BEQ     TST2
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
                                                                ;           CONDITIONAL BRANCH INST. AND      <====
                                                                ;           REPLACE THE MOVE INSTRUCTION      <====
                                                                ;           WHICH FOLLOWS W/ 754              <====
000634  012742  000004                  MOV     #4,-(R2)        ;MOVE TO MAILBOX #  *******  4  *******
000640  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
000642  000000                          HALT                    ;SHOULD HAVE BRANCHED ON Z=1
                                                                ;  OR SEQUENCE ERROR
```

```
                                        ;*****************************************************************************
                                        .SBTTL  DATA PATH TESTS
                                        ;
                                        ;       THE DATA PATH TESTS ARE USED TO VERIFY THAT VARIOUS
                                        ;DATA PATTERNS CAN BE SUCCESSFULLY MOVED THROUGH THE DATA PATHS
                                        ;MOVE AND COMPARE MODE 2,3 INSTRUCTIONS ARE USED TO PASS AND
                                        ;TEST VARIOUS DATA PATTERNS IN THE DATA PATHS.
                                        ;       THE TEST EXERCISES THE INTERNAL DATA PATHS, THE UNIBUS
                                        ;DATA TRANSCIEVERS, AND AMUX CONTROL FOR ALU AND UBUS INPUTS.
                                        ;       IF THESE TESTS FAIL, EXAMINE THE TARGET LOCATION (LOC. 0)
                                        ;TO SEE WHICH BITS OF THE DATA PATH ARE FAILING.  IF THIS PROVIDES
                                        ;INCONCLUSIVE DATA, TRY TO CHECK MODE 3 IR DECODE BY RUNNING
                                        ;JUST THE MICROCODE AND IR DECODE TESTS FOR THE MOVE AND COMPARE
                                        ;INSTRUCTIONS.
                                        ;*****************************************************************************
                                        ;TEST 2 TEST OF ZEROES IN THE DATA PATH
                                        ;*****************************************************************************
000644  005212                  TST2:   INC     (R2)            ;UPDATE TEST NUMBER
000646  022712  000002                  CMP     #2,(R2)         ;SEQUENCE ERROR?
000652  001006                          BNE     TST3-10         ;BR TO ERROR HALT ON SEQ ERROR
000654  012737  000000  000000          MOV     #0,@#0          ;MOVE ZEROES THRU ADDRESS LINES, DATA
                                                                ;LINES AND INTERNAL PATHS
000662  005737  000000                  TST     @#0             ;SUCCESSFUL?
000666  001404                          BEQ     TST3
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 772           <====
000670  012742  000005                  MOV     #5,-(R2)        ;MOVE TO MAILBOX #  *******  5  *******
000674  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
000676  000000                          HALT                    ;DATA INCORRECT
                                                                ;  OR SEQUENCE ERROR

                                        ;*****************************************************************************
                                        ;TEST 3 TEST OF PATTERN 125252 IN DATA PATH
                                        ;*****************************************************************************
000700  005212                  TST3:   INC     (R2)            ;UPDATE TEST NUMBER
000702  022712  000003                  CMP     #3,(R2)         ;SEQUENCE ERROR?
000706  001007                          BNE     TST4-10         ;BR TO ERROR HALT ON SEQ ERROR
000710  012737  125252  000000          MOV     #125252,@#0     ;MOVE ALTERNATING ONES AND ZEROES
                                                                ;THRU DATA PATHS
000716  022737  125252  000000          CMP     #125252,@#0     ;SUCCESSFUL
000724  001404                          BEQ     TST4
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 771           <====
000726  012742  000006                  MOV     #6,-(R2)        ;MOVE TO MAILBOX #  *******  6  *******
000732  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
000734  000000                          HALT                    ;DATA INCORRECT
                                                                ;  OR SEQUENCE ERROR

                                        ;*****************************************************************************
                                        ;TEST 4 TEST OF PATTERN 052525 IN DATA PATH
                                        ;*****************************************************************************
```

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                                TST4:   INC     (R2)            ;UPDATE TEST NUMBER
                                        CMP     #4,(R2)         ;SEQUENCE ERROR?
                                        BNE     TST5-10         ;BR TO ERROR HALT ON SEQ ERROR
                                        MOV     #052525,@#0     ;MOVE ALTERNATING ZEROES AND ONES
                                                                ;THRU DATA PATH
                                        CMP     #052525,@#0     ;SUCCESSFUL?
                                        BEQ     TST5
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 771           <====
                                        MOV     #7,-(R2)        ;MOVE TO MAILBOX #  *******  7  *******
                                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
                                        HALT                    ;DATA INCORRECT
                                                                ;  OR SEQUENCE ERROR

                                ;***************************************************************************
                                ;TEST 5 TEST OF ALL ONES IN DATA PATH
                                ;***************************************************************************
                                TST5:   INC     (R2)            ;UPDATE TEST NUMBER
                                        CMP     #5,(R2)         ;SEQUENCE ERROR?
                                        BNE     TST6-10         ;BR TO ERROR HALT ON SEQ ERROR
                                        MOV     #177777,@#0     ;MOVE ONES THRU DATA PATH
                                        CMP     #177777,@#0     ;SUCCESSFUL
                                        BEQ     TST6
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 771           <====
                                        MOV     #10,-(R2)       ;MOVE TO MAILBOX #  *******  10  *******
                                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
                                        HALT                    ;DATA INCORRECT
                                                                ;  OR SEQUENCE ERROR
```

```
                        ;*****************************************************************************
                        .SBTTL  SCRATCH PAD TESTS
                        ;
                        ;       THE SCRATCH PAD TESTS ARE USED TO VERIFY THAT VARIOUS
                        ;DATA PATTERNS CAN BE SUCCESSFULLY HELD IN THE SCRATCH PAD
                        ;CIRCUITRY.  MOVE AND COMPARE INSTRUCTIONS ARE USED TO TEST THAT
                        ;R0 CAN HOLD VARIOUS DATA PATTERNS.  EACH DATA PATTERN IS
                        ;MOVED AND TESTED IN A SMALL LOOP CONVENIENT FOR SCOPING.  THE
                        ;SUCCESSFUL COMPLETION OF THESE TESTS SHOULD VERIFY THE CIRCUITRY EXTERNAL
                        ;TO THE SCRATCH PAD ITSELF.
                        ;       THE REMAINDER OF THE GENERAL REGISTERS ARE TESTED BY MOVING
                        ;A BIT INTO BIT 0 OF THE REGISTER AND SHIFTING IT LEFT ONE
                        ;BIT AT A TIME INTO THE CARRY BIT.  THE RESULT IS THEN CHECKED TO INSURE THAT
                        ;NO BITS WERE PICKED.
                        ;       AT THIS POINT ALL OF THE GENERAL REGISTERS HAVE BEEN EXERCISED
                        ;AS WELL AS REGISTER 11.  REGISTERS 10 AND 12 HAVE BEEN ACCESSED BY
                        ;THE INSTRUCTIONS.  REGISTERS 13,14,AND 17 WILL BE TESTED LATER IN THE
                        ;MICROCODE TESTS.
                        ;       IF THE PATTERN TESTS WITH REGISTER 0 FAIL CHECK THE RESULTANT
                        ;DATA FOR A CLUE TO A FAULT IN THE EXTERNAL CIRCUITRY.  IF THE
                        ;PATTERN TESTS WITH R0 ARE SUCCESSFUL BUT THE TESTS WITH THE OTHER
                        ;REGISTERS FAIL, SUSPECT THE REGISTER SELECT LINES AND THEN THE SCRATCH
                        ;PAD ITSELF.
                        ;
                        ;*****************************************************************************
                        ;TEST 6 TEST IF R0 CAN HOLD ALL ZEROES
                        ;*****************************************************************************
001032  005212          TST6:   INC     (R2)            ;UPDATE TEST NUMBER
001034  022712  000006          CMP     #6,(R2)         ;SEQUENCE ERROR?
001040  001004                  BNE     TST7-10         ;BR TO ERROR HALT ON SEQ ERROR
                        ;
001042  012700  000000          MOV     #0,R0           ;MOVE ZEROES TO R0
001046  005700                  TST     R0              ;SUCCESSFUL?
001050  001404                  BEQ     TST7
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 774           <====
001052  012742  000011          MOV     #11,-(R2)       ;MOVE TO MAILBOX #  *******  11  *******
001056  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
001060  000000                  HALT                    ;R0 NOT 0
                                                        ;  OR SEQUENCE ERROR
                        ;
                        ;*****************************************************************************
                        ;TEST 7 TEST IF R0 CAN HOLD ONES AND ZEROES
                        ;*****************************************************************************
001062  005212          TST7:   INC     (R2)            ;UPDATE TEST NUMBER
001064  022712  000007          CMP     #7,(R2)         ;SEQUENCE ERROR?
001070  001005                  BNE     TST10-10        ;BR TO ERROR HALT ON SEQ ERROR
001072  012700  125252          MOV     #125252,R0      ;MOVE ALTERNATING ONES AND ZEROES TO R0
001076  020027  125252          CMP     R0,#125252      ;SUCCESSFUL?
001102  001404                  BEQ     TST10
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
```

```
                                                ;          WHICH FOLLOWS W/ 773
001104  012742  000012                MOV     #12,-(R2)   ;MOVE TO MAILBOX #  *******  12  *******
001110  005242                        INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
001112  000000                        HALT                ;R0 NOT 125252
                                                ;  OR SEQUENCE ERROR


                        ;*****************************************************************************
                        ;TEST 10        TEST IF R0 CAN HOLD ZEROES AND ONES
                        ;*****************************************************************************
001114  005212          TST10:  INC     (R2)            ;UPDATE TEST NUMBER
001116  022712  000010          CMP     #10,(R2)        ;SEQUENCE ERROR?
001122  001005                  BNE     TST11-10        ;BR TO ERROR HALT ON SEQ ERROR
001124  012700  052525          MOV     #052525,R0      ;MOVE ALTERNATING ZEROES AND ONES TO R0
001130  020027  052525          CMP     R0,#052525      ;SUCCESSFUL?
001134  001404                  BEQ     TST11
                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                ;           WHICH FOLLOWS W/ 773           <====
001136  012742  000013                MOV     #13,-(R2)   ;MOVE TO MAILBOX #  *******  13  *******
001142  005242                        INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
001144  000000                        HALT                ;R0 NOT 52525
                                                ;  OR SEQUENCE ERROR


                        ;*****************************************************************************
                        ;TEST 11        TEST IF R0 CAN HOLD ALL ONES
                        ;*****************************************************************************
001146  005212          TST11:  INC     (R2)            ;UPDATE TEST NUMBER
001150  022712  000011          CMP     #11,(R2)        ;SEQUENCE ERROR?
001154  001005                  BNE     TST12-10        ;BR TO ERROR HALT ON SEQ ERROR
001156  012700  177777          MOV     #177777,R0      ;MOVE ALL ONES TO R0
001162  020027  177777          CMP     R0,#177777      ;SUCCESSFUL?
001166  001404                  BEQ     TST12
                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                ;           WHICH FOLLOWS W/ 773           <====
001170  012742  000014                MOV     #14,-(R2)   ;MOVE TO MAILBOX #  *******  14  *******
001174  005242                        INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
001176  000000                        HALT                ;R0 NOT 177777
                                                ;  OR SEQUENCE ERROR


                        ;*****************************************************************************
                        ;TEST 12        TEST IF R1 CAN HOLD A ONE IN ALL BITS
                        ;*****************************************************************************
001200  005212          TST12:  INC     (R2)            ;UPDATE TEST NUMBER
001202  022712  000012          CMP     #12,(R2)        ;SEQUENCE ERROR?
001206  001006                  BNE     TST13-10        ;BR TO ERROR HALT ON SEQ ERROR
001210  012701  000001          MOV     #1,R1           ;SET BIT 0
001214  000241                  CLC                     ;CLEAR C-BIT
001216  006101          REG1:   ROL     R1              ;ROTATE 1 POSITION
001220  103376                  BCC     REG1            ;ALL DONE
001222  001404                  BEQ     TST13
                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                ;           REPLACE THE MOVE INSTRUCTION   <====
```

```
                                                ;            WHICH FOLLOWS W/ 772          <====
001224  012742  000015                  MOV   #15,-(R2)     ;MOVE TO MAILBOX #  *******  15  *******
001230  005242                          INC   -(R2)         ;SET MSGTYP TO FATAL ERROR
001232  000000                          HALT                ;FAILURE WITH R1
                                                            ;  OR SEQUENCE ERROR


                                ;***************************************************************************
                                ;TEST 13        TEST IF R2 CAN HOLD A ONE IN ALL BITS
                                ;***************************************************************************
001234  005212                  TST13:  INC   (R2)          ;UPDATE TEST NUMBER
001236  022712  000013                  CMP   #13,(R2)      ;SEQUENCE ERROR?
001242  001006                          BNE   REG2A-14              ;BR TO ERROR HALT ON SEQ ERROR
001244  012702  000001                  MOV   #1,R2         ;SET BIT 0
001250  000241                          CLC                 ;CLEAR C-BIT
001252  006102                  REG2:   ROL   R2            ;ROTATE 1 POSITION
001254  103376                          BCC   REG2          ;ALL DONE
001256  001406                          BEQ   REG2A
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           BRANCH INSTRUCTION AND        <====
                                                            ;           REPLACE THE MOVE INSTRUCTION  <====
                                                            ;           FOLLOWING W/ 771              <====
001260  012702  000304                  MOV   #$TESTN,R2    ;RESTORE POINTER
001264  012742  000016                  MOV   #16,-(R2)     ;MOVE TO MAILBOX #  *******  16  *******
001270  005242                          INC   -(R2)         ;SET MSGTYP TO FATAL ERROR
001272  000000                          HALT                ;FAILURE WITH R2
001274  012702  000304          REG2A:  MOV   #$TESTN,R2            ;RESTORE POINTER
                                ;***************************************************************************
                                ;TEST 14        TEST IF R3 CAN HOLD A ONE IN ALL BITS
                                ;***************************************************************************
001300  005212                  TST14:  INC   (R2)          ;UPDATE TEST NUMBER
001302  022712  000014                  CMP   #14,(R2)      ;SEQUENCE ERROR?
001306  001006                          BNE   TST15-10      ;BR TO ERROR HALT ON SEQ ERROR
001310  012703  000001                  MOV   #1,R3         ;SET BIT 0
001314  000241                          CLC                 ;CLEAR C-BIT
001316  006103                  REG3:   ROL   R3            ;ROTATE 1 POSITION
001320  103376                          BCC   REG3          ;ALL DONE
001322  001404                          BEQ   TST15
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND  <====
                                                            ;           REPLACE THE MOVE INSTRUCTION  <====
                                                            ;           WHICH FOLLOWS W/ 772          <====
001324  012742  000017                  MOV   #17,-(R2)     ;MOVE TO MAILBOX #  *******  17  *******
001330  005242                          INC   -(R2)         ;SET MSGTYP TO FATAL ERROR
001332  000000                          HALT                ;FAILURE WITH R3
                                                            ;  OR SEQUENCE ERROR


                                ;***************************************************************************
                                ;TEST 15        TEST IF R4 CAN HOLD A ONE IN ALL BITS
                                ;***************************************************************************
001334  005212                  TST15:  INC   (R2)          ;UPDATE TEST NUMBER
001336  022712  000015                  CMP   #15,(R2)      ;SEQUENCE ERROR?
001342  001006                          BNE   TST16-10      ;BR TO ERROR HALT ON SEQ ERROR
001344  012704  000001                  MOV   #1,R4         ;SET BIT 0
001350  000241                          CLC                 ;CLEAR C-BIT
001352  006104                  REG4:   ROL   R4            ;ROTATE 1 POSITION
001354  103376                          BCC   REG4          ;ALL DONE
```

```
001356  001404                          BEQ     TST16
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 772           <====
001360  012742  000020                  MOV     #20,-(R2)       ;MOVE TO MAILBOX #  *******  20  *******
001364  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
001366  000000                          HALT                    ;FAILURE WITH R4
                                                                ;  OR SEQUENCE ERROR

                                ;*****************************************************************************
                                ;TEST 16         TEST IF R5 CAN HOLD A ONE IN ALL BITS
                                ;*****************************************************************************
001370  005212                  TST16:  INC     (R2)            ;UPDATE TEST NUMBER
001372  022712  000016                  CMP     #16,(R2)        ;SEQUENCE ERROR?
001376  001006                          BNE     TST17-10        ;BR TO ERROR HALT ON SEQ ERROR
001400  012705  000001                  MOV     #1,R5           ;SET BIT 0
001404  000241                          CLC                     ;CLEAR C-BIT
001406  006105                  REG5:   ROL     R5              ;ROTATE 1 POSITION
001410  103376                          BCC     REG5            ;ALL DONE
001412  001404                          BEQ     TST17
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 772           <====
001414  012742  000021                  MOV     #21,-(R2)       ;MOVE TO MAILBOX #  *******  21  *******
001420  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
001422  000000                          HALT                    ;FAILURE WITH R5
                                                                ;  OR SEQUENCE ERROR

                                ;*****************************************************************************
                                ;TEST 17         TEST IF R6 CAN HOLD A ONE IN ALL BITS
                                ;*****************************************************************************
001424  005212                  TST17:  INC     (R2)            ;UPDATE TEST NUMBER
001426  022712  000017                  CMP     #17,(R2)        ;SEQUENCE ERROR?
001432  001006                          BNE     TST20-10        ;BR TO ERROR HALT ON SEQ ERROR
001434  012706  000001                  MOV     #1,R6           ;SET BIT 0
001440  000241                          CLC                     ;CLEAR C-BIT
001442  006106                  REG6:   ROL     R6              ;ROTATE 1 POSITION
001444  103376                          BCC     REG6            ;ALL DONE
001446  001404                          BEQ     TST20
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 772           <====
001450  012742  000022                  MOV     #22,-(R2)       ;MOVE TO MAILBOX #  *******  22  *******
001454  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
001456  000000                          HALT                    ;FAILURE WITH R6
                                                                ;  OR SEQUENCE ERROR
```

```
                                        ;*****************************************************************
                                        .SBTTL  PSW TESTS
                                        ;
                                        ;       THE PSW TESTS ARE USED TO VERIFY THAT VARIOUS DATA
                                        ;PATTERNS CAN BE SUCCESSFULLY HELD IN THE PSE AND THAT THE
                                        ;PSW ADDRESSING LOGIC IS FUNCTIONING.  MOVE AND COMPARE INSTRUCTIONS
                                        ;ARE USED TO TEST THAT THE PSE CAN HOLD VARIOUS DATA PATTERNS.
                                        ;EACH DATA PATTERN IS MOVED AND TESTED IN A SMALL LOOP CONVENIENT FOR
                                        ;SCOPING.
                                        ;       THE PSW REGISTER ITSELF IS TESTED AS WELL AS THE ADDRESS
                                        ;SELECT CIRCUITRY.  THE AMUX INPUTS TO THE PSW MUX ARE TESTED.  THE
                                        ;CC INPUTS ARE TESTED LATER IN THE MICROCODE TESTS.  SETTING OF
                                        ;THE T-BIT BY THE TEST PATTERNS IS PURPOSELY AVOIDED; TESTING OF THE
                                        ;T-BIT TRAP CIRCUITRY IS LEFT FOR THE TRAP TEST.
                                        ;
                                        ;*****************************************************************
                                        ;TEST 20        TEST IF PSW WILL HOLD ZEROES
                                        ;*****************************************************************
001460  005212                        TST20:  INC     (R2)            ;UPDATE TEST NUMBER
001462  022712  000020                        CMP     #20,(R2)        ;SEQUENCE ERROR?
001466  001010                                BNE     TST21-10        ;BR TO ERROR HALT ON SEQ ERROR
001470  012706  000500                        MOV     #STBOT,R6
001474  012737  000000  177776                MOV     #0,@#PS         ;SET PSW TO ZERO
001502  005737  177776                        TST     @#PS            ;SUCCESSFUL
001506  001404                                BEQ     TST21
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                        ;           CONDITIONAL BRANCH INST. AND    <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                        ;           WHICH FOLLOWS W/ 770            <====
001510  012742  000023                        MOV     #23,-(R2)       ;MOVE TO MAILBOX #  *******  23  *******
001514  005242                                INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
001516  000000                                HALT                    ;PSW NOT 0
                                                                        ;  OR SEQUENCE ERROR

                                        ;*****************************************************************
                                        ;TEST 21        TEST IF PSW WILL HOLD ONES AND ZEROES
                                        ;*****************************************************************
001520  005212                        TST21:  INC     (R2)            ;UPDATE TEST NUMBER
001522  022712  000021                        CMP     #21,(R2)        ;SEQUENCE ERROR?
001526  001007                                BNE     TST22-10        ;BR TO ERROR HALT ON SEQ ERROR
001530  012737  000252  177776                MOV     #252,@#PS       ;MOVE ALT. ONES AND ZEROES TO PSW
001536  023727  177776  000252                CMP     @#PS,#252       ;SUCCESSFUL?
001544  001404                                BEQ     TST22
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                        ;           CONDITIONAL BRANCH INST. AND    <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                        ;           WHICH FOLLOWS W/ 771            <====
001546  012742  000024                        MOV     #24,-(R2)       ;MOVE TO MAILBOX #  *******  24  *******
001552  005242                                INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
001554  000000                                HALT                    ;PSW NOT 252
                                                                        ;  OR SEQUENCE ERROR

                                        ;*****************************************************************
                                        ;TEST 22        TEST IF PSW (EXCEPT T-BIT) WILL HOLD ZEROES AND ONES
                                        ;*****************************************************************
```

```
 907  001556  005212                  TST22:  INC     (R2)            ;UPDATE TEST NUMBER
 908  001560  022712  000022                  CMP     #22,(R2)        ;SEQUENCE ERROR?
 909  001564  001007                          BNE     TST23-10        ;BR TO ERROR HALT ON SEQ ERROR
 910  001566  012737  000105  177776          MOV     #105,@#PS       ;MOVE ALT. ONES AND ZEROES TO PSW
 911  001574  023727  177776  000105          CMP     @#PS,#105       ;SUCCESSFUL?
 912  001602  001404                          BEQ     TST23
 913                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 914                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
 915                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
 916                                                                  ;           WHICH FOLLOWS W/ 771           <====
 917  001604  012742  000025                  MOV     #25,-(R2)       ;MOVE TO MAILBOX #  *******  25  *******
 918  001610  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 919  001612  000000                          HALT                    ;PSW NOT 105
 920                                                                  ;  OR SEQUENCE ERROR
 921
 922                                  ;*****************************************************************************
 923                                  ;TEST 23        TEST IF PSW (EXCEPT T-BIT) WILL HOLD ALL ONES
 924                                  ;*****************************************************************************
 925  001614  005212                  TST23:  INC     (R2)            ;UPDATE TEST NUMBER
 926  001616  022712  000023                  CMP     #23,(R2)        ;SEQUENCE ERROR?
 927  001622  001007                          BNE     TST24-10        ;BR TO ERROR HALT ON SEQ ERROR
 928  001624  012737  000357  177776          MOV     #357,@#PS       ;MOVE ONES TO PSW
 929  001632  023727  177776  000357          CMP     @#PS,#357       ;SUCCESSFUL
 930  001640  001404                          BEQ     TST24
 931                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 932                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
 933                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
 934                                                                  ;           WHICH FOLLOWS W/ 771           <====
 935  001642  012742  000026                  MOV     #26,-(R2)       ;MOVE TO MAILBOX #  *******  26  *******
 936  001646  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 937  001650  000000                          HALT                    ;PSW NOT 357
 938                                                                  ;  OR SEQUENCE ERROR
```

```
                                        ;*************************************************************************
                                        .SBTTL  B-REGISTER TEST
                                        ;
                                        ;       THE B-REGISTER SHIFTING LOGIC TESTS ARE USED TO TEST THAT THE
                                        ;B-REGISTER CAN HOLD VARIOUS DATA PATTERNS AND THAT THE ASSOCIATED
                                        ;LOGIC SUPPORTS THE SHIFTING FUNCTIONS WITHIN THE B-REGISTER AND C-BIT.
                                        ;A ONE IS SHIFTED THROUGH EVERY BIT IN THE B-REGISTER AND C-BIT IN
                                        ;BOTH DIRECTIONS.
                                        ;       THE B-REGISTER ITSELF IS TESTED IN ITS ABILITY AS A BUFFER AND AS
                                        ;A SHIFT REGISTER.  DATA IS ALSO PASSED THROUGH THE DATA PATH AND ALU.
                                        ;       IF THESE TESTS FAIL, EXAMINE THE TARGET LOCATION (LOC. 0) TO SEE
                                        ;WHICH BITS OF THE B-REGISTER MAY BE FAILING.  IF THIS PROVIDES
                                        ;INCONCLUSIVE DATA TRY TO CHECK THE MODE 3 IR DECODE BY RUNNING JUST
                                        ;THE MICROCODE AND IR DECODE TESTS FOR THE PARTICULAR INSTRUCTIONS.
                                        ;
                                        ;*************************************************************************
                                        ;TEST 24        SHIFT BIT 0 TO BIT 1
                                        ;*************************************************************************
001652  005212                          TST24:  INC     (R2)            ;UPDATE TEST NUMBER
001654  022712  000024                          CMP     #24,(R2)        ;SEQUENCE ERROR?
001660  001012                                  BNE     TST25-10        ;BR TO ERROR HALT ON SEQ ERROR
001662  000241                                  CLC                     ;CLEAR CARRY BIT
001664  012737  000001  000000                  MOV     #1,@#0          ;LOAD A 1
001672  006137  000000                          ROL     @#0             ;SHIFT LEFT
001676  022737  000002  000000                  CMP     #2,@#0          ;SUCCESSFUL
001704  001404                                  BEQ     TST25
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                        ;           CONDITIONAL BRANCH INST. AND    <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                        ;           WHICH FOLLOWS W/ 766            <====
001706  012742  000027                          MOV     #27,-(R2)       ;MOVE TO MAILBOX #  *******  27  *******
001712  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
001714  000000                                  HALT                    ;BIT 1 NOT SET
                                                                        ;  OR SEQUENCE ERROR

                                        ;*************************************************************************
                                        ;TEST 25        SHIFT CARRY INTO BIT 0
                                        ;*************************************************************************
001716  005212                          TST25:  INC     (R2)            ;UPDATE TEST NUMBER
001720  022712  000025                          CMP     #25,(R2)        ;SEQUENCE ERROR?
001724  001017                                  BNE     TST26-10        ;BR TO ERROR HALT ON SEQ ERROR
001726  012737  000000  000000                  MOV     #0,@#0          ;CLEAR LOCATION
001734  000261                                  SEC                     ;SET CARRY
001736  006137  000000                          ROL     @#0             ;ROTATE CARRY BIT TO BIT 0
001742  103014                                  BCC     TST26
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                        ;           CONDITIONAL BRANCH INST. AND    <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                        ;           WHICH FOLLOWS W/ 771            <====
001744  012742  000030                          MOV     #30,-(R2)       ;MOVE TO MAILBOX #  *******  30  *******
001750  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
001752  000000                                  HALT                    ;CARRY CLEAR
                                                                        ;  OR SEQUENCE ERROR
001754  022737  000001  000000                  CMP     #1,@#0          ;BIT 0 SET
001762  001404                                  BEQ     TST26
```

```
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
                                                        ;           CONDITIONAL BRANCH INST. AND      <====
                                                        ;           REPLACE THE MOVE INSTRUCTION      <====
                                                        ;           WHICH FOLLOWS W/ 761              <====
001764  012742  000031                  MOV     #31,-(R2)       ;MOVE TO MAILBOX #  *******  31  *******
001770  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
001772  000000                          HALT                    ;BIT 0 NOT SET
                                                                ;  OR SEQUENCE ERROR

                                ;*************************************************************************
                                ;TEST 26        LEFT SHIFT FROM BIT 0 TO C-BIT
                                ;*************************************************************************
001774  005212                  TST26:  INC     (R2)            ;UPDATE TEST NUMBER
001776  022712  000026                  CMP     #26,(R2)        ;SEQUENCE ERROR?
002002  001010                          BNE     TST27-10        ;BR TO ERROR HALT ON SEQ ERROR
002004  012737  000001  000000          MOV     #1,@#0          ;SET BIT 0
002012  000241                          CLC                     ;CLEAR C-BIT
002014  006137  000000          SHL:    ROL     @#0             ;SHIFT LEFT ONE POSITION
002020  103375                          BCC     SHL             ;BRANCH IF C-BIT NOT SET
002022  001404                          BEQ     TST27
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
                                                        ;           CONDITIONAL BRANCH INST. AND      <====
                                                        ;           REPLACE THE MOVE INSTRUCTION      <====
                                                        ;           WHICH FOLLOWS W/ 770              <====
002024  012742  000032                  MOV     #32,-(R2)       ;MOVE TO MAILBOX #  *******  32  *******
002030  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002032  000000                          HALT                    ;LEFT SHIFTING LOGIC FAILED
                                                                ;  OR SEQUENCE ERROR

                                ;*************************************************************************
                                ;TEST 27        SHIFT BIT 15 TO BIT 14
                                ;*************************************************************************
002034  005212                  TST27:  INC     (R2)            ;UPDATE TEST NUMBER
002036  022712  000027                  CMP     #27,(R2)        ;SEQUENCE ERROR?
002042  001012                          BNE     TST30-10        ;BR TO ERROR HALT ON SEQ ERROR
002044  012737  100000  000000          MOV     #100000,@#0     ;SET BIT 15
002052  000241                          CLC                     ;CLEAR CARRY
002054  006037  000000                  ROR     @#0             ;SHIFT BIT 15 TO BIT 14
002060  022737  040000  000000          CMP     #40000,@#0      ;SUCCESSFUL
002066  001404                          BEQ     TST30
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
                                                        ;           CONDITIONAL BRANCH INST. AND      <====
                                                        ;           REPLACE THE MOVE INSTRUCTION      <====
                                                        ;           WHICH FOLLOWS W/ 766              <====
002070  012742  000033                  MOV     #33,-(R2)       ;MOVE TO MAILBOX #  *******  33  *******
002074  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002076  000000                          HALT                    ;BIT 14 NOT SET
                                                                ;  OR SEQUENCE ERROR

                                ;*************************************************************************
                                ;TEST 30        RIGHT SHIFT FROM BIT 15 TO C-BIT
                                ;*************************************************************************
002100  005212                  TST30:  INC     (R2)            ;UPDATE TEST NUMBER
002102  022712  000030                  CMP     #30,(R2)        ;SEQUENCE ERROR?
002106  001010                          BNE     TST31-10        ;BR TO ERROR HALT ON SEQ ERROR
002110  012737  100000  000000          MOV     #100000,@#0             ;SET BIT 15
```

```
1051  002116  000241                    CLC             ;CLEAR C-BIT
1052  002120  006037  000000  SHP:      ROR     @#0     ;ROTATE RIGHT ONE POSITION
1053  002124  103375                    BCC     SHR     ;BRANCH IF C-BIT CLEAR
1054  002126  001404                    BEQ     TST31
1055                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1056                                                    ;           CONDITIONAL BRANCH INST. AND   <====
1057                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
1058                                                    ;           WHICH FOLLOWS W/ 770           <====
1059  002130  012742  000034                    MOV     #34,-(R2)       ;MOVE TO MAILBOX #  *******  34  *******
1060  002134  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1061  002136  000000                    HALT                    ;RIGHT SHIFT LOGIC FAILED
1062                                                            ;  OR SEQUENCE ERROR
```

```
                           .SBTTL  CONDITION CODE TEST

                           ;*****************************************************************
                           ;
                           ;       THIS TEST CHECKS THE CONDITIONAL BRANCHES INVOLVING THE Z-BIT.
                           ;THE Z-BIT IS SET WITH ALL OTHER CC BITS ZERO AND BOTH CONDITIONS
                           ;BEQ AND BNE ARE TESTED FOR PROPER EXECUTION.  THEN THE Z-BIT IS
                           ;SET WITH ALL OTHER CC BITS CLEAR AND BOTH CONDITIONS ARE TESTED
                           ;AGAIN FOR PROPER OPERATION.
                           ;       THIS TEST CHECKS THE OPERATION OF THE SET AND CLEAR CONDITION
                           ;CODE INSTRUCTIONS AND CHECKS THE CIRCUITRY EXTERNAL TO THE CONDITIONAL
                           ;BRANCH ROM.  THE BRANCH MICROCODE FOR ALTERING THE PC AND FOR
                           ;LEAVING THE PC UNALTERED IS TESTED.  ONLY THOSE ROM ADDRESSES SPECIFICALLY
                           ;USED IN THE TEST ARE VERIFIED HERE.
                           ;
                           ;*****************************************************************
                           ;TEST 31         TEST BRANCHES AROUND Z-BIT
                           ;*****************************************************************
002140  005212             TST31:  INC     (R2)            ;UPDATE TEST NUMBER
002142  022712  000031             CMP     #31,(R2)        ;SEQUENCE ERROR?
002146  001014                     BNE     TST32-10        ;BR TO ERROR HALT ON SEQ ERROR
                                   ;FIRST WITH Z-BIT ON
002150  000257                     CCC                     ;CC=0100: JUST Z-BIT
002152  000264                     SEZ
002154  001001                     BNE     BRZ1            ;CHECK OPPOSITE CONDITION
002156  001404                     BEQ     BRZ2
                                                           ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                           ;           CONDITIONAL BRANCH INST. AND    <====
                                                           ;           REPLACE THE MOVE INSTRUCTION    <====
                                                           ;           WHICH FOLLOWS W/ 774            <====
002160                     BRZ1:
002160  012742  000035             MOV     #35,-(R2)       ;MOVE TO MAILBOX #  *******  35  *******
002164  005242                     INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002166  000000                     HALT                    ;IMPROPER BR W/ Z=1
                                   ;CHECK WITH Z-BIT OFF
002170  000277             BRZ2:   SCC                     ;CC=1011: ALL BUT Z-BIT
002172  000244                     CLZ
002174  001401                     BEQ     BRZ3
002176  001004                     BNE     TST32
                                                           ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                           ;           CONDITIONAL BRANCH INST. AND    <====
                                                           ;           REPLACE THE MOVE INSTRUCTION    <====
                                                           ;           WHICH FOLLOWS W/ 764            <====
002200                     BRZ3:
002200  012742  000036             MOV     #36,-(R2)       ;MOVE TO MAILBOX #  *******  36  *******
002204  005242                     INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002206  000000                     HALT                    ;IMPROPER BR W/ Z=0
                                                           ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST CHECKS THE CONDITIONAL BRANCHES INVOLVING THE N-BIT.
                                ;THE N-BIT IS SET WITH ALL OTHER CC BITS ZERO AND BOTH CONDITIONS
                                ;BMI AND BPL ARE TESTED FOR PROPER EXECUTION.  THEN THE N-BIT IS
                                ;SET WITH ALL OTHER CC BITS CLEAR AND BOTH CONDITIONS ARE TESTED
                                ;AGAIN FOR PROPER OPERATION.
                                ;       THIS TEST CHECKS THE OPERATION OF THE SET AND CLEAR CONDITION
                                ;CODE INSTRUCTIONS AND CHECKS THE CIRCUITRY EXTERNAL TO THE CONDITIONAL
                                ;BRANCH ROM.  THE BRANCH MICROCODE FOR ALTERING THE PC AND FOR
                                ;LEAVING THE PC UNALTERED IS TESTED.  ONLY THOSE ROM ADDRESSES SPECIFICALLY
                                ;USED IN THE TEST ARE VERIFIED HERE.
                                ;
                                ;*****************************************************************************
                                ;TEST 32         TEST BRANCHES AROUND N-BIT
                                ;*****************************************************************************
002210  005212                TST32:  INC     (R2)            ;UPDATE TEST NUMBER
002212  022712  000032                CMP     #32,(R2)        ;SEQUENCE ERROR?
002216  001014                        BNE     TST33-10        ;BR TO ERROR HALT ON SEQ ERROR
                                        ;FIRST WITH N-BIT ON
002220  000257                        CCC                     ;CC=1000: JUST N-BIT
002222  000270                        SEN
002224  100001                        BPL     BRN1            ;CHECK OPPOSITE CONDITION
002226  100404                        BMI     BRN2
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 774           <====
002230                          BRN1:
002230  012742  000037                MOV     #37,-(R2)       ;MOVE TO MAILBOX #  *******  37  *******
002234  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002236  000000                        HALT                    ;IMPROPER BR W/ N=1
                                        ;CHECK WITH N-BIT OFF
002240  000277                BRN2:   SCC                     ;CC=0111
002242  000250                        CLN
002244  100401                        BMI     BRN3            ;CHECK OPPOSITE CONDITION
002246  100004                        BPL     TST33
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 764           <====
002250                          BRN3:
002250  012742  000040                MOV     #40,-(R2)       ;MOVE TO MAILBOX #  *******  40  *******
002254  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002256  000000                        HALT                    ;IMPROPER BR W/ N=0
                                                            ;  OR SEQUENCE ERROR
```

```
1158
1159                    ;*************************************;*************************************************
1160                    ;
1161                    ;       THIS TEST CHECKS THE CONDITIONAL BRANCHES INVOLVING THE V-BIT.
1162                    ;THE V-BIT IS SET WITH ALL OTHER CC BITS ZERO AND BOTH CONDITIONS
1163                    ;BVS AND BVC ARE TESTED FOR PROPER EXECUTION.  THEN THE V-BIT IS
1164                    ;SET WITH ALL OTHER CC BITS CLEAR AND BOTH CONDITIONS ARE TESTED
1165                    ;AGAIN FOR PROPER OPERATION.
1166                    ;       THIS TEST CHECKS THE OPERATION OF THE SET AND CLEAR CONDITION
1167                    ;CODE INSTRUCTIONS AND CHECKS THE CIRCUITRY EXTERNAL TO THE CONDITIONAL
1168                    ;BRANCH ROM.  THE BRANCH MICROCODE FOR ALTERING THE PC AND FOR
1169                    ;LEAVING THE PC UNALTERED IS TESTED.  ONLY THOSE ROM ADDRESSES SPECIFICALLY
1170                    ;USED IN THE TEST ARE VERIFIED HERE.
1171                    ;
1172                    ;*****************************************************************************
1173                    ;TEST 33        TEST BRANCHES AROUND V-BIT
1174                    ;*****************************************************************************
1175  002260  005212    TST33:  INC     (R2)            ;UPDATE TEST NUMBER
1176  002262  022712    000033          CMP     #33,(R2)        ;SEQUENCE ERROR?
1177  002266  001014                    BNE     TST34-10        ;BR TO ERROR HALT ON SEQ ERROR
1178                                    ;FIRST WITH V-BIT ON
1179  002270  000257                    CCC                     ;CC=0010: JUST V-BIT
1180  002272  000262                    SEV
1181  002274  102001                    BVC     BRV1            ;CHECK OPPOSITE CONDITION
1182  002276  102404                    BVS     BRV2
1183                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1184                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1185                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1186                                                            ;           WHICH FOLLOWS W/ 774           <====
1187  002300            BRV1:
1188  002300  012742    000041          MOV     #41,-(R2)       ;MOVE TO MAILBOX #  *******  41  *******
1189  002304  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1190  002306  000000                    HALT                    ;IMPROPER BR W/ V=1
1191                                    ;CHECK WITH V-BIT OFF
1192  002310  000277    BRV2:           SCC                     ;CC=1101: ALL BVT V-BIT
1193  002312  000242                    CLV
1194  002314  102401                    BVS     BRV3            ;CHECK OPPOSITE CONDITION
1195  002316  102004                    BVC     TST34
1196                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1197                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1198                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1199                                                            ;           WHICH FOLLOWS W/ 764           <====
1200  002320            BRV3:
1201  002320  012742    000042          MOV     #42,-(R2)       ;MOVE TO MAILBOX #  *******  42  *******
1202  002324  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1203  002326  000000                    HALT                    ;IMPROPER BR W/ V=0
1204                                                            ;  OR SEQUENCE ERROR
```

```
1205
1206                            ;*****************************************************************************
1207                            ;
1208                            ;       THIS TEST CHECKS THE CONDITIONAL BRANCHES INVOLVING THE C-BIT.
1209                            ;THE C-BIT IS SET WITH ALL OTHER CC BITS ZERO AND BOTH CONDITIONS
1210                            ;BCS AND BCC ARE TESTED FOR PROPER EXECUTION.  THEN THE C-BIT IS
1211                            ;SET WITH ALL OTHER CC BITS CLEAR AND BOTH CONDITIONS ARE TESTED
1212                            ;AGAIN FOR PROPER OPERATION.
1213                            ;       THIS TEST CHECKS THE OPERATION OF THE SET AND CLEAR CONDITION
1214                            ;CODE INSTRUCTIONS AND CHECKS THE CIRCUITRY EXTERNAL TO THE CONDITIONAL
1215                            ;BRANCH ROM.  THE BRANCH MICROCODE FOR ALTERING THE PC AND FOR
1216                            ;LEAVING THE PC UNALTERED IS TESTED.  ONLY THOSE ROM ADDRESSES SPECIFICALLY
1217                            ;USED IN THE TEST ARE VERIFIED HERE.
1218                            ;
1219                            ;*****************************************************************************
1220                            ;TEST 34        TEST BRANCHES AROUND C-BIT
1221                            ;*****************************************************************************
1222  002330  005212            TST34:  INC     (R2)            ;UPDATE TEST NUMBER
1223  002332  022712  000034            CMP     #34,(R2)        ;SEQUENCE ERROR?
1224  002336  001014                    BNE     TST35-10        ;BR TO ERROR HALT ON SEQ ERROR
1225                                    ;FIRST WITH C-BIT ON
1226  002340  000257                    CCC                     ;CC=0001: JUST C-BIT
1227  002342  000261                    SEC
1228  002344  103001                    BCC     BRC1            ;CHECK OPPOSITE CONDITION
1229  002346  103404                    BCS     BRC2
1230                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1231                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1232                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1233                                                            ;           WHICH FOLLOWS W/ 774           <====
1234  002350                    BRC1:
1235  002350  012742  000043           MOV     #43,-(R2)       ;MOVE TO MAILBOX #  *******  43  *******
1236  002354  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1237  002356  000000                    HALT                    ;IMPROPER BR W/ C=1
1238                                    ;CHECK WITH V-BIT OFF
1239  002360  000277            BRC2:   SCC                     ;CC=1110
1240  002362  000242                    CLV
1241  002364  102401                    BVS     BRC3            ;CHECK OPPOSITE CONDITION
1242  002366  100404                    BMI     TST35
1243                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1244                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1245                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1246                                                            ;           WHICH FOLLOWS W/ 764           <====
1247  002370                    BRC3:
1248  002370  012742  000044           MOV     #44,-(R2)       ;MOVE TO MAILBOX #  *******  44  *******
1249  002374  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1250  002376  000000                    HALT                    ;IMPROPER BR W/ C=0
1251                                                            ;  OR SEQUENCE ERROR
```

```
1252
1253                            ;*****************************************************************************
1254                            .SBTTL  MICROCODE TESTS
1255                            ;
1256                            ;       THE MICROCODE TESTS ARE USED TO VERIFY THE MICROPROGRAMM
1257                            ;FLOW.  THE GOAL OF THESE TESTS IS TO EXERCISE EVERY POSSIBLE
1258                            ;BRANCH IN THE MICROPROGRAM FLOW.
1259                            ;       THE TEST EXERCISES EVERY BRANCH IN THE MICROCODE BY
1260                            ;TESTING AT LEAST ONE INSTRUCTION FROM EVERY CLASS OF INSTRUCTION IN
1261                            ;ALL POSSIBLE MODES.  FOR EXAMPLE, TO TEST THE SINGLE OPERAND INSTRUCTIONS,
1262                            ;AT LEAST ONE SINGLE OPERAND INSTRUCTION IS VERIFIED IN ALL UNIQUE
1263                            ;ADDRESSING MODES.  BYTE MODES ARE ALSO TESTED.  AS EACH NEW
1264                            ;MODE IS INTRODUCED THE SAME INSTRUCTION IS TRIED AND TESTED IN
1265                            ;A SMALL LOOP CONVENIENT FOR SCOPING.  THE TEST IS SET UP USING
1266                            ;ONLY INSTRUCTIONS AND ADDRESSING MODES WHICH HAVE BEEN PREVIOUSLY
1267                            ;VERIFIED.
1268                            ;       IF THESE TESTS FAIL, CHECK THE RESULTS FOR A CLUE TO THE
1269                            ;FAULT.
1270                            ;
1271                            ;*****************************************************************************
1272
1273
1274
1275                            ;*****************************************************************************
1276                            ;
1277                            ;       THE CLR INSTRUCTION IS USED TO INTRODUCE EACH ADDRESSING
1278                            ;MODE WITH THE SINGLE OPERAND INSTRUCTION.  FOLLOWING THE SEQUENCE CHECK,
1279                            ;THE CLR INSTRUCTION IS EXECUTED AND A BRANCH TEST IS EXECUTED WHICH
1280                            ;CHECKS THAT THE Z-BIT WAS PROPERLY SET.  THIS SMALL TEST IS SELF-SUFFICIENT
1281                            ;AND CAN BE SCOPED TO TROUBLE SHOOT ALL OF THE IR DECODE LOGIC AND
1282                            ;MICROCODE FOR SOP INSTRUCTIONS WITH MODE 0.  FOLLOWING THIS TEST
1283                            ;SEVERAL OTHER SOP INSTRUCTIONS ARE INTRODUCED WITH MODE 0.  THESE
1284                            ;INSTRUCTIONS MAINPULATE DATA AND SERVE TO CHECK THE DATA RESULTS
1285                            ;OF THE SOP INSTRUCTIONS IN THIS TEST.  THE DATA IN THIS TEST IS
1286                            ;OPERATED ON BY EACH INSTRUCTION WITHOUT REINITIALIZING.
1287                            ;
1288                            ;*****************************************************************************
1289                            ;TEST 35        TEST MODE 0 USING SOP INST.
1290                            ;*****************************************************************************
1291  002400  005212            TST35:  INC     (R2)            ;UPDATE TEST NUMBER
1292  002402  022712  000035            CMP     #35,(R2)        ;SEQUENCE ERROR?
1293  002406  001017                    BNE     TST36-10        ;BR TO ERROR HALT ON SEQ ERROR
1294  002410  005000                    CLR     R0              ;TRY THE CLEAR INST.
1295  002412  001404                    BEQ     SOPOA
1296                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1297                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1298                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1299                                                            ;           WHICH FOLLOWS W/ 776           <====
1300  002414  012742  000045            MOV     #45,-(R2)       ;MOVE TO MAILBOX #  *******  45  *******
1301  002420  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1302  002422  000000                    HALT                    ;CLR DID NOT SET Z-BIT
1303  002424  005200            SOPOA:  INC     R0              ;TRY THE INCREMENT INST.
1304  002426  005400                    NEG     R0              ;TRY THE NEGATE INST.
1305  002430  100404 ↑                  BMI     SOPOB
1306                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1307                                                            ;           CONDITIONAL BRANCH INST. AND   <====
```

```
1308                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1309                                                            ;           WHICH FOLLOWS W/ 767           <====
1310  002432  012742  000046                MOV     #46,-(R2)  ;MOVE TO MAILBOX #  *******  46  *******
1311  002436  005242                          INC     -(R2)      ;SET MSGTYP TO FATAL ERROR
1312  002440  000000                          HALT               ;NEGATE DID NOT SET N-BIT
1313  002442  005100                SOP0B:    COM     R0         ;TRY COMPLEMENT INST.
1314  002444  001404                          BEQ     TST36
1315                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1316                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1317                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1318                                                            ;           WHICH FOLLOWS W/ 761           <====
1319  002446  012742  000047                MOV     #47,-(R2)  ;MOVE TO MAILBOX #  *******  47  *******
1320  002452  005242                          INC     -(R2)      ;SET MSGTYP TO FATAL ERROR
1321  002454  000000                          HALT               ;CUMMULATIVE RESULT OF CLR,INC,NEG AND COM INSTS. FAILED
1322                                                            ;  OR SEQUENCE ERROR
1323
1324
1325                                ;*************************************************************************
1326                                ;
1327                                ;       THIS TEST INTRODUCES THE REMAINING SOP INSTRUCIONS AND TESTS
1328                                ;THEM IN MODE 0.  THE PURPOSE IS TO PROVIDE A BASELINE OF
1329                                ;INSTRUCTIONS FOR USE IN THE SUBSEQUENT TESTS.  SINCE THE MICROCODE FOR
1330                                ;THESE INSTRUCTIONS IS IDENTICAL TO THAT ALREADY TESTED, ANY TROUBLE
1331                                ;SHOOTING EFFORTS SHOULD BE AIMED AT THE ACTUAL IR DECODE AND ALU
1332                                ;FUNCTIONING.
1333                                ;
1334                                ;*************************************************************************
1335                                ;TEST 36        TEST REMAINDER OF SOP INSTS IN MODE 0
1336                                ;*************************************************************************
1337  002456  005212                TST36:    INC     (R2)       ;UPDATE TEST NUMBER
1338  002460  022712  000036                  CMP     #36,(R2)   ;SEQUENCE ERROR?
1339  002464  001020                          BNE     TST37-10   ;BR TO ERROR HALT ON SEQ ERROR
1340  002466  005000                          CLR     R0         ;INITIALIZE
1341  002470  005300                          DEC     R0         ;TRY DECREMENT INST.
1342  002472  100404                          BMI     SOP0C
1343                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1344                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1345                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1346                                                            ;           WHICH FOLLOWS W/ 775           <====
1347  002474  012742  000050                MOV     #50,-(R2)  ;MOVE TO MAILBOX #  *******  50  *******
1348  002500  005242                          INC     -(R2)      ;SET MSGTYP TO FATAL ERROR
1349  002502  000000                          HALT               ;N-BIT NOT SET ON DEC
1350  002504  000261                SOP0C:    SEC                ;INITIALIZE CARRY
1351  002506  005500                          ADC     R0         ;TRY ADD CARRY INST
1352  002510  001006                          BNE     SOP0D
1353  002512  000261                          SEC                ;INITIALIZE CARRY
1354  002514  005600                          SBC     R0         ;TRY SUBTRACT-CARRY INST
1355  002516  100003                          BPL     SOP0D
1356  002520  005400                          NEG     R0
1357  002522  005300                          DEC     R0
1358  002524  001404                          BEQ     TST37
1359                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1360                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1361                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1362                                                            ;           WHICH FOLLOWS W/ 760           <====
1363  002526                        SOP0D:
```

```
 1364  002526  012742  000051                  MOV     #51,-(R2)       ;MOVE TO MAILBOX #  ******  51  *******
 1365  002532  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 1366  002534  000000                          HALT                    ; CUMMULATIVE RESULT OF ADC,SBC,NEG AND DEC INSTS. FAILE
 1367                                                                  ;  OR SEQUENCE ERROR
```

```
1368
1369                                    ;*****************************************************************************
1370                                    ;
1371                                    ;       THIS TEST INTRODUCES THE BYTE CONTROL LOGIC OF THE PROCESSOR.
1372                                    ;THE MODE 0 BYTE MICROCODE IS TESTED.  THE METHOD AND SEQUENCE
1373                                    ;OF TESTING IS THE SAME AS THAT USED IN THE SOP MODE 0 TESTS.
1374                                    ;
1375                                    ;*****************************************************************************
1376                                    ;*****************************************************************************
1377                                    ;TEST 37        TEST MODE 0 EVEN BYTE USING SOP INST
1378                                    ;*****************************************************************************
1379 002536  005212                    TST37:  INC     (R2)            ;UPDATE TEST NUMBER
1380 002540  022712  000037            CMP     #37,(R2)        ;SEQUENCE ERROR?
1381 002544  001012                    BNE     TST40-10        ;BR TO ERROR HALT ON SEQ ERROR
1382 002546  105000                    CLRB    R0              ;TRY CLEARING EVEN BYTE OF REGISTER
1383 002550  001404                    BEQ     SOPB0A
1384                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1385                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1386                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1387                                                            ;           WHICH FOLLOWS W/ 776           <====
1388 002552  012742  000052            MOV     #52,-(R2)       ;MOVE TO MAILBOX #  *******  52  *******
1389 002556  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1390 002560  000000                    HALT                    ;CLRB DID NOT SET Z-BIT
1391 002562  105100            SOPB0A: COMB    R0              ;TRY SETTING EVEN BYTE OF REGISTER
1392 002564  100002                    BPL     SOPB0B
1393 002566  105200                    INCB    R0              ;TRY INCREMENTING EVEN BYTE OF REGISTER))
1394 002570  001404                    BEQ     TST40
1395                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1396                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1397                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1398 002572                            SOPB0B:                 ;           WHICH FOLLOWS W/ 766           <====
1399 002572  012742  000053            MOV     #53,-(R2)       ;MOVE TO MAILBOX #  *******  53  *******
1400 002576  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1401 002600  000000                    HALT                    ;TEST CUMMULATIVE RESULT OF ABOVE BYTE INST.
1402                                                            ;  OR SEQUENCE ERROR
```

```
                        ;*****************************************************************************
                        ;
                        ;       THIS TEST USES THE CLR INSTRUCTION TO INTRODUCE AND TEST
                        ;SINGLE OPERAND MODE 1 INSTRUCTIONS.  AGAIN, THE CLR INSTRUCTION
                        ;IS USED TO INTRODUCE THE MICROCODE AND TO TEST THAT THE PROPER
                        ;CONDITION CODES ARE SET.  OTHER SOP INSTRUCTIONS ARE USED TO MANIPULATE
                        ;COMMON DATA TO VERIFY THAT THE CORRECT DATA IS PRODUCED.
                        ;
                        ;*****************************************************************************
                        ;TEST 40        TEST MODE 1 USING SOP INST.
                        ;*****************************************************************************
002602  005212         TST40:  INC     (R2)            ;UPDATE TEST NUMBER
002604  022712  000040         CMP     #40,(R2)        ;SEQUENCE ERROR?
002610  001014                 BNE     TST41-10        ;BR TO ERROR HALT ON SEQ ERROR
002612  005000                 CLR     R0              ;INITIALIZE R0
002614  005010                 CLR     (R0)            ;TRY CLEAR INST W/MODE 1
002616  001404                 BEQ     SOP1A
                                                       ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                       ;           CONDITIONAL BRANCH INST. AND   <====
                                                       ;           REPLACE THE MOVE INSTRUCTION   <====
                                                       ;           WHICH FOLLOWS W/ 775           <====
002620  012742  000054                 MOV     #54,-(R2)       ;MOVE TO MAILBOX #  *******  54  *******
002624  005242                 INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002626  000000                 HALT                    ;CLR DID NOT SET Z-BIT
002630  005310         SOP1A:  DEC     (R0)            ;TRY DECREMENT INST W/MODE 1
002632  100003                 BPL     SOP1B
002634  000261                 SEC                     ;INITIALIZE CARRY
002636  005510                 ADC     (R0)            ;TRY ADD-CARRY W/MODE 1
002640  001404                 BEQ     TST41
                                                       ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                       ;           CONDITIONAL BRANCH INST. AND   <====
                                                       ;           REPLACE THE MOVE INSTRUCTION   <====
                                                       ;           WHICH FOLLOWS W/ 764           <====
002642         SOP1B:
002642  012742  000055                 MOV     #55,-(R2)       ;MOVE TO MAILBOX #  *******  55  *******
002646  005242                 INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002650  000000                 HALT                    ;TEST CUMMULATIVE RESULT OF ABOVE INST
                                                       ;  OR SEQUENCE ERROR
```

```
                                     ;*****************************************************************
                                     ;
                                     ;       THIS TEST VERIFIES THE BYTE INSTRUCTION MICROCODE FOR MODE 1
                                     ;SINGLE OPERAND INSTRUCTIONS.
                                     ;       THIS IS THE FIRST PLACE THE SIGN EXTEND LOGIC IS EXERCISED
                                     ;AND VERIFIED.
                                     ;
                                     ;*****************************************************************
                                     ;TEST 41        TEST MODE 1 EVEN BYTE USING SOP INST
                                     ;*****************************************************************
002652  005212                      TST41:  INC     (R2)            ;UPDATE TEST NUMBER
002654  022712  000041                      CMP     #41,(R2)        ;SEQUENCE ERROR?
002660  001017                              BNE     TST42-10        ;BR TO ERROR HALT ON SEQ ERROR
002662  005000                              CLR     R0              ;INITIALIZE R0
002664  005010                              CLR     (R0)            ;INITIALIZE LOC. 0
002666  005110                              COM     (R0)
002670  105010                              CLRB    (R0)            ;TRY TO CLEAR BYTE 0
002672  001404                              BEQ     SOPB1A
                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                    ;           CONDITIONAL BRANCH INST. AND    <====
                                                                    ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                    ;           WHICH FOLLOWS W/ 773            <====
002674  012742  000056                      MOV     #56,-(R2)       ;MOVE TO MAILBOX #  *******  56  *******
002700  005242                              INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002702  000000                              HALT                    ;CLRB DID NOT SET Z-BIT
002704  005210                      SOPB1A: INC     (R0)            ;INCREMENT TO TEST WORD
002706  100004                              BPL     SOPB1B
002710  105410                              NEGB    (R0)            ;NEGATE: ODD BYTE=377
002712  100002                              BPL     SOPB1B
002714  105210                              INCB    (R0)            ;INCREMENT ODD BYTE=0
002716  001404                              BEQ     TST42
                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                    ;           CONDITIONAL BRANCH INST. AND    <====
                                                                    ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                    ;           WHICH FOLLOWS W/ 761            <====
002720                              SOPB1B:
002720  012742  000057                      MOV     #57,-(R2)       ;MOVE TO MAILBOX #  *******  57  *******
002724  005242                              INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002726  000000                              HALT                    ;CHECK CUMMULATIVE RESULT OF ABOVE INST
                                                                    ;  OR SEQUENCE ERROR
```

```
                                ;*************************************************************************
                                ;
                                ;       THIS TEST VERIFIES THAT SINGLE OPERAND BYTE INSTRUCTIONS WILL
                                ;FUNCTION CORRECTLY FOR ODD BYTES.
                                ;       THIS IS THE FIRST TIME THAT ADDRESS LINE 0 HAS BEEN
                                ;EXERCISED.  CHECKS ARE MADE THAT THE PROPER BYTE IS MODIFIED AND
                                ;THE CONDITION CODES ARE CHECKED.  IT IS ALSO VERIFIED THAT THE UNADDRESSED
                                ;BYTE IS NOT ALTERED BY THE INSTRUCTION.
                                ;
                                ;*************************************************************************
                                ;TEST 42        TEST MODE 1 ODD BYTE USING SOP INST
                                ;*************************************************************************
002730  005212                  TST42:  INC     (R2)            ;UPDATE TEST NUMBER
002732  022712  000042                  CMP     #42,(R2)        ;SEQUENCE ERROR?
002736  001021                          BNE     TST43-10        ;BR TO ERROR HALT ON SEQ ERROR
002740  005000                          CLR     R0              ;INITIALIZE R0
002742  005010                          CLR     (R0)            ;INITIALIZE LOC. 0
002744  005110                          COM     (R0)
002746  005200                          INC     R0              ;R0=ODD BYTE
002750  105010                          CLRB    (R0)            ;TRY TO CLEAR BYTE 1
002752  001404                          BEQ     SOPB1C
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                ;           CONDITIONAL BRANCH INST. AND    <====
                                                                ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                ;           WHICH FOLLOWS W/ 772            <====
002754  012742  000060                  MOV     #60,-(R2)       ;MOVE TO MAILBOX #  *******  60  *******
002760  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
002762  000000                          HALT                    ;CLRB DID NOT SET Z-BIT
002764  005300                  SOPB1C: DEC     R0              ;R0=WORD ADDR.
002766  005210                          INC     (R0)            ;INCREMENT TO TEST WORD
002770  005200                          INC     R0              ;R0=ODD BYTE
002772  105410                          NEGB    (R0)            ;TRY TO NEGATE BYTE 1
002774  100002                          BPL     SOPB1D
002776  105210                          INCB    (R0)            ;TRY TO INCREMENT BYTE 1
003000  001404                          BEQ     TST43
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                ;           CONDITIONAL BRANCH INST. AND    <====
                                                                ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                ;           WHICH FOLLOWS W/ 757            <====
003002                          SOPB1D:
003002  012742  000061                  MOV     #61,-(R2)       ;MOVE TO MAILBOX #  *******  61  *******
003006  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003010  000000                          HALT                    ;TEST CUMMULATIVE RESULT OF ABOVE INST.
                                                                ;  OR SEQUENCE ERROR
```

```
                                        ;*********************************************************************
                                        ;
                                        ;       THIS TEST VERIFIES MODE 2 SINGLE-OPERAND INSTRUCTIONS.  PREVIOUSLY
                                        ;TESTED INSTRUCTIONS ARE USED TO SET A POINTER IN R0 TO LOC. 400.
                                        ;LOC. 400 IS INITIALIZED TO -1 BEFORE A CLR MODE 2 IS EXECUTED.
                                        ;       THEN R0 IS DECREMENTED BY TWO TO AGAIN POINT TO 400 BEFORE EACH
                                        ;OF SEVERAL MODE 2 INSTRUCTIONS ARE USED TO VERIFY THE DATA RESULTS OF
                                        ;THE TEST.  THIS PROCEDURE ALSO VERIFIES THE PROPER INCREMENTING OF THE
                                        ;REGISTER.
                                        ;
                                        ;*********************************************************************
                                        ;TEST 43        TEST MODE 2 USING SOP INST.
                                        ;*********************************************************************
003012  005212                          TST43:  INC     (R2)            ;UPDATE TEST NUMBER
003014  022712  000043                          CMP     #43,(R2)        ;SEQUENCE ERROR?
003020  001023                                  BNE     TST44-10        ;BR TO ERROR HALT ON SEQ ERROR
003022  005000                                  CLR     R0              ;SET R0=400
003024  105100                                  COMB    R0
003026  005200                                  INC     R0
003030  005010                                  CLR     (R0)            ;CLEAR 400
003032  005110                                  COM     (R0)            ;INITIALIZE: 400=-1
003034  005020                                  CLR     (R0)+           ;TRY CLEARING WITH MODE 2
003036  001404                                  BEQ     SOPZA
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                        ;           CONDITIONAL BRANCH INST. AND    <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                        ;           WHICH FOLLOWS W/ 771            <====
003040  012742  000062                          MOV     #62,-(R2)       ;MOVE TO MAILBOX #  *******  62  *******
003044  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003046  000000                                  HALT                    ;CLR INST DID NOT SET Z-BIT
003050  005300                          SOPZA:  DEC     R0              ;RESET R0
003052  005300                                  DEC     R0
003054  005120                                  COM     (R0)+           ;TRY COMPLEMENTING WITH MODE 2
003056  100004                                  BPL     SOP2B
003060  005300                                  DEC     R0              ;RESET R0
003062  005300                                  DEC     R0
003064  005220                                  INC     (R0)+           ;TRY INCREMENTING WITH MODE 2
003066  001404                                  BEQ     TST44
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                        ;           CONDITIONAL BRANCH INST. AND    <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                        ;           WHICH FOLLOWS W/ 755            <====
003070                                  SOP2B:
003070  012742  000063                          MOV     #63,-(R2)       ;MOVE TO MAILBOX #  *******  63  *******
003074  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003076  000000                                  HALT                    ;CHECK CUMMULATIVE RESULT OF ABOVE INST
                                                                        ;  OR SEQUENCE ERROR
```

```
1577
1578                            ;*****************************************************************************
1579                            ;
1580                            ;       THIS TEST VERIFIES MODE 2 SINGLE OPERAND INSTRUCTIONS WHICH
1581                            ;ADDRESS EVEN BYTES.  R0 IS SET TO 400 AND USED TO INITIALIZE LOCATION
1582                            ;400 TO -1.  CLRB INSTRUCTION IS THEN EXECUTED ON BYTE 400 WITH
1583                            ;MODE 2.
1584                            ;       R0 IS THEN DECREMENTED BEFORE EACH OF SEVERAL MODE 2 INSTRUCTIONS
1585                            ;WHICH ARE USED TO VERIFY THE DATA RESULTS OF THE TEST.  THIS PROCEDURE ALSO
1586                            ;VERIFIES THE PROPER INCREMENTING OF THE REGISTER.
1587                            ;
1588                            ;*****************************************************************************
1589                            ;TEST 44        TEST MODE 2 EVEN BYTE USING SOP INST.
1590                            ;*****************************************************************************
1591  003100  005212            TST44:  INC     (R2)            ;UPDATE TEST NUMBER
1592  003102  022712  000044            CMP     #44,(R2)        ;SEQUENCE ERROR?
1593  003106  001022                    BNE     TST45-10        ;BR TO ERROR HALT ON SEQ ERROR
1594  003110  005000                    CLR     R0              ;SET R0=400
1595  003112  105100                    COMB    R0
1596  003114  005200                    INC     R0
1597  003116  005010                    CLR     (R0)            ;CLEAR 400
1598  003120  005110                    COM     (R0)            ;INITIALIZE: 400=-1
1599  003122  105020                    CLRB    (R0)+           ;TRY TO CLEAT 400 W/MODE 2
1600  003124  001404                    BEQ     SOPB2A
1601                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1602                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1603                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1604                                                            ;           WHICH FOLLOWS W/ 771           <====
1605  003126  012742  000064            MOV     #64,-(R2)       ;MOVE TO MAILBOX #  *******  64  *******
1606  003132  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1607  003134  000000                    HALT                    ;CLR DID NOT SET Z-BIT
1608  003136  005300            SOPB2A: DEC     R0              ;RESULT R0=400
1609  003140  005210                    INC     (R0)            ;INC 400 TO TEST WORD
1610  003142  105420                    NEGB    (R0)+           ;TRY TO NEGATE EVEN BYTE
1611  003144  100003                    BPL     SOPB2B
1612  003146  005300                    DEC     R0              ;RESET R0=400
1613  003150  105220                    INCB    (R0)+           ;TRY INCREMENT OF EVEN BYTE
1614  003152  001404                    BEQ     TST45
1615                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1616                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1617                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1618                                                            ;           WHICH FOLLOWS W/ 756           <====
1619  003154                    SOPB2B:
1620  003154  012742  000065            MOV     #65,-(R2)       ;MOVE TO MAILBOX #  *******  65  *******
1621  003160  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1622  003162  000000                    HALT                    ;TEST CUMMULATIVE RESULT OF ABOVE INST.
1623                                                            ;  OR SEQUENCE ERROR
```

```
                                        ;****************************************************************************
                                        ;
                                        ;       THIS TEST FOLLOWS THE SAME PROCEDURE DESCRIBED IN THE PREVIOUS
                                        ;TEST.  HERE. THE BYTE INSTRUCTION IS USED TO ADDRESS AN ODD BYTE.
                                        ;
                                        ;****************************************************************************
                                        ;TEST 45        TEST MODE 2 ODD BYTE USING SOP INST.
                                        ;****************************************************************************
003164  005212                          TST45:  INC     (R2)            ;UPDATE TEST NUMBER
003166  022712  000045                          CMP     #45,(R2)        ;SEQUENCE ERROR?
003172  001025                                  BNE     TST46-10        ;BR TO ERROR HALT ON SEQ ERROR
003174  005000                                  CLR     R0              ;SET R0=400
003176  105100                                  COMB    R0
003200  005200                                  INC     R0
003202  005010                                  CLR     (R0)            ;CLEAR LOC 400
003204  005110                                  COM     (R0)            ;INITIALIZE: 400=-1
003206  005200                                  INC     R0              ;R0=ODD BYTE
003210  105020                                  CLRB    (R0)+           ;TRY TO CLEAR ODD BYTE
003212  001404                                  BEQ     SOPB2C
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS     <====
                                                                        ;           CONDITIONAL BRANCH INST. AND     <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION     <====
                                                                        ;           WHICH FOLLOWS W/ 770             <====
003214  012742  000066                          MOV     #66,-(R2)       ;MOVE TO MAILBOX #  *******  66  *******
003220  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003222  000000                                  HALT                    ;CLRB DID NOT SET Z-BIT
003224  005300                          SOPB2C: DEC     R0              ;R0=WORD ADDR.
003226  005300                                  DEC     R0
003230  005220                                  INC     (R0)+           ;INCREMENT WORD
003232  005300                                  DEC     R0              ;POINT TO ODD BYTE
003234  105420                                  NEGB    (R0)+           ;TRY TO NEGATE ODD BYTE
003236  100003                                  BPL     SOPB2D
003240  005300                                  DEC     R0              ;RESET R0 TO ODD BYTE
003242  105220                                  INCB    (R0)+           ;TRY TO INCREMENT ODD BYTE
003244  001404                                  BEQ     TST46
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS     <====
                                                                        ;           CONDITIONAL BRANCH INST. AND     <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION     <====
                                                                        ;           WHICH FOLLOWS W/ 753             <====
003246                                  SOPB2D:
003246  012742  000067                          MOV     #67,-(R2)       ;MOVE TO MAILBOX #  *******  67  *******
003252  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003254  000000                                  HALT                    ;TEST CUMMULATIVE RESULT OF ABOVE INST.
                                                                        ;  OR SEQUENCE ERROR
```

```
                                   ;*****************************************************************************
                                   ;
                                   ;        THIS TEST VERIFIES MODE 3 SINGLE OPERAND INSTRUCTIONS.  IT
                                   ;USES LOCATION 0 AS ITS TARGET DATA.  A TABLE LOCATED AT LOC. 400
                                   ;THRU 402 IS USED TO SUPPLY THE ADDRESS OF LOCATION 0 TO THE
                                   ;INSTRUCTIONS UNDER TEST.
                                   ;        R0 IS SET TO 400, THE START OF THE ADDRESS TABLE, AND A CLR
                                   ;INSTRUCTION IS EXECUTED WITH MODE 3 TO CLEAR LOC. 0.  THEN R0
                                   ;IS DECREMENTED BY TWO AND TWO OTHER MODE 3 INSTRUCTIONS OPERATE ON
                                   ;LOC. 0 TO VERIFY THE DATA RESULTS OF THE TEST.  THE PROPER INCREMENTING
                                   ;OF THE REGISTER IS ALSO VERIFIED IN THIS MANNER.
                                   ;        IF A FAILURE IS DETECTED BE SURE TO VERIFY THAT THE TABLE
                                   ;(LOC. 400-402) HAS THE PROPER VALUES (0).
                                   ;
                                   ;*****************************************************************************
                                   ;TEST 46        TEST MODE 3 USING SOP INST.
                                   ;*****************************************************************************
003256  005212                     TST46:  INC     (R2)                    ;UPDATE TEST NUMBER
003260  022712  000046                     CMP     #46,(R2)                ;SEQUENCE ERROR?
003264  001020                             BNE     TST47-10                ;BR TO ERROR HALT ON SEQ ERROR
003266  005000                             CLR     R0                      ;SET R0=400
003270  105100                             COMB    R0
003272  005200                             INC     R0
003274  005010                             CLR     (R0)                    ;CLEAR LOC 400
003276  005030                             CLR     @(R0)+                  ;TRY TO CLEAR LOC 0 USING MODE 3
003300  001404                             BEQ     SOP3A
                                                                           ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                           ;           CONDITIONAL BRANCH INST. AND   <====
                                                                           ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                           ;           WHICH FOLLOWS W/ 772           <====
003302  012742  000070                     MOV     #70,-(R2)               ;MOVE TO MAILBOX #  *******  70  *******
003306  005242                             INC     -(R2)                   ;SET MSGTYP TO FATAL ERROR
003310  000000                             HALT                            ;CLR DID NOT SET Z-BIT
003312  005300                     SOP3A:  DEC     R0                      ;RESET R0=400
003314  005300                             DEC     R0
003316  005130                             COM     @(R0)+                  ;TRY TO COMPLEMENT LOC 0 OF MODE 3
003320  100002                             BPL     SOP3B
003322  005230                             INC     @(R0)+                  ;TRY TO INCREMENT LOC 0 W/MODE 3
003324  001404                             BEQ     TST47
                                                                           ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                           ;           CONDITIONAL BRANCH INST. AND   <====
                                                                           ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                           ;           WHICH FOLLOWS W/ 760           <====
003326                             SOP3B:
003326  012742  000071                     MOV     #71,-(R2)               ;MOVE TO MAILBOX #  *******  71  *******
003332  005242                             INC     -(R2)                   ;SET MSGTYP TO FATAL ERROR
003334  000000                             HALT                            ;CUMMULATIVE RESULT OF ABOVE INST FAILED
                                                                           ;  OR SEQUENCE ERROR
```

```
1718
1719                                    ;*****************************************************************************
1720                                    ;
1721                                    ;       THIS TEST VERIFIES MODE 3 SINGLE OPERAND BYTE INSTRUCTIONS
1722                                    ;WHICH ADDRESS EVEN BYTES.  AGAIN, THE TARGET LOCATION 0 IS USED
1723                                    ;AND THE SAME TABLE AT 400 IS EMPLOYED.
1724                                    ;       AFTER POINTING R4 TO THE TABLE (400) AND SETTING LOCATION
1725                                    ;0 TO -1, A CLRB INSTRUCTION IS USED TO CLEAR BYTE 0.
1726                                    ;       SEVERAL OTHER MODE 3 INSTRUCTIONS ARE THEN USED WITH THE TABLE
1727                                    ;TO VERIFY THE DATA RESULTS AND THE PROPER INCREMENTING OF THE REGISTER.
1728                                    ;IF A FAILURE IS DETECTED, BE SURE THAT THE TABLE (LOCATION 400-402) HAS
1729                                    ;THE PROPER VALUES (0).
1730                                    ;
1731                                    ;*****************************************************************************
1732                                    ;TEST 47        TEST MODE 3 EVEN BYTE USING SOP INST.
1733                                    ;*****************************************************************************
1734  003336  005212                    TST47:  INC     (R2)            ;UPDATE TEST NUMBER
1735  003340  022712  000047                    CMP     #47,(R2)        ;SEQUENCE ERROR?
1736  003344  001026                            BNE     TST50-10        ;BR TO ERROR HALT ON SEQ ERROR
1737  003346  005004                            CLR     R4              ;SET R4=400
1738  003350  105104                            COMB    R4
1739  003352  005204                            INC     R4
1740  003354  005000                            CLR     R0              ;INITIALIZE LOC. 0=-1
1741  003356  005010                            CLR     (R0)
1742  003360  005110                            COM     (R0)
1743  003362  105034                            CLRB    @(R4)+          ;TRY TO CLEAR EVEN BYTE
1744  003364  001404                            BEQ     SOPB3A
1745                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1746                                                                    ;           CONDITIONAL BRANCH INST. AND   <====
1747                                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
1748                                                                    ;           WHICH FOLLOWS W/ 770           <====
1749  003366  012742  000072                            MOV     #72,-(R2)       ;MOVE TO MAILBOX #  *******  72  *******
1750  003372  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1751  003374  000000                            HALT                    ;CLRB DID NOT SET Z-BIT
1752  003376  005304                    SOPB3A: DEC     R4              ;RESET POINTER
1753  003400  005304                            DEC     R4
1754  003402  005234                            INC     @(R4)+          ;TRY INCREMENTING WORD
1755  003404  100006                            BPL     SOPB3B
1756  003406  105434                            NEGB    @(R4)+          ;TRY TO NEGATE EVEN BYTE
1757  003410  100004                            BPL     SOPB3B
1758  003412  005304                            DEC     R4
1759  003414  005304                            DEC     R4
1760  003416  105234                            INCB    @(R4)+          ;TRY TO INCREMENT EVEN BYTE
1761  003420  001404                            BEQ     TST50
1762                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1763                                                                    ;           CONDITIONAL BRANCH INST. AND   <====
1764                                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
1765                                                                    ;           WHICH FOLLOWS W/ 752           <====
1766  003422                            SOPB3B:
1767  003422  012742  000073                            MOV     #73,-(R2)       ;MOVE TO MAILBOX #  *******  73  *******
1768  003426  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1769  003430  000000                            HALT                    ;CUMMULATIVE RESULT OF ABOVE INST FAILED
1770                                                                    ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 3 SINGLE OPERAND BYTE INSTRUCTIONS
                                ;WHICH ADDRESS ODD BYTES.  THE TARGET IS BYTE 1.  A TABLE AT
                                ;LOC. 400-406 IS USED.  R0 SERVES AS THE TABLE POINTER.
                                ;       R0 IS INITIALIZED TO 400.  LOC. 0 IS SET TO -1 USING THE
                                ;FIRST TWO TABLE ENTRIES.  A CLRB MODE 3 IS EXECUTED ON BYTE 1 USING
                                ;TABLE ADDRESS AT 404.  R0 IS DECREMENTED TO 402 AND SEVERAL SOP
                                ;MODE 3 INSTRUCTIONS ARE USED TO VERIFY DATA RESULTS AND PROPER
                                ;REGISTER INCREMENTING.
                                ;       THE TABLE (400-406) SHOULD CONTAIN 0,0,1,1 BEFORE AND
                                ;AFTER THE TEST IS RUN.
                                ;
                                ;*****************************************************************************
                                ;TEST 50        TEST MODE 3 ODD BYTE USING SOP INST.
                                ;*****************************************************************************
003432  005212                  TST50:  INC     (R2)            ;UPDATE TEST NUMBER
003434  022712  000050                  CMP     #50,(R2)        ;SEQUENCE ERROR?
003440  001024                          BNE     TST51-10        ;BR TO ERROR HALT ON SEQ ERROR
003442  005000                          CLR     R0              ;SET R0=400
003444  105100                          COMB    R0
003446  005200                          INC     R0
003450  005030                          CLR     @(R0)+          ;INITIALIZE
003452  005130                          COM     @(R0)+          ;LOC 0=-1 R0=404
003454  105030                          CLRB    @(R0)+          ;TRY TO CLEAR ODD BYTE
003456  001404                          BEQ     SOPB3C
                                                                ;  TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;            CONDITIONAL BRANCH INST. AND   <====
                                                                ;            REPLACE THE MOVE INSTRUCTION   <====
                                                                ;            WHICH FOLLOWS W/ 771           <====
003460  012742  000074                          MOV     #74,-(R2)       ;MOVE TO MAILBOX #  *******  74  *******
003464  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003466  000000                          HALT                    ;CLRB DID NOT SET Z-BIT
003470  005300                  SOPB3C: DEC     R0              ;RESET R0
003472  005300                          DEC     R0
003474  005300                          DEC     R0              ;POINT TO EVEN BYTE ADDR.
003476  005300                          DEC     R0
003500  005230                          INC     @(R0)+          ;INCREMENT WORD
003502  105430                          NEGB    @(R0)+          ;TRY TO NEGATE ODD BYTE
003504  100002                          BPL     SOPB3D
003506  10523C                          INCB    @(R0)+          ;TRY TO INCREMENT ODD BYTE
003510  001404                          BEQ     TST51
                                                                ;  TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;            CONDITIONAL BRANCH INST. AND   <====
                                                                ;            REPLACE THE MOVE INSTRUCTION   <====
                                                                ;            WHICH FOLLOWS W/ 754           <====
003512                  SOPB3D:
003512  012742  000075                          MOV     #75,-(R2)       ;MOVE TO MAILBOX #  *******  75  *******
003516  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003520  000000                          HALT                    ;CUMMULATIVE RESULT OF ABOVE INSTS FAILED
                                                                ;  OR SEQUENCE ERROR
```

```
1823
1824                                    ;*****************************************************************************
1825                                    ;TEST 51        TEST MODE 4 USING SOP INSTS
1826                                    ;*****************************************************************************
1827  003522  005212                    TST51:  INC     (R2)            ;UPDATE TEST NUMBER
1828  003524  022712  000051                    CMP     #51,(R2)        ;SEQUENCE ERROR?
1829  003530  001021                            BNE     TST52-10        ;BR TO ERROR HALT ON SEQ ERROR
1830  003532  005000                            CLR     R0              ;SET R0=400
1831  003534  105100                            COMB    R0
1832  003536  005200                            INC     R0
1833  003540  005040                            CLR     -(R0)           ;TRY TO CLEAR USING MODE 4
1834  003542  001404                            BEQ     SOP4A
1835                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1836                                                                    ;           CONDITIONAL BRANCH INST. AND   <====
1837                                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
1838                                                                    ;           WHICH FOLLOWS W/ 773           <====
1839  003544  012742  000076                  MOV     #76,-(R2)       ;MOVE TO MAILBOX #  *******  76  *******
1840  003550  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1841  003552  000000                            HALT                    ;CLR DID NOT SET Z-BIT
1842  003554  005200                    SOP4A:  INC     R0              ;RESET R0
1843  003556  005200                            INC     R0
1844  003560  005140                            COM     -(R0)           ;TRY TO COMPLEMENT USING MODE 4
1845  003562  100004                            BPL     SOP4B
1846  003564  005200                            INC     R0              ;MOVE POINTER
1847  003566  005200                            INC     R0
1848  003570  005240                            INC     -(R0)
1849  003572  001404                            BEQ     TST52
1850                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1851                                                                    ;           CONDITIONAL BRANCH INST. AND   <====
1852                                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
1853                                                                    ;           WHICH FOLLOWS W/ 757           <====
1854  003574                            SOP4B:
1855  003574  012742  000077                  MOV     #77,-(R2)       ;MOVE TO MAILBOX #  *******  77  *******
1856  003600  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1857  003602  000000                            HALT                    ;CHECK CUMMULATIVE RESULT OF ABOVE INST.
1858                                                                    ;  OR SEQUENCE ERROR
```

```
                                  ;*************************************************************************
                                  ;
                                  ;       THIS TEST VERIFIES MODE 5 SINGLE OPERAND INSTRUCTIONS.  IT
                                  ;USES LOCATION 0 AS ITS TARGET DATA.  A TABLE LOCATED AT LOC. 372
                                  ;THRU 374 IS USED TO SUPPLY THE ADDRESS OF LOCATION 0 TO THE
                                  ;INSTRUCTIONS UNDER TEST
                                  ;       R0 IS SET TO 376, (THE START OF THE ADDRESS TABLE) +2,
                                  ;AND A CLR INSTRUCTION IS EXECUTED WITH MODE 3 TO CLEAR
                                  ;LOC. 0.  THEN R0 IS INCREMENTED BY TWO AND TWO OTHER MODE 3
                                  ;INSTRUCTIONS OPERATE ON LOC. 0 TO VERIFY THE DATA RESULTS OF
                                  ;THE TEST.  THE PROPER DECREMENTING OF THE REGISTER IS ALSO
                                  ;VERIFIED IN THIS MANNER.
                                  ;       IF A FAILURE IS DETECTED BE SURE TO VERIFY THAT THE TABLE
                                  ;(LOC. 372 THRU 374) HAS THE PROPER VALUES (0).
                                  ;
                                  ;*************************************************************************
                                  ;TEST 52        TEST MODE 5 USING SOP INSTS
                                  ;*************************************************************************
003604  005212                    TST52:  INC     (R2)            ;UPDATE TEST NUMBER
003606  022712  000052                    CMP     #52,(R2)        ;SEQUENCE ERROR?
003612  001017                            BNE     TST53-10        ;BR TO ERROR HALT ON SEQ ERROR
003614  005000                            CLR     R0              ;SET R0=376
003616  005020                            CLR     (R0)+
003620  105400                            NEGB    R0
003622  005050                            CLR     @-(R0)          ;TRY TO CLEAR LOC 0 W/MODE 5
003624  001404                            BEQ     SOP5A
                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS     <====
                                                                  ;           CONDITIONAL BRANCH INST. AND     <====
                                                                  ;           REPLACE THE MOVE INSTRUCTION     <====
                                                                  ;           WHICH FOLLOWS W/ 773             <====
003626  012742  000100                    MOV     #100,-(R2)      ;MOVE TO MAILBOX #  *******  100  *******
003632  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003634  000000                            HALT                    ;CLR DID NOT SET Z-BIT
003636  005200                    SOP5A:  INC     R0              ;RESET R0
003640  005200                            INC     R0
003642  005150                            COM     @-(R0)          ;TRY TO COMPLEMENT LOC. 0 W/MODE 5
003644  100002                            BPL     SOP5B
003646  005250                            INC     @-(R0)          ;TRY TO INCREMENT LOC. 0 W/MODE 5
003650  001404                            BEQ     TST53
                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS     <====
                                                                  ;           CONDITIONAL BRANCH INST. AND     <====
                                                                  ;           REPLACE THE MOVE INSTRUCTION     <====
                                                                  ;           WHICH FOLLOWS W/ 761             <====
003652                            SOP5B:
003652  012742  000101                    MOV     #101,-(R2)      ;MOVE TO MAILBOX #  *******  101  *******
003656  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003660  000000                            HALT                    ;TEST CUMMULATIVE RESULT OF ABOVE INSTS
                                                                  ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 6 SINGLE OPERAND INSTRUCTIONS.  IT
                                ;USES LOCATION 0 AS ITS TARGET DATA.  R0 IS SET TO 400 USING
                                ;PREVIOUSLY TESTED INSTRUCTIONS AND A MODE 6 CLR INSTRUCTION IS
                                ;EXECUTED ON LOC. 0 USING R0 AND A -400 OFFSET.  COM AND INC
                                ;INSTRUCTIONS ARE THEN USED TO VERIFY THE DATA.
                                ;
                                ;*****************************************************************************
                                ;TEST 53         TEST MODE 6 USING SOP INSTS
                                ;*****************************************************************************
003662  005212                TST53:  INC     (R2)            ;UPDATE TEST NUMBER
003664  022712  000053                CMP     #53,(R2)        ;SEQUENCE ERROR?
003670  001020                        BNE     TST54-10        ;BR TO ERROR HALT ON SEQ ERROR
003672  005000                        CLR     R0              ;SET R0=400
003674  105100                        COMB    R0
003676  005200                        INC     R0
003700  005060  177400                CLR     -400(R0)        ;TRY TO CLEAR LOCATION 0 W/MODE 6
003704  001404                        BEQ     SOP6A
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 772           <====
003706  012742  000102                MOV     #102,-(R2)      ;MOVE TO MAILBOX #  *******  102  *******
003712  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003714  000000                        HALT                    ;CLR DID NOT SET Z-BIT
003716  005160  177400        SOP6A:  COM     -400(R0)        ;TRY TO COMPLEMENT LOCATION 0 W/MODE 6
003722  100003                        BPL     SOP6B
003724  005260  177400                INC     -400(R0)        ;TRY TO INCREMENT LOCATION 0 W/MODE 6
003730  001404                        BEQ     TST54
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 760           <====
003732                          SOP6B:
003732  012742  000103                MOV     #103,-(R2)      ;MOVE TO MAILBOX #  *******  103  *******
003736  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
003740  000000                        HALT                    ;TEST CUMMULATIVE RESULT OF ABOVE INSTS
                                                            ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 7 SINGLE OPERAND INSTRUCTIONS.  IT USES
                                ;THE POINTER TO LOC. 0 WHICH IS STORED AT LOC. 402.
                                ;       R0 IS SET TO 400 AND A MODE 7 CLR INSTRUCTION IS
                                ;EXECUTED WITH A +2 OFFSET TO CLEAR LOC. 0.
                                ;       SEVERAL OTHER MODE 7 INSTRUCTIONS ARE THEN USED ON THE COMMON
                                ;LOCATION TO VERIFY THE DATA RESULTS.
                                ;
                                ;*****************************************************************************
                                ;TEST 54         TEST MODE 7 USING SOP INST.
                                ;*****************************************************************************
1961  003742  005212            ;ST54:  INC     (R2)            ;UPDATE TEST NUMBER
1962  003744  022712  000054            CMP     #54,(R2)        ;SEQUENCE ERROR?
1963  003750  001020                    BNE     TST55-10        ;BR TO ERROR HALT ON SEQ ERROR
1964  003752  005000                    CLR     R0              ;SET R0=400
1965  003754  105100                    COMB    R0
1966  003756  005200                    INC     R0
1967  003760  005070  000002            CLR     @2(R0)          ;TRY TO CLEAR LOC. 0 W/MODE 7
1968  003764  001404                    BEQ     SOP7A
1969                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1970                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1971                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1972                                                            ;           WHICH FOLLOWS W/ 772           <====
1973  003766  012742  000104            MOV     #104,-(R2)      ;MOVE TO MAILBOX #  *******  104  *******
1974  003772  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1975  003774  000000                    HALT                    ;CLR DID NOT SET Z-BIT
1976  003776  005170  000002    SOP7A:  COM     @2(R0)          ;TRY TO COMPLEMENT LOC. 0 W/MODE 7
1977  004002  100003                    BPL     SOP7B
1978  004004  005270  000002            INC     @2(R0)          ;TRY TO INCREMENT LOC. 0 W/MODE 7
1979  004010  001404                    BEQ     TST55
1980                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
1981                                                            ;           CONDITIONAL BRANCH INST. AND   <====
1982                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
1983                                                            ;           WHICH FOLLOWS W/ 760           <====
1984  004012            SOP7B:
1985  004012  012742  000105            MOV     #105,-(R2)      ;MOVE TO MAILBOX #  *******  105  *******
1986  004016  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
1987  004020  000000                    HALT                    ;TEST CUMMULATIVE RESULT OF ABOVE INSTS.
1988                                                            ;  OR SEQUENCE ERROR
```

C04

```
                                        ;*************************************************************************
                                        ;
                                        ;        THIS TEST VERIFIES PROGRAM COUNTER ADDRESSING WITH SOP
                                        ;INSTRUCTIONS.  CLR MODE 77 IS USED TO CLEAR THE LOCATION FOLLOWING THE
                                        ;INSTRUCTION (SOPX).  THEN SINGLE OPERAND INSTRUCTIONS WITH MODES 37, 67, AND
                                        ;77, USING INDIRECT POINTER SOPXAD ARE USED TO VERIFY THE DATA RESULTS
                                        ;OF THESE INSTRUCTIONS.
                                        ;
                                        ;*************************************************************************
                                        ;TEST 55        TEST SOP INSTRUCTIONS MODES 2,3,6,7 WITH REGISTER 7
                                        ;*************************************************************************
004022  005212                          TST55:  INC     (R2)            ;UPDATE TEST NUMBER
004024  022712  000055                          CMP     #55,(R2)        ;SEQUENCE ERROR?
004030  001017                                  BNE     SOPB            ;BR TO ERROR HALT ON SEQ ERROR
004032  005027                                  CLR     (R7)+           ;CLEAR NEXT LOCATION: (SOPX)
004034  177777                          SOPX:   -1                      ;USE MODE 27
004036  001404                                  BEQ     SOPA
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                        ;           CONDITIONAL BRANCH INST. AND    <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                        ;           WHICH FOLLOWS W/ 775            <====
004040  012742  000106                          MOV     #106,-(R2)      ;MOVE TO MAILBOX #  *******  106  *******
004044  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004046  000000                                  HALT                    ;CLR DID NOT SET Z-BIT
004050  005237  004034                  SOPA:   INC     @#SOPX          ;INC SOPX W/MODE 37
004054  005467  177754                          NEG     SOPX            ;NEGATE SOPX W/MODE 67
004060  100003                                  BPL     SOPB
004062  005277  000012                          INC     @SOPXAD         ;INC SOPX W/MODE 77
004066  001405                                  BEQ     TST56
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                        ;           CONDITIONAL BRANCH INST. AND    <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                        ;           WHICH FOLLOWS W/ 761            <====
004070                                  SOPB:
004070  012742  000107                          MOV     #107,-(R2)      ;MOVE TO MAILBOX #  *******  107  *******
004074  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004076  000000                                  HALT                    ;INC DID NOT SET Z-BIT
                                                                        ;  OR SEQUENCE ERROR
004100  004034                          SOPXAD: SOPX                    ;INDIRECT ADDRESS OF SOPX
```

```
                                ;*******************************************************************
                                ;
                                ;       THIS TEST VERIFIES SINGLE OPERAND NON-MODIFYING INSTRUCTIONS
                                ;USING MODE 0.  R0 IS SET TO ZERO AND THE CONDITION CODES ARE SET
                                ;TO THE COMPLEMENT OF THAT EXPECTED BY THE INSTRUCTION.  A TST INSTRUCTION
                                ;IS EXECUTED AND CONDITIONAL BRANCHES ARE USED TO TEST THE CONDITION
                                ;CODES.
                                ;
                                ;*******************************************************************
                                ;TEST 56        TEST MODE 0 SOP NON-MODIFYING
                                ;*******************************************************************
004102  005212                  TST56:  INC     (R2)            ;UPDATE TEST NUMBER
004104  022712  000056                  CMP     #56,(R2)        ;SEQUENCE ERROR?
004110  001010                          BNE     TST57-10        ;BR TO ERROR HALT ON SEQ ERROR
004112  005000                          CLR     R0              ;INITIALIZE R0=0
004114  000277                          SCC                     ;SET CC=1011
004116  000244                          CLZ
004120  005700                          TST     R0              ;TRY TST W/ MODE 0
004122  102403                          BVS     SNMOA           ;CHECK THAT CC=0100
004124  100402                          BMI     SNMOA
004126  103401                          BCS     SNMOA
004130  001404                          BEQ     TST57
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                ;          CONDITIONAL BRANCH INST. AND    <====
                                                                ;          REPLACE THE MOVE INSTRUCTION     ====
                                                                ;          WHICH FOLLOWS W/ 770            <====
004132                          SNMOA:
004132  012742  000110                  MOV     #110,-(R2)      ;MOVE TO MAILBOX #  *******  110  *******
004136  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004140  000000                          HALT                    ;CONDITION CODES NOT SET PROPERLY
                                                                ;  OR SEQUENCE ERROR
```

```
2061
2062
2063
2064
2065
2066
2067
2068
2069
2070
2071
2072
2073  004142  005212                  TST57:  INC     (R2)            ;UPDATE TEST NUMBER
2074  004144  022712  000057                  CMP     #57,(R2)        ;SEQUENCE ERROR?
2075  004150  001010                          BNE     TST60-10        ;BR TO ERROR HALT ON SEQ ERROR
2076  004152  005000                          CLR     R0              ;INITIALIZE
2077  004154  105100                          COMB    R0              ;R0=377
2078  004156  000277                          SCC                     ;SET CC=0111
2079  004160  000250                          CLN
2080  004162  105700                          TSTB    R0              ;TRY TST EVEN BYTE
2081  004164  102402                          BVS     SNMBOA          ;CHECK CC=1000
2082  004166  101401                          BLOS    SNMBOA
2083  004170  100404                          BMI     TST60
2084                                                                   ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2085                                                                   ;           CONDITIONAL BRANCH INST. AND   <====
2086                                                                   ;           REPLACE THE MOVE INSTRUCTION   <====
2087                                                                   ;           WHICH FOLLOWS W/ 770           <====
2088  004172                          SNMBOA:
2089  004172  012742  000111                  MOV     #111,-(R2)      ;MOVE TO MAILBOX #  *******  111  *******
2090  004176  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2091  004200  000000                          HALT                    ;CONDITION CODES NOT SET PROPERLY
2092                                                                   ;  OR SEQUENCE ERROR
```

```
                                ;*************************************************************************
                                ;
                                ;       THIS TEST VERIFIES SINGLE OPERAND INSTRUCTIONS WITH MODE 1.
                                ;RO IS USED TO POINT TO AND CLEAR LOC. 0.  THE COMPLEMENT OF THE
                                ;EXPECTED CONDITION CODES ARE LOADED IN THE PSW.  A TST INSTRUCTION
                                ;IS THEN EXECUTED ON LOC. 0 USING R0 AND CONDITIONAL BRANCHES TEST
                                ;THE RESULTS.
                                ;
                                ;*************************************************************************
                                ;TEST 60        TEST MODE 1 SOP NON-MODIFYING
                                ;*************************************************************************
004202  005212                  TST60:  INC     (R2)            ;UPDATE TEST NUMBER
004204  022712  000060                  CMP     #60,(R2)        ;SEQUENCE ERROR?
004210  001011                          BNE     TST61-10        ;BR TO ERROR HALT ON SEQ ERROR
004212  005000                          CLR     R0              ;POINT TO LOC 0
004214  005010                          CLR     (R0)            ;CLEAR LOC 0
004216  000277                          SCC                     ;INITIALIZE
004220  000244                          CLZ                     ;CC=1011
004222  005710                          TST     (R0)            ;TRY TST W/ MODE 1
004224  102403                          BVS     SNM1A           ;CHECK CC=0100
004226  103402                          BCS     SNM1A
004230  100401                          BMI     SNM1A
004232  001404                          BEQ     TST61
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                ;           CONDITIONAL BRANCH INST. AND    <====
                                                                ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                ;           WHICH FOLLOWS W/ 767            <====
004234                          SNM1A:
004234  012742  000112                  MOV     #112,-(R2)      ;MOVE TO MAILBOX #  *******  112  *******
004240  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004242  000000                          HALT                    ;CC'S NOT SET PROPERLY
                                                                ;  OR SEQUENCE ERROR
```

```
                                  ;*************************************************************************
                                  ;
                                  ;        THIS TEST SETS LOCATION 0 TO 377 AND THEN USES R0 TO TEST
                                  ;THE EVEN BYTE AND THE ODD BYTE USING SOP BYTE INSTRUCTIONS WITH MODE 1.
                                  ;AGAIN, CONDITIONAL BRANCHES ARE USED TO VERIFY THE SETTING OF THE
                                  ;PROPER CONDITION CODE BITS.
                                  ;
                                  ;*************************************************************************
                                  ;TEST 61         TEST MODE 1 BYTE INST. NON-MODIFYING
                                  ;*************************************************************************
004244  005212                    TST61:  INC     (R2)            ;UPDATE TEST NUMBER
004246  022712  000061                    CMP     #61,(R2)        ;SEQUENCE ERROR?
004252  001026                            BNE     TST62-10        ;BR TO ERROR HALT ON SEQ ERROR
004254  005000                            CLR     R0              ;POINT TO LOC 0
004256  005010                            CLR     (R0)            ;CLEAR LOC 0
004260  105110                            COMB    (R0)            ;COMPLEMENT BYTE 0
004262  000277                            SCC                     ;SET CC=0111
004264  000250                            CLN
004266  105710                            TSTB    (R0)            ;TRY TST ON EVEN BYTE
004270  102402                            BVS     SNMB1A
004272  101401                            BLOS    SNMB1A
004274  100404                            BMI     SNMB1B
                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                  ;           CONDITIONAL BRANCH INST. AND     <====
                                                                  ;           REPLACE THE MOVE INSTRUCTION     <====
                                                                  ;           WHICH FOLLOWS W/ 767             <====
004276                            SNMB1A:
004276  012742  000113                    MOV     #113,-(R2)      ;MOVE TO MAILBOX #  *******  113  *******
004302  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004304  000000                            HALT                    ;CC'S NOT CORRECT
004306  005000                    SNMB1B: CLR     R0
004310  005200                            INC     R0
004312  000277                            SCC                     ;SET CC=1011
004314  000244                            CLZ
004316  105710                            TSTB    (R0)            ;TRY TO TST AN ODD BYTE
004320  102403                            BVS     SNMB1C          ;CHECK CC=0100
004322  103402                            BCS     SNMB1C
004324  100401                            BMI     SNMB1C
004326  001404                            BEQ     TST62
                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                  ;           CONDITIONAL BRANCH INST. AND     <====
                                                                  ;           REPLACE THE MOVE INSTRUCTION     <====
                                                                  ;           WHICH FOLLOWS W/ 752             <====
004330                            SNMB1C:
004330  012742  000114                    MOV     #114,-(R2)      ;MOVE TO MAILBOX #  *******  114  *******
004234  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004336  000000                            HALT                    ;CC'S NOT CORRECT
                                                                  ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES THE SINGLE-OPERAND NON-MODIFYING INSTRUCTIONS
                                ;USING MODE 2.  IT USES THE IDENTICAL PROCEDURE EMPLOYED IN THE
                                ;MODE 1 TESTS.  ADDITIONALLY, THE REGISTER IS CHECKED TO ASSURE THAT
                                ;IT IS INCREMENTED PROPERLY.
                                ;
                                ;*****************************************************************************
                                ;TEST 62         TEST MODE 2 WITH SOP NON-MODIFYING
                                ;*****************************************************************************
004340  005212                  TST62:  INC     (R2)            ;UPDATE TEST NUMBER
004342  022712  000062                  CMP     #62,(R2)        ;SEQUENCE ERROR?
004346  001020                          BNE     TST63-10        ;BR TO ERROR HALT ON SEQ ERROR
004350  005000                          CLR     R0              ;INITIALIZE R0=0
004352  005010                          CLR     (R0)            ;CLEAR LOC 0
004354  000277                          SCC                     ;SET CC=1011
004356  000244                          CLZ
004360  005720                          TST     (R0)+           ;TRY TST W/ MODE 2
004362  102403                          BVS     SNM2A           ;CHECK CC=0100
004364  103402                          BCS     SNM2A
004366  100401                          BMI     SNM2A
004370  001404                          BEQ     SNM2B
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 767           <====
004372                          SNM2A:
004372  012742  000115                  MOV     #115,-(R2)      ;MOVE TO MAILBOX #  *******  115  *******
004376  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004400  000000                          HALT                    ;CC'S NOT CORRECT
004402  005300                  SNM2B:  DEC     R0              ;RESET R0
004404  005300                          DEC     R0
004406  001404                          BEQ     TST63
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 760           <====
004410  012742  000116                  MOV     #116,-(R2)      ;MOVE TO MAILBOX #  *******  116  *******
004414  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004416  000000                          HALT                    ;MODE 2 DID NOT INC REQ CORRECTLY
                                                                ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 2 SINGLE OPERAND NON-MODIFYING BYTE
                                ;INSTRUCTIONS IT USES R0 TO POINT TO LOC. 0.  WITH LOCATION 0
                                ;SET TO 377, THE EVEN AND ODD BYTE IS TESTED WITH TSTB INSTRUCTIONS
                                ;TO VERIFY THE CORRECT CC ARE SET.  THE REGISTER IS CHECKED FOR
                                ;PROPER INCREMENTING.
                                ;
                                ;*****************************************************************************
                                ;TEST 63         TEST MODE 2 - BYTE W/ SOP NON-MODIFYING
                                ;*****************************************************************************
004420  005212                TST63:  INC     (R2)            ;UPDATE TEST NUMBER
004422  022712  000063              CMP     #63,(R2)        ;SEQUENCE ERROR?
004426  001042                      BNE     TST64-10        ;BR TO ERROR HALT ON SEQ ERROR
004430  005000                      CLR     R0              ;CLEAR R0
004432  005010                      CLR     (R0)            ;CLEAR LOC 0
004434  105110                      COMB    (R0)            ;SET LOC 0=377
004436  000277                      SCC                     ;SET CC=0111
004440  000250                      CLN
004442  105720                      TSTB    (R0)+           ;TRY TST OF EVEN BYTE
004444  102402                      BVS     SNMB2A
004446  101401                      BLOS    SNMB2A
004450  100404                      BMI     SNMB2B
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 767           <====
004452                          SNMB2A:
004452  012742  000117                MOV     #117,-(R2)      ;MOVE TO MAILBOX #  *******  117  *******
004456  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004460  000000                      HALT                    ;CC'S NOT SET CORRECTLY
004462  005300                SNMB2B: DEC     R0              ;DECREMENT R0
004464  001404                      BEQ     SNMB2C
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 761           <====
004466  012742  000120                MOV     #120,-(R2)      ;MOVE TO MAILBOX #  *******  120  *******
004472  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004474  000000                      HALT                    ;MODE 2 DID NOT INC REG CORRECTLY
004476  005200                SNMB2C: INC     R0              ;POINT TO ODD BYTE
004500  000277                      SCC                     ;SET CC=1011
004502  000244                      CLZ
004504  105720                      TSTB    (R0)+           ;TRY TST OF ODD BYTE
004506  102403                      BVS     SNMB2D          ;CHECK CC'S=0100
004510  103402                      BCS     SNMB2D
004512  100401                      BMI     SNMB2D
004514  001404                      BEQ     SNMB2E
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 745           <====
004516                          SNMB2D:
004516  012742  000121                MOV     #121,-(R2)      ;MOVE TO MAILBOX #  *******  121  *******
004522  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
```

```
004524  000000                  HALT                    ;CC'S NOT CORRECT
004526  005300          SNMB2E: DEC     R0
004530  005300                  DEC     R0
004532  001404                  BEQ     TST64
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
                                                        ;           CONDITIONAL BRANCH INST. AND      <====
                                                        ;           REPLACE THE MOVE INSTRUCTION      <====
                                                        ;           WHICH FOLLOWS W/ 736              <====
004534  012742  000122          MOV     #122,-(R2)      ;MOVE TO MAILBOX #  *******  122  *******
004540  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004542  000000                  HALT                    ;R0 DID NOT INCREMENT PROPERLY
                                                        ;  OR SEQUENCE ERROR
```

```
2285
2286                                    ;*****************************************************************************
2287                                    ;
2288                                    ;       THIS TEST VERIFIES MODE 3 SINGLE OPERAND NON-MODIFYING INSTRUCTIONS.
2289                                    ;A POINTER IN A TABLE AT LOC. 376 IS USED TO TEST LOCATION 0.
2290                                    ;THE CC'S AND THE REGISTER ARE CHECKED FOLLOWING THE
2291                                    ;TST MODE 3 INSTRUCTION.
2292                                    ;
2293                                    ;*****************************************************************************
2294                                    ;TEST 64        TEST MODE 3 W/ SOP NON-MODIFYING INSTS
2295                                    ;*****************************************************************************
2296  004544  005212                    TST64:  INC     (R2)            ;UPDATE TEST NUMBER
2297  004546  022712  000064                    CMP     #64,(R2)        ;SEQUENCE ERROR?
2298  004552  001022                            BNE     TST65-10        ;BR TO ERROR HALT ON SEQ ERROR
2299  004554  005000                            CLR     R0              ;R0=0
2300  004556  005010                            CLR     (R0)            ;CLEAR LOC 0
2301  004560  105100                            COMB    R0              ;R0=376
2302  004562  005300                            DEC     R0
2303  004564  000277                            SCC                     ;SET CC=1011
2304  004566  000244                            CLZ
2305  004570  005730                            TST     @(R0)+          ;TRY TST W/ MODE 3
2306  004572  102403                            BVS     SNM3A           ;CHECK CC=0100
2307  004574  103402                            BCS     SNM3A
2308  004576  100401                            BMI     SNM3A
2309  004600  001404                            BEQ     SNM3B
2310                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2311                                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2312                                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2313                                                                    ;           WHICH FOLLOWS W/ 765           <====
2314  004602                            SNM3A:
2315  004602  012742  000123                    MOV     #123,-(R2)      ;MOVE TO MAILBOX #  *******  123  *******
2316  004606  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2317  004610  000000                            HALT                    ;CC'S NOT CORRECT
2318  004612  005300                    SNM3B:  DEC     R0              ;R0=377
2319  004614  105100                            COMB    R0              ;R0=0
2320  004616  001404                            BEQ     TST65
2321                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2322                                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2323                                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2324                                                                    ;           WHICH FOLLOWS W/ 756           <====
2325  004620  012742  000124                    MOV     #124,-(R2)      ;MOVE TO MAILBOX #  *******  124  *******
2326  004624  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2327  004626  000000                            HALT                    ;MODE 3 DID NOT INC REG CORRECTLY
2328                                                                    ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES SOP NON-MODIFYING BYTE INSTRUCTIONS MODE 3
                                ;LOC. 0 IS SET TO 377.  TABLE AT LOC. 402-404 IS USED TO TEST
                                ;BYTE 0 AND BYTE 1.  THE REGISTER IS CHECKED FOR PROPER INCREMENTING AND
                                ;THE CC'S ARE VERIFIED.
                                ;       THE TABLE AT LOC. 402-404 SHOULD CONTAIN 0 AND 1 BEFORE AND
                                ;AFTER THE TEST IS RUN.
                                ;
                                ;*****************************************************************************
                                ;TEST 65        TEST MODE 3 - BYTES W/ SOP NON-MODIFYING INSTS.
                                ;*****************************************************************************
004630  005212        TST65:  INC     (R2)            ;UPDATE TEST NUMBER
004632  022712  000065        CMP     #65,(R2)        ;SEQUENCE ERROR?
004636  001036                BNE     TST66-10        ;BR TO ERROR HALT ON SEQ ERROR
004640  005000                CLR     R0              ;R0=0
004642  005010                CLR     (R0)            ;CLEAR LOC 0
004644  105110                COMB    (R0)            ;LOC. 0 =377
004646  105100                COMB    R0
004650  005200                INC     R0
004652  005720                TST     (R0)+           ;R0=402
004654  000277                SCC                     ;CC=0111
004656  000250                CLN
004660  105730                TSTB    @(R0)+          ;TRY TST OF EVEN BYTE
004662  102402                BVS     SNMB3A          ;CHECK CC=1000
004664  101401                BLOS    SNMB3A
004666  100404                BMI     SNMB3B
                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                ;           CONDITIONAL BRANCH INST. AND   <====
                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                ;           WHICH FOLLOWS W/ 764           <====
004670          SNMB3A:
004670  012742  000125        MOV     #125,-(R2)      ;MOVE TO MAILBOX #  *******  125  *******
004674  005242                INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004676  000000                HALT                    ;CC'S NOT CORRECT
004700  000277        SNMB3B: SCC                     ;SET CC=1011
004702  000244                CLZ
004704  105730                TSTB    @(R0)+          ;TRY TST OF ODD BYTE
004706  102403                BVS     SNMB3C          ;CHECK CC=0100
004710  103402                BCS     SNMB3C
004712  100401                BMI     SNMB3C
004714  001404                BEQ     SNMB3D
                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                ;           CONDITIONAL BRANCH INST. AND   <====
                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                ;           WHICH FOLLOWS W/ 751           <====
004716          SNMB3C:
004716  012742  000125        MOV     #126,-(R2)      ;MOVE TO MAILBOX #  *******  126  *******
004722  005242                INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004724  000000                HALT                    ;CC'S NOT CORRECT
004726  005720        SNMB3D: TST     (R0)+           ;R0=410
004730  005710                TST     (R0)
004732  100404                BMI     TST66
                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                ;           CONDITIONAL BRANCH INST. AND   <====
```

```
                                                        ;          REPLACE THE MOVE INSTRUCTION   <====
                                                        ;          WHICH FOLLOWS W/ 742           <====
004734  012742  000127          MOV     #127,-(R2)      ;MOVE TO MAILBOX #  *******  127  *******
004740  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
004742  000000                  HALT                    ;TSTB DID NOT INCREMENT R0 CORRETCLY
                                                        ;  OR SEQUENCE ERROR
                        ;*****************************************************************************
                        ;
                        ;       THIS TEST VERIFIES MODE 4 SOP NON-MODIFYING INSTRUCTIONS.
                        ;LOC. 0 IS SET TO -1 AND THE CC'S ARE SET TO THE COMPLEMENT OF THE
                        ;EXPECTED RESULTS.  R0 AND SET TO 2 AND A TST MODE 4 IS EXECUTED.
                        ;THE CC'S ARE CHECKED WITH CONDITIONAL BRANCH INSTRUCTIONS AND THE REGISTER
                        ;IS CHECKED FOR PROPER DECREMENTING.
                        ;
                        ;*****************************************************************************
                        ;TEST 66        TEST MODE 4 W/ SOP NON-MODIFYING INSTS
                        ;*****************************************************************************
004744  005212          TST66:  INC     (R2)            ;UPDATE TEST NUMBER
004746  022712  000066          CMP     #66,(R2)        ;SEQUENCE ERROR?
004752  001017                  BNE     TST67-10        ;BR TO ERROR HALT ON SEQ ERROR
004754  005000                  CLR     R0              ;R0=0
004756  005010                  CLR     (R0)            ;LOC 0=0
004760  005120                  COM     (R0)+           ;LOC 0=-1
004762  000277                  SCC                     ;SET CC=1011
004764  000244                  CLZ
004766  005740                  TST     -(R0)           ;TRY TST W/ MODE 4
004770  102402                  BVS     SNM4A           ;CHECK CC=0100
004772  101401                  BLOS    SNM4A
004774  100404                  BMI     SNM4B
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;          CONDITIONAL BRANCH INST. AND   <====
                                                        ;          REPLACE THE MOVE INSTRUCTION   <====
                                                        ;          WHICH FOLLOWS W/ 767           <====
004776          SNM4A:
004776  012742  000130          MOV     #130,-(R2)      ;MOVE TO MAILBOX #  *******  130  *******
005002  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
005004  000000                  HALT                    ;CC'S NOT CORRECT
005006  005700          SNM4B:  TST     R0
005010  001404                  BEQ     TST67
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;          CONDITIONAL BRANCH INST. AND   <====
                                                        ;          REPLACE THE MOVE INSTRUCTION   <====
                                                        ;          WHICH FOLLOWS W/ 761           <====
005012  012742  000131          MOV     #131,-(R2)      ;MOVE TO MAILBOX #  *******  131  *******
005016  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
005020  000000                  HALT                    ;TST MODE 4 DID NOT DEC R0 CORRECTLY
                                                        ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 5 SOP NON-MODIFYING INSTRUCTIONS.
                                ;IT USES A POINTER AT LOC. 376 TO TEST LOC. 0.  R0 IS SET
                                ;TO 400, A TST MODE 5 INSTRUCTION IS EXECUTED AND THE CC'S CHECKED.
                                ;R0 IS CHECKED TO INSURE PROPER DECREMENTING.
                                ;
                                ;*****************************************************************************
                                ;TEST 67        TEST MODE 5 W/ SOP NON-MODIFYING INSTS
                                ;*****************************************************************************
005022  005212                  TST67:  INC     (R2)            ;UPDATE TEST NUMBER
005024  022712  000067                  CMP     #67,(R2)        ;SEQUENCE ERROR?
005030  001022                          BNE     TST70-10        ;BR TO ERROR HALT ON SEQ ERROR
005032  005000                          CLR     R0              ;R0=0
005034  005010                          CLR     (R0)            ;LOC 0=0
005036  005110                          COM     (R0)            ;LOC 0=-1
005040  105100                          COMB    R0              ;R0=377
005042  005200                          INC     R0              ;R0=400
005044  000277                          SCC                     ;SET CC=0111
005046  000250                          CLN
005050  005750                          TST     @-(R0)          ;TRY TST W/ MODE 5
005052  102402                          BVS     SNM5A           ;CHECK CC=1000
005054  101401                          BLOS    SNM5A
005056  100404                          BMI     SNM5B
                                ;                               ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                ;                               ;           CONDITIONAL BRANCH INST. AND   <====
                                ;                               ;           REPLACE THE MOVE INSTRUCTION   <====
                                ;                               ;           WHICH FOLLOWS W/ 765           <====
005060                          SNM5A:
005060  012742  000132                  MOV     #132,-(R2)      ;MOVE TO MAILBOX #  *******  132  *******
005064  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
005066  000000                          HALT                    ;CC'S NOT SET PROPERLY
005070  005200                  SNM5B:  INC     R0              ;R0=377
005072  105100                          COMB    R0              ;R0=0
005074  001404                          BEQ     TST70
                                ;                               ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                ;                               ;           CONDITIONAL BRANCH INST. AND   <====
                                ;                               ;           REPLACE THE MOVE INSTRUCTION   <====
                                ;                               ;           WHICH FOLLOWS W/ 756           <====
005076  012742  000133                  MOV     #133,-(R2)      ;MOVE TO MAILBOX #  *******  133  *******
005102  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
005104  000000                          HALT                    ;MODE 5 DID NOT DEC R0 CORRECTLY
                                ;                               ;  OR SEQUENCE ERROR
```

```
                        ;*****************************************************************************
                        ;
                        ;       THIS TEST VERIFIES MODE 6 SOP NON-MODIFYING INSTRUCTIONS.
                        ;R0 IS SET TO 377 AND A MODE 6 TST INSTRUCTION IS EXECUTED
                        ;USING R0 AND AN OFFSET OF -377.  THE CC'S ARE CHECKED AS WELL
                        ;AS R0 TO INSURE IT WAS NOT ALTERED.
                        ;
                        ;*****************************************************************************
                        ;TEST 70         TEST MODE 6 W/ SOP NON-MODIFYING INSTS
                        ;*****************************************************************************
005106  005212          TST70:  INC     (R2)            ;UPDATE TEST NUMBER
005110  022712  000070          CMP     #70,(R2)        ;SEQUENCE ERROR?
005114  001021                  BNE     TST71-10        ;BR TO ERROR HALT ON SEQ ERROR
005116  005000                  CLR     R0              ;R0=0
005120  005010                  CLR     (R0)            ;LOC 0=0
005122  005110                  COM     (R0)            ;LOC 0=-1
005124  105100                  COMB    R0              ;R0=377
005126  000277                  SCC                     ;SET CC=0111
005130  000250                  CLN
005132  005760  177401          TST     -377(R0)        ;TRY TST W/ MODE 6
005136  102402                  BVS     SNM6A           ;CHECK CC=1000
005140  101401                  BLOS    SNM6A
005142  100404                  BMI     SNM6B
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 765           <====
005144                  SNM6A:
005144  012742  000134          MOV     #134,-(R2)      ;MOVE TO MAILBOX #  *******  134  *******
005150  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
005152  000000                  HALT                    ;CC'S INCORRECT
005154  105100          SNM6B:  COMB    R0              ;R0=0
005156  001404                  BEQ     TST71
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 757           <====
005160  012742  000135          MOV     #135,-(R2)      ;MOVE TO MAILBOX #  *******  135  *******
005164  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
005166  000000                  HALT                    ;TST MODE 6 INCORRECTLY CHANGED RC
                                                        ;  OR SEQUENCE ERROR
```

```
2518
2519                    ;*****************************************************************************
2520                    ;
2521                    ;       THIS TEST VERIFIES MODE 7 SOP NON-MODIFYING INSTRUCTIONS.
2522                    ;IT USES A POINTER TO LOC. 0 STORED AT LOC. 400 TO TST LOC. 0.
2523                    ;R0 IS SET TO 377 AND LOC. 0 IS TESTED THRU THE POINTER AT 400 USING
2524                    ;R0 AND AN OFFSET OF 1.
2525                    ;
2526                    ;*****************************************************************************
2527                    ;TEST 71        TEST MODE 7 W/ SOP NON-MODIFYING INSTS.
2528                    ;*****************************************************************************
2529  005170  005212    TST71:  INC     (R2)            ;UPDATE TEST NUMBER
2530  005172  022712    000071          CMP     #71,(R2)        ;SEQUENCE ERROR?
2531  005176  001021                    BNE     TST72-10        ;BR TO ERROR HALT ON SEQ ERROR
2532  005200  005000                    CLR     R0              ;R0=0
2533  005202  005010                    CLR     (R0)            ;LOC 0=0
2534  005204  005110                    COM     (R0)            ;LOC 0=-1
2535  005206  105100                    COMB    R0              ;R0=377
2536  005210  000277                    SCC                     ;CC=0111
2537  005212  000250                    CLN
2538  005214  005770    000001          TST     @1(R0)          ;TRY TST W/ MODE 7
2539  005220  102402                    BVS     SNM7A           ;CHECK CC=1000
2540  005222  101401                    BLOS    SNM7A
2541  005224  100404                    BMI     SNM7B
2542                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2543                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2544                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2545                                                    ;           WHICH FOLLOWS W/ 765           <====
2546  005226            SNM7A:
2547  005226  012742    000136          MOV     #136,-(R2)      ;MOVE TO MAILBOX #  *******  136  *******
2548  005232  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2549  005234  000000                    HALT                    ;CC'S NOT CORRECT
2550  005236  105100    SNM7B:  COMB    R0                      ;R0=0
2551  005240  001404                    BEQ     TST72
2552                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2553                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2554                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2555                                                    ;           WHICH FOLLOWS W/ 757           <====
2556  005242  012742    000137          MOV     #137,-(R2)      ;MOVE TO MAILBOX #  *******  137  *******
2557  005246  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2558  005250  000000                    HALT                    ;TST MODE 7 INCORRECTLY CHANGED RC
2559                                                    ;  OR SEQUENCE ERROR
```

```
2560
2561                    ;*****************************************************************************
2562                    ;
2563                    ;       THIS TEST VERIFIES MODE 0 DOUBLE OPERAND INSTRUCTIONS.  IT SETS
2564                    ;DATA IN R0 AND R4 AND USES THE ADD INSTRUCTION TO TEST THE DOP
2565                    ;MICROCODE.
2566                    ;
2567                    ;*****************************************************************************
2568                    ;TEST 72        TEST MODE 0 DOUBLE-OPERAND (DOP) INSTS.
2569                    ;*****************************************************************************
2570  005252  005212    ;ST72:  INC     (R2)            ;UPDATE TEST NUMBER
2571  005254  022712    000072          CMP     #72,(R2)        ;SEQUENCE ERROR?
2572  005260  001006                    BNE     TST73-10        ;BR TO ERROR HALT ON SEQ ERROR
2573  005262  005000                    CLR     R0              ;R0=0
2574  005264  005100                    COM     R0              ;R0=-1
2575  005266  005004                    CLR     R4              ;R4=0
2576  005270  060004                    ADD     R0,R4           ;TRY ADD: R4=-1
2577  005272  005204                    INC     R4              ;R4=0
2578  005274  001404                    BEQ     TST73
2579                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
2580                                                    ;           CONDITIONAL BRANCH INST. AND    <====
2581                                                    ;           REPLACE THE MOVE INSTRUCTION    <====
2582                                                    ;           WHICH FOLLOWS W/ 772            <====
2583  005276  012742    000140          MOV     #140,-(R2)      ;MOVE TO MAILBOX #  *******  140  *******
2584  005302  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2585  005304  000000                    HALT                    ;ADD INST. FAILED W/ MODE 0
2586                                                    ;  OR SEQUENCE ERROR
2587
2588                    ;*****************************************************************************
2589                    ;
2590                    ;       THIS TEST VERIFIES THE MOVE INSTRUCTION WITH MODE 0 TO MODE 0.
2591                    ;THIS TEST IS NECESSARY BECAUSE THIS PARTICULAR INSTRUCTION UTILIZES UNIQUE
2592                    ;MICROCODE.
2593                    ;
2594                    ;*****************************************************************************
2595                    ;TEST 73        MOV MODE 0 TO MODE 0
2596                    ;*****************************************************************************
2597  005306  005212    ;ST73:  INC     (R2)            ;UPDATE TEST NUMBER
2598  005310  022712    000073          CMP     #73,(R2)        ;SEQUENCE ERROR?
2599  005314  001006                    BNE     TST74-10        ;BR TO ERROR HALT ON SEQ ERROR
2600  005316  005000                    CLR     R0              ;R0=0
2601  005320  005004                    CLR     R4              ;R4=0
2602  005322  005100                    COM     R0              ;R0=-1
2603  005324  010004                    MOV     R0,R4           ;TRY MOVE -1 TO R4
2604  005326  005204                    INC     R4              ;INC R4
2605  005330  001404                    BEQ     TST74
2606                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
2607                                                    ;           CONDITIONAL BRANCH INST. AND    \====
2608                                                    ;           REPLACE THE MOVE INSTRUCTION    \====
2609                                                    ;           WHICH FOLLOWS W/ 772            \====
2610  005332  012742    000141          MOV     #141,-(R2)      ;MOVE TO MAILBOX #  *******  141  *******
2611  005336  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2612  005340  000000                    HALT                    ;MOVE FAILED MODE 0 TO MODE 0
2613                                                    ;  OR SEQUENCE ERROR
```

```
2614
2615                    ;*****************************************************************************
2616                    ;
2617                    ;       THIS TEST QUICKLY VERIFIES THE REMAINING DOP MODIFYING INSTRUCTIONS
2618                    ;WITH MODE 0 TO PROVIDE A BASELINE FOR SUBSEQUENT TESTS.
2619                    ;SINGLE OPERAND INSTRUCTIONS ARE USED TO SET UP DATA IN R0 AND R4
2620                    ;BEFORE EACH OF THE SEVERAL DOP MODIFYING INSTRUCTIONS ARE USED AND
2621                    ;VERIFIED.
2622                    ;
2623                    ;*****************************************************************************
2624                    ;TEST 74        TEST ALL THE DOP INSTRUCTIONS W/ SOURCE MODE 0
2625                    ;*****************************************************************************
2626  005342  005212    ST74:   INC     (R2)            ;UPDATE TEST NUMBER
2627  005344  022712  000074    CMP     #74,(R2)        ;SEQUENCE ERROR?
2628  005350  001051            BNE     TST75-10        ;BR TO ERROR HALT ON SEQ ERROR
2629  005352  005000            CLR     R0              ;R0=0
2630  005354  010004            MOV     R0,R4           ;TRY MOVE MODE 0,0
2631  005356  001404            BEQ     DOP0A
2632                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2633                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2634                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2635                                                    ;           WHICH FOLLOWS W/ 775           <====
2636  005360  012742  000142          MOV     #142,-(R2)      ;MOVE TO MAILBOX #  *******  142  *******
2637  005364  005242            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2638  005366  000000            HALT                    ;Z-BIT NOT SET
2639  005370  005200    DOP0A:  INC     R0              ;R0=1
2640  005372  005100            COM     R0              ;R0=177776
2641  005374  005104            COM     R4              ;R4=177777
2642  005376  040004            BIC     R0,R4           ;TRY BIC: R4=1
2643  005400  005304            DEC     R4              ;R4=0
2644  005402  001404            BEQ     DOP0B
2645                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2646                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2647                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2648                                                    ;           WHICH FOLLOWS W/ 763           <====
2649  005404  012742  000143          MOV     #143,-(R2)      ;MOVE TO MAILBOX #  *******  143  *******
2650  005410  005242            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2651  005412  000000            HALT                    ;BIC CLEAR RESULT INCORRECT
2652  005414  050004    DOP0B:  BIS     R0,R4           ;TRY BIS: R4=177777
2653  005416  005204            INC     R4
2654  005420  005204            INC     R4              ;R4=0
2655  005422  001404            BEQ     DOP0C
2656                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2657                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2658                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2659                                                    ;           WHICH FOLLOWS W/ 753           <====
2660  005424  012742  000144          MOV     #144,-(R2)      ;MOVE TO MAILBOX #  *******  144  *******
2661  005430  005242            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2662  005432  000000            HALT                    ;RESULT OF BIS INCORRECT
2663  005434  005000    DOP0C:  CLR     R0              ;R0=0
2664  005436  105100            COMB    R0              ;R0=377
2665  005440  005004            CLR     R4              ;R4=0
2666  005442  005104            COM     R4              ;R4=177777
2667  005444  040004            BIC     R0,R4           ;R4=177400
2668  005446  060004            ADD     R0,R4           ;TRY ADD: R4=177777
2669  005450  005204            INC     R4              ;R4=0
```

```
 2670  005452  001404                    BEQ     DOPOD
 2671                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    =
 2672                                                    ;           CONDITIONAL BRANCH INST. AND    =
 2673                                                    ;           REPLACE THE MOVE INSTRUCTION    =
 2674                                                    ;           WHICH FOLLOWS W/ 737            ====
 2675  005454  012742  000145                MOV     #145,-(R2)  ;MOVE TO MAILBOX #  *******  145  *******
 2676  005460  005242                    INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
 2677  005462  000000                    HALT                ;RESULT OF ADD INCORRECT
 2678  005464  160004            DOPOD:  SUB     R0,R4       ;177401=R4
 2679  005466  105404                    NEGB    R4          ;R4=177777
 2680  005470  005204                    INC     R4          ;R0=0
 2681  005472  001404                    BEQ     TST75
 2682                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
 2683                                                    ;           CONDITIONAL BRANCH INST. AND    <====
 2684                                                    ;           REPLACE THE MOVE INSTRUCTION    <====
 2685                                                    ;           WHICH FOLLOWS W/ 727            <====
 2686  005474  012742  000146                MOV     #146,-(R2)  ;MOVE TO MAILBOX #  *******  146  *******
 2687  005500  005242                    INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
 2688  005502  000000                    HALT                ;RESULT OF SUB INCORRECT
 2689                                                    ;  OR SEQUENCE ERROR
```

```
2690
2691                    ;*****************************************************************************
2692                    ;
2693                    ;       THIS TEST VERIFIES MODE 0 DOP NON-MODIFYING INSTRUCTIONS.
2694                    ;R0 AND R4 ARE PRESET TO 0 AND 1 RESPECTIVELY.  COMPARE INSTRUCTIONS ARE
2695                    ;THEN EXECUTED AND CHECKED.  FIRST R4 IS COMPARED TO R0 THEN R0 TO R4.
2696                    ;
2697                    ;*****************************************************************************
2698                    ;TEST 75        TEST DOP NON-MODIFYING INST. W/ SOURCE MODE 0
2699                    ;*****************************************************************************
2700  005504  005212    TST75:  INC     (R2)            ;UPDATE TEST NUMBER
2701  005506  022712    000075          CMP     #75,(R2)        ;SEQUENCE ERROR?
2702  005512  001042                    BNE     TST76-10        ;BR TO ERROR HALT ON SEQ ERROR
2703  005514  005000                    CLR     R0              ;R0=0
2704  005516  005004                    CLR     R4              ;R4=0
2705  005520  005204                    INC     R4              ;R4=1
2706  005522  020400                    CMP     R4,R0           ;TRY COMPARE R4 TO R0
2707  005524  003004                    BGT     DNM1
2708                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2709                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2710                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2711                                                    ;           WHICH FOLLOWS W/ 773           <====
2712  005526  012742    000147          MOV     #147,-(R2)      ;MOVE TO MAILBOX #  *******  147  *******
2713  005532  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2714  005534  000000                    HALT                    ;CC'S NOT CORRECT FOR CMP
2715  005536  020004    DNM1:   CMP     R0,R4           ;TRY COMPARE R0 TO R4
2716  005540  002404                    BLT     DNM2
2717                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2718                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2719                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2720                                                    ;           WHICH FOLLOWS W/ 765           <====
2721  005542  012742    000150          MOV     #150,-(R2)      ;MOVE TO MAILBOX #  *******  150  *******
2722  005546  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2723  005550  000000                    HALT                    ;CC'S NOT CORRECT FOR CMP
2724  005552  005200    DNM2:   INC     R0              ;R4=0
2725  005554  020400                    CMP     R4,R0           ;TRY COMPARE R4=1 TO R0=1
2726  005556  001404                    BEQ     DNM3
2727                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2728                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2729                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2730                                                    ;           WHICH FOLLOWS W/ 756           <====
2731  005560  012742    000151          MOV     #151,-(R2)      ;MOVE TO MAILBOX #  *******  151  *******
2732  005564  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2733  005566  000000                    HALT                    ;CC'S NOT CORRECT (Z=1) FOR CMP
2734  005570  005000    DNM3:   CLR     R0              ;R0=0
2735  005572  005100                    COM     R0              ;R0=177777
2736  005574  005004                    CLR     R4              ;R4=0
2737  005576  030004                    BIT     R0,R4           ;TRY BIT R0 TO R4
2738  005600  001404                    BEQ     DNM4
2739                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2740                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2741                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2742                                                    ;           WHICH FOLLOWS W/ 745           <====
2743  005602  012742    000152          MOV     #152,-(R2)      ;MOVE TO MAILBOX #  *******  152  *******
2744  005606  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2745  005610  000000                    HALT                    ;CC'S NOT CORRECT FOR BIT
```

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2746  005612  005304                  DN74:   DEC     R4              ;R4=177777
2747  005614  030004                          BIT     R0,R4           ;TRY BIT AGAIN
2748  005616  100404                          BMI     TST76
2749                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
2750                                                                  ;           CONDITIONAL BRANCH INST. AND    <====
2751                                                                  ;           REPLACE THE MOVE INSTRUCTION    <====
2752                                                                  ;           WHICH FOLLOWS W/ 736            <====
2753  005620  012742  000153                      MOV     #153,-(R2)  ;MOVE TO MAILBOX #  *******  153  *******
2754  005624  005242                              INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
2755  005626  000000                              HALT                ;CC'S NOT CORRECT FOR BIT
2756                                                                  ;  OR SEQUENCE ERROR
2757
2758                                  ;*****************************************************************************
2759                                  ;
2760                                  ;       THIS TEST VERIFIES MODE 1 DOP INSTRUCTIONS.  R0 IS SET TO -1
2761                                  ;AND LOC 0 TO 1.  R4 IS THEN CLEARED AND USED TO POINT TO LOC 0.
2762                                  ;IN THE ADD MODE 1 INSTRUCTION, LOC 0 IS ADDED TO R0 AND THE
2763                                  ;RESULTS VERIFIED.
2764                                  ;
2765                                  ;*****************************************************************************
2765                                  ;TEST 76        TEST MODE 1 W/ DOP INST.
2767                                  ;*****************************************************************************
2768  005630  005212                  TST76:  INC     (R2)            ;UPDATE TEST NUMBER
2769  005632  022712  000076                  CMP     #76,(R2)        ;SEQUENCE ERROR?
2770  005636  001007                          BNE     TST77-10        ;BR TO ERROR HALT ON SEQ ERROR
2771  005640  005000                          CLR     R0              ;R0=0
2772  005642  005100                          COM     R0              ;R0=177777
2773  005644  005004                          CLR     R4              ;R4=0
2774  005646  005014                          CLR     (R4)            ;LOC 0=0
2775  005650  005214                          INC     (R4)            ;LOC 0=1
2776  005652  061400                          ADD     (R4),R0         ;TRY ADD SOURCE MODE 1
2777  005654  001404                          BEQ     TST77
2778                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
2779                                                                  ;           CONDITIONAL BRANCH INST. AND    <====
2780                                                                  ;           REPLACE THE MOVE INSTRUCTION    <====
2781                                                                  ;           WHICH FOLLOWS W/ 771            <====
2782  005656  012742  000154                      MOV     #154,-(R2)  ;MOVE TO MAILBOX #  *******  154  *******
2783  005662  005242                              INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
2784  005664  000000                              HALT                ;RESULT OF ADD INCORRECT
2785                                                                  ;  OR SEQUENCE ERROR
```

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2786
2787
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2796  005666  005212                  TST77:  INC     (R2)            ;UPDATE TEST NUMBER
2797  005670  022712  000077                  CMP     #77,(R2)        ;SEQUENCE ERROR?
2798  005674  001007                        BNE     TST100-10       ;BR TO ERROR HALT ON SEQ ERROR
2799  005676  005000                        CLR     R0              ;R0=0
2800  005700  005010                        CLR     (R0)            ;LOC. 0=0
2801  005702  005110                        COM     (R0)            ;LOC. 0=177777
2802  005704  005004                        CLR     R4              ;R4=0
2803  005706  151004                        BISB    (R0),R4         ;TRY MODE 1- EVEN BYTE W/ DOP
2804  005710  105104                        COMB    R4              ;R4=0
2805  005712  001404                        BEQ     TST100
2806                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2807                                                                ;           CONDITIONAL BRANCH INST. AND   <====
2808                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
2809                                                                ;           WHICH FOLLOWS W/ 771           <====
2810  005714  012742  000155                  MOV     #155,-(R2)      ;MOVE TO MAILBOX #  *******  155  *******
2811  005720  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2812  005722  000000                        HALT                    ;RESULT OF BISB IS INCORRECT
2813                                                                ;  OR SEQUENCE ERROR
```

```
2814
2815                            ;*****************************************************************************
2816                            ;
2817                            ;       THIS TEST VERIFIES MODE 1 DOP NON-MODIFYING INSTRUCTIONS
2818                            ;WHICH ADDRESS EVEN BYTES.  LOC. 0 IS SET TO -1 AND R0 IS CLEARED
2819                            ;AND USED AS THE ADDRESSING REGISTER.  R4 IS SET TO 377 AND A
2820                            ;MODE 1,0 CMPB INSTRUCTION IS USED THE RESULTS VERIFIED.
2821                            ;
2822                            ;*****************************************************************************
2823                            ;TEST 100       TEST MODE 1 - EVEN BYTE W/ DOP NON-MODIFYING INST.
2824                            ;*****************************************************************************
2825  005724  005212            TST100: INC     (R2)            ;UPDATE TEST NUMBER
2826  005726  022712  000100           CMP     #100,(R2)       ;SEQUENCE ERROR?
2827  005732  001007                   BNE     TST101-10       ;BR TO ERROR HALT ON SEQ ERROR
2828  005734  005000                   CLR     R0              ;R0=0
2829  005736  005010                   CLR     (R0)            ;LOC 0=0
2830  005740  005110                   COM     (R0)            ;LOC 0=177777
2831  005742  005004                   CLR     R4              ;R4=0
2832  005744  105104                   COMB    R4              ;R4=377
2833  005746  121004                   CMPB    (R0),R4         ;TRY MODE 1 - EVEN BYTE W/ DOP NON-MODIFYING
2834  005750  001404                   BEQ     TST101
2835                                                           ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2836                                                           ;           CONDITIONAL BRANCH INST. AND   <====
2837                                                           ;           REPLACE THE MOVE INSTRUCTION   <====
2838                                                           ;           WHICH FOLLOWS W/ 771           <====
2839  005752  012742  000156           MOV     #156,-(R2)      ;MOVE TO MAILBOX #  *******  156  *******
2840  005756  005242                   INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2841  005760  000000                   HALT                    ;RESULT OF CMPB INCORRECT
2842                                                           ;  OR SEQUENCE ERROR
```

```
2843
2844                            ;*****************************************************************************
2845                            ;
2846                            ;       THIS TEST VERIFIES MODE 1,0 MOVB INSTRUCTIONS
2847                            ;WHICH ADDRESS EVEN BYTES.  LOC. 0 IS SET TO 177400, R0 IS CLEARED AND
2848                            ;R4 IS SET TO -1.  MOVB ARE USED TO MOVE BYTE 0 TO R4.  THIS
2849                            ;VERIFIES THAT THE PROPER BYTE WAS SELECTED AND THAT THE SIGN-X-TEND
2850                            ;FUNCTION WITH MODE 0.
2851                            ;       THEN LOC. 0 IS COMPLEMENTED AND THE SAME PROCEDURE EXERCISES
2852                            ;THE LOGIC FOR COMPLEMENTARY DATA.
2853                            ;       THIS TEST EXERCISES UNIQUE MICROCODE.
2854                            ;
2855                            ;*****************************************************************************
2856                            ;TEST 101       TEST MOV INSTRUCTION MODE 1,0 EVEN BYTE
2857                            ;*****************************************************************************
2858  005762  005212            TST101: INC     (R2)            ;UPDATE TEST NUMBER
2859  005764  022712  000101            CMP     #101,(R2)       ;SEQUENCE ERROR?
2860  005770  001020                    BNE     TST102-10       ;BR TO ERROR HALT ON SEQ ERROR
2861  005772  005000                    CLR     R0              ;R0=0
2862  005774  005010                    CLR     (R0)            ;LOC 0=0
2863  005776  105110                    COMB    (R0)            ;LOC 0=177400
2864  006000  005110                    COM     (R0)
2865  006002  005004                    CLR     R4              ;R4=0
2866  006004  005104                    COM     R4              ;R4=177777
2867  006006  111004                    MOVB    (R0),R4         ;R4=0
2868  006010  005704                    TST     R4              ;CHECK SIGN OF WORD
2869  006012  001404                    BEQ     DOP1
2870                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2871                                                            ;           CONDITIONAL BRANCH INST. AND   <====
2872                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
2873                                                            ;           WHICH FOLLOWS W/ 767           <====
2874  006014  012742  000157                  MOV     #157,-(R2)      ;MOVE TO MAILBOX #  *******  157  *******
2875  006020  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2876  006022  000000                    HALT                    ;MOVB SHOULD SIGN X-TEND
2877  006024  005110            DOP1:   COM     (R0)            ;LOC 0=177777
2878  006026  111004                    MOVB    (R0),R4         ;DO MOVB W/ EVEN BYTE
2879  006030  100404                    BMI     TST102
2880                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2881                                                            ;           CONDITIONAL BRANCH INST. AND   <====
2882                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
2883                                                            ;           WHICH FOLLOWS W/ 760           <====
2884  006032  012742  000160                  MOV     #160,-(R2)      ;MOVE TO MAILBOX #  *******  160  *******
2885  006036  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2886  006040  000000                    HALT                    ;MOVB SHOULD SIGN X-TEND
2887                                                            ;  OR SEQUENCE ERROR
```

```
                        ;*****************************************************************************
                        ;
                        ;       THIS TEST VERIFIES MODE 1 DOP INSTRUCTIONS WHICH REFERENCE
                        ;ODD BYTES.  LOC. 0 IS SET TO 177400.  R0 IS SET TO 0 AND R4 IS
                        ;SET TO 1.  THE BISB INSTRUCTION USES THE DATA IN BYTE 1 TO SET BYTE 0.
                        ;THE RESULT IS CHECKED BY INCREMENTING THE WORD (LOC. 0) TO ZERO.
                        ;
                        ;*****************************************************************************
                        ;TEST 102       TEST MODE 1-ODD BYTE W/ DOP INSTS.
                        ;*****************************************************************************
006042  005212          TST102: INC     (R2)            ;UPDATE TEST NUMBER
006044  022712  000102          CMP     #102,(R2)       ;SEQUENCE ERROR?
006050  001010                  BNE     TST103-10       ;BR TO ERROR HALT ON SEQ ERROR
006052  005000                  CLR     R0              ;R0=0
006054  005010                  CLR     (R0)            ;LOC. 0=0
006056  005004                  CLR     R4              ;R4=0
006060  005204                  INC     R4              ;R4=1
006062  105114                  COMB    (R4)            ;LOC. 0=177400
006064  151410                  BISB    (R4),(R0)       ;TRY TO BIS LOW ORDER BITS W/ MODE 1
006066  005210                  INC     (R0)            ;CHECK RESULT
006070  001404                  BEQ     TST103
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <== =
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W' 770           <====
006072  012742  000161          MOV     #161,-(R2)      ;MOVE TO MAILBOX #  *******  161  *******
006076  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
006100  000000                  HALT                    ;RESULT OF BISB INCORRECT
                                                        ;  OR SEQUENCE ERROR
```

```
2918
2919                                    ;*****************************************************************************
2920                                    ;
2921                                    ;       THIS TEST VERIFIES MODE 2 DOP INSTRUCTIONS.  LOC. 0 IS SET TO -1.
2922                                    ;R0 IS CLEARED AND USED AS THE MODE 2 ADDRESSING REGISTER TO MOVE LOC. 0
2923                                    ;TO R7.  THE DATA RESULTS ARE VERIFIED AND THE INCREMENTING OF THE REGISTER
2924                                    ;IS CHECKED.
2925                                    ;
2926                                    ;*****************************************************************************
2927                                    ;TEST 103       TEST MODE 2 W/ DOP INSTS.
2928                                    ;*****************************************************************************
2929  006102  005212                    TST103: INC     (R2)            ;UPDATE TEST NUMBER
2930  006104  022712  000103                    CMP     #103,(R2)       ;SEQUENCE ERROR?
2931  006110  001015                            BNE     TST104-10       ;BR TO ERROR HALT ON SEQ ERROR
2932  006112  005000                            CLR     R0              ;R0=0
2933  006114  005010                            CLR     (R0)            ;LOC. 0=0
2934  006116  005110                            COM     (R0)            ;LOC. 0=177777
2935  006120  012004                            MOV     (R0)+,R4        ;TRY MOVE MODE 2,0
2936  006122  005204                            INC     R4              ;CHECK R4
2937  006124  001404                            BEQ     DOP2
2938                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2939                                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2940                                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2941                                                                    ;           WHICH FOLLOWS W/ 772           <====
2942  006126  012742  000162                      MOV     #162,-(R2)    ;MOVE TO MAILBOX #  *******  162  *******
2943  006132  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2944  006134  000000                            HALT                    ;RESULT OF MOV INST INCORRECT
2945  006136  005300                    DOP2:   DEC     R0              ;TEST R0 AFTER MODE 2
2946  006140  005300                            DEC     R0
2947  006142  001404                            BEQ     TST104
2948                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
2949                                                                    ;           CONDITIONAL BRANCH INST. AND   <====
2950                                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
2951                                                                    ;           WHICH FOLLOWS W/ 763           <====
2952  006144  012742  000163                      MOV     #163,-(R2)    ;MOVE TO MAILBOX #  *******  163  *******
2953  006150  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
2954  006152  000000                            HALT                    ;REGISTER NOT INCREMENTED IN MODE 2
2955                                                                    ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 2 DOP BYTE INSTRUCTIONS WHICH ADDRESS
                                ;EVEN BYTES.  LOC. 0 IS SET TO -1.  R0 IS CLEARED AND USED AS THE
                                ;ADDRESSING REGISTER IN A TEST WHICH TRIES TO CLEAR BYTE 1 USING
                                ;BYTE 0 DATA AND A BICB.  UNIQUE IN THIS TEST IS USE OF THE
                                ;SAME ADDRESSING REGISTER FOR BOTH SOURCE AND DESTINATION.  THE SOURCE AND
                                ;DESTINATION IS CHECKED TO INSURE PROPER FUNCTIONING.
                                ;
                                ;*****************************************************************************
                                ;TEST 104       TEST MODE 2 - EVEN BYTE W/ DOP INST.
                                ;*****************************************************************************
006154  005212          TST104: INC     (R2)            ;UPDATE TEST NUMBER
006156  022712  000104          CMP     #104,(R2)       ;SEQUENCE ERROR?
006162  001016                  BNE     TST105-10       ;BR TO ERROR HALT ON SEQ ERROR
006164  005000                  CLR     R0              ;R0=0
006166  010010                  MOV     R0,(R0)         ;LOC. 0=0
006170  005110                  COM     (R0)            ;LOC. 0=177777
006172  142010                  BICB    (R0)+,(R0)      ;TRY TO CLEAR BYTE 1 FROM BYTE 0 W/ BICB
006174  105737  000001          TSTB    @#1             ;CHECK RESULT
006200  001404                  BEQ     DOPB2A
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 771           <====
006202  012742  000164                  MOV     #164,-(R2)      ;MOVE TO MAILBOX #  *******  164  *******
006206  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
006210  000000                  HALT                    ;BICB DESTINATION INCORRECT
006212  105137  000000  DOPB2A: COMB    @#0             ;CHECK BICB SOURCE
006216  001404                  BEQ     TST105
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 762           <====
006220  012742  000165          MOV     #165,-(R2)      ;MOVE TO MAILBOX #  *******  165  *******
006224  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
006226  000000                  HALT                    ;BICB SOURCE INCORRECTLY CHANGED
                                                        ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 2 DOP BYTE INSTRUCTIONS WHICH REFERENCE
                                ;ODD BYTES.  R0 IS SET TO 1, LOC. 0 IS SET TO 177400, AND R4 IS CLEARED.
                                ;A MODE 2 MOVB USES R0 TO MOVE BYTE 1 TO R4.  AN INCREMENT
                                ;IS USED TO CHECK THAT THE PROPER BYTE WAS MOVED AND SIGN X-TENDED.
                                ;
                                ;*****************************************************************************
                                ;TEST 105       TEST MODE 2 - ODD BYTE W/ DOP INST.
                                ;*****************************************************************************
006230  005212        000105  ;ST105: INC     (R2)            ;UPDATE TEST NUMBER
006232  022712                        CMP     #105,(R2)       ;SEQUENCE ERROR?
006236  001017                        BNE     TST106-10       ;BR TO ERROR HALT ON SEQ ERROR
006240  005000                        CLR     R0              ;R0=0
006242  005004                        CLR     R4              ;R4=0
006244  005010                        CLR     (R0)            ;LOC. 0=0
006246  005110                        COM     (R0)            ;LOC. 0=177777
006250  105120                        COMB    (R0)+           ;LOC 0=177400; R0=1
006252  112004                        MOVB    (R0)+,R4        ;TRY DOP MODE 2 W/ ODD BYTE
006254  005204                        INC     R4              ;CHECK RESULT OF MOVB
006256  001404                        BEQ     DOPB2B
                                                            ;  TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;            CONDITIONAL BRANCH INST. AND   <====
                                                            ;            REPLACE THE MOVE INSTRUCTION   <====
                                                            ;            WHICH FOLLOWS W/ 770           <====
006260  012742  000166                  MOV     #166,-(R2)      ;MOVE TO MAILBOX #  *******  166  *******
006264  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
006266  000000                          HALT                    ;RESULT OF MOVB INCORRECT
006270  005740                DOPB2B: TST     -(R0)           ;BUMP R0 DOWN BY 2
006272  005700                        TST     R0              ;CHECK R0
006274  001404                        BEQ     TST106
                                                            ;  TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;            CONDITIONAL BRANCH INST. AND   <====
                                                            ;            REPLACE THE MOVE INSTRUCTION   <====
                                                            ;            WHICH FOLLOWS W/ 761           <====
006276  012742  000167                  MOV     #167,-(R2)      ;MOVE TO MAILBOX #  *******  167  *******
006302  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
006304  000000                          HALT                    ;MODE 2 BYTE DID NOT INCREMENT REG. CORRECTLY
                                                            ;  OR SEQUENCE ERROR
```

```
                                        ;*****************************************************************************
                                        ;
                                        ;       THIS TEST VERIFIES MODE 3 DOUBLE-OPERAND INSTRUCTIONS.
                                        ;LOC. 0 IS LOADED WITH ALTERNATING ZEROES AND ONES; AND R0 IS LOADED
                                        ;WITH ALTERNATING ONES AND ZEROES.  A MODE 3 BIS IS USED TO SET R0
                                        ;TO -1 BY USING LOC. 0 AS THE SOURCE TO BIS THE ZEROES IN R0.  THE
                                        ;RESULT IS TESTED BY INCREMENTING R0 AND CHECKING FOR ZERO.
                                        ;
                                        ;*****************************************************************************
                                        ;TEST 106       TEST MODE 3 W/ DOP INSTS.
                                        ;*****************************************************************************
006306  005212                  TST106: INC     (R2)            ;UPDATE TEST NUMBER
006310  022712  000106                  CMP     #106,(R2)       ;SEQUENCE ERROR?
006314  001011                          BNE     TST107-10       ;BR TO ERROR HALT ON SEQ ERROR
006316  012737  052525  000000          MOV     #052525,@#0     ;MOVE 52525 TO LOC. 0
006324  012700  125252                  MOV     #125252,R0      ;SET ALT. ONE AND ZERO IN R0
006330  053700  000000                  BIS     @#0,R0          ;TRY TO SET ALL OTHER BITS W/ MODE 3
006334  005200                          INC     R0              ;TEST RESULT
006336  001404                          BEQ     TST107
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 767           <====
006340  012742  000170                  MOV     #170,-(R2)      ;MOVE TO MAILBOX #  *******  170  *******
006344  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
006346  000000                          HALT                    ;BIS W/ MODE 3 INCORRECT RESULT
                                                                ;  OR SEQUENCE ERROR
                                        ;*****************************************************************************
                                        ;
                                        ;       THIS TEST VERIFIES MODE 3 DOUBLE OPERAND BYTE INSTRUCTIONS WHICH
                                        ;ADDRESS EVEN BYTES.  BYTE 0 IS SET TO ALTERNATING 1'S AND 0'S; BYTE 1,
                                        ;ALTERNATING 0'S AND 1'S.  R0 IS CLEARED AND A BISB IS USED TO
                                        ;SET THE LOW BYTE OF R0 TO 252.
                                        ;
                                        ;*****************************************************************************
                                        ;TEST 107       TEST MODE 3 - EVEN BYTE W/ DOP INSTS.
                                        ;*****************************************************************************
006350  005212                  TST107: INC     (R2)            ;UPDATE TEST NUMBER
006352  022712  000107                  CMP     #107,(R2)       ;SEQUENCE ERROR?
006356  001011                          BNE     TST110-10       ;BR TO ERROR HALT ON SEQ ERROR
006360  012737  052652  000000          MOV     #52652,@#0      ;MOVE 1'S AND 0' PATTERN TO LOC. 0
006366  005000                          CLR     R0              ;R0=0
006370  153700  000000                  BISB    @#0,R0          ;TRY R0=252 W/ MODE 3 - EVEN BYTE
006374  022700  000252                  CMP     #252,R0         ;BISB W/ EVEN BYTE SUCCESSFUL?
006400  001404                          BEQ     TST110
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 767           <====
006402  012742  000171                  MOV     #171,-(R2)      ;MOVE TO MAILBOX #  *******  171  *******
006406  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
006410  000000                          HALT                    ;BISB W/ MODE 3 - EVEN BYTE FAILED
                                                                ;  OR SEQUENCE ERROR
```

```
                        ;*****************************************************************************
                        ;
                        ;       THIS TEST VERIFIES MODE 3 DOUBLE OPERAND BYTE INSTRUCTIONS
                        ;WHICH ADDRESS ODD BYTES.  THE SAME PROCEDURE USED IN PREVIOUS
                        ;TEST IS USED HERE.  THIS TIME BYTE 1 IS USED AS THE SOURCE BYTE.
                        ;THE EXPECTED RESULT IS:  R0 = 125.
                        ;
                        ;*****************************************************************************
                        ;TEST 110       TEST MODE 3 - ODD BYTE W/ DOP INSTS.
                        ;*****************************************************************************
006412  005212          TST110: INC     (R2)            ;UPDATE TEST NUMBER
006414  022712  000110          CMP     #110,(R2)       ;SEQUENCE ERROR?
006420  001011                  BNE     TST111-10       ;BR TO ERROR HALT ON SEQ ERROR
006422  012737  052652  000000  MOV     #52652,@#0      ;MOVE 1'S AND 0'S PATTERN TO LOC 0
006430  005000                  CLR     R0              ;R0=0
006432  153700  000001          BISB    @#1,R0          ;TRY R0=152 W/ MODE 3 - ODD BYTE
006436  022700  000125          CMP     #125,R0         ;R0=125?
006442  001404                  BEQ     TST111
                                                        ; TO SCOPE. CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 767           <====
006444  012742  000172          MOV     #172,-(R2)      ;MOVE TO MAILBOX #  *******  172  *******
006450  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
006452  000000                  HALT                    ;BISB W/ MODE 3 - ODD BYTE FAILED
                                                        ;  OR SEQUENCE ERROR
                        ;*****************************************************************************
                        ;
                        ;       THIS TEST VERIFIES MODE 4 DOUBLE OPERAND INSTRUCTIONS.
                        ;THE TEST USES MODE 4 ADDRESSING WITH REGISTER 0 TO MOVE THRU A
                        ;TABLE OF OPERANDS.  THE TABLE OF OPERANDS AND THE WORK LOCATION IS
                        ;STORED FOLLOWING THE TEST CODE.  A SERIES OF 5 DOP INSTRUCTIONS UTILIZES
                        ;THE DATA IN THE TABLE TO CYCLE THE WORK LOCATION THRU A SET OF
                        ;VALUE.  THE DATA HAS BEEN CHOSEN TO INSURE THAT NO SINGLE ERROR WILL
                        ;GO UNDETECTED.  WORD AND BYTE INSTRUCTION ACCESSING BOTH EVEN AND
                        ;ODD ADDRESSES ARE USED IN THE TEST.  THE LISTING SHOWS THE
                        ;EXPECTED INTERMEDIATE RESULT AS EACH INSTRUCTION IS EXECUTED.
                        ;
                        ;*****************************************************************************
                        ;TEST 111       TEST MODE 4 W/ DOP INSTS.
                        ;*****************************************************************************
006454  005212          TST111: INC     (R2)            ;UPDATE TEST NUMBER
006456  022712  000111          CMP     #111,(R2)       ;SEQUENCE ERROR?
006462  001015                  BNE     DOP4            ;BR TO ERROR HALT ON SEQ ERROR
006464  012700  006536          MOV     #TBL1,R0        ;INITIALIZE R0
006470  014037  006536          MOV     -(R0),@#TBL1    ;TBL1=125252
006474  064037  006536          ADD     -(R0),@#TBL1    ;TBL1=000377
006500  144037  006536          BICB    -(R0),@#TBL1    ;TBL1=000252
006504  154037  006537          BISB    -(R0),@#TBL1+1  ;TBL1=125252
006510  024037  006536          CMP     -(R0),@#TBL1    ;CHECK RESULT
006514  001411                  BEQ     TST112
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION    ====
```

```
3145                                                    ;           WHICH FOLLOWS W/ 763
3146  006516                                    DOP4:
3147  006516  012742  000173                          MOV     #173,-(R2)      ;MOVE TO MAILBOX #  *******  173  *******
3148  006522  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3149  006524  000000                                  HALT                    ;RESULT OF MODE 4 INSTS. INCORPECT
3150                                                                          ;  OR SEQUENCE ERROR
3151
3152  006526  125252                                  125252
3153  006530  052652                                  52652
3154  006532  053125                                  53125
3155  006534  125252                                  125252
3156  006536  000000                    TBL1:         0
3157
3158                                    ;*****************************************************************************
3159                                    ;
3160                                    ;       THIS TEST VERIFIES MODE 5 DOUBLE OPERAND INSTRUCTIONS.
3161                                    ;THE TEST USES AN ADDRESS TABLE STORED FOLLOWING THE TEST CODE.
3162                                    ;THIS TABLE IS SIMPLY A TABLE OF ADDRESS POINTERS WHICH ADDRESS
3163                                    ;THE DATA TABLE USED IN THE PREVIOUS TEST.  THE TEST IS IDENTICAL TO
3164                                    ;THE PREVIOUS TEST EXCEPT THE DATA IS REFERENCED USING THIS ADDRESS
3165                                    ;TABLE AND MODE 5 ADDRESSING.  (SEE PREVIOUS TEST).
3166                                    ;
3167                                    ;*****************************************************************************
3168                                    ;TEST 112       TEST MODE 5 W/ DOP INSTS.
3169                                    ;*****************************************************************************
3170  006540  005212                    TST112: INC     (R2)            ;UPDATE TEST NUMBER
3171  006542  022712  000112                    CMP     #112,(R2)       ;SEQUENCE ERROR?
3172  006546  001015                            BNE     DOP5            ;BR TO ERROR HALT ON SEQ ERROR
3173  006550  012700  006624                    MOV     #TBL2+2,R0      ;INITIALIZE R0
3174  006554  015037  006536                    MOV     @-(R0),@#TBL1   ;TBL1=125252
3175  006560  065037  006536                    ADD     @-(R0),@#TBL1   ;TBL1=000377
3176  006564  145037  006536                    BICB    @-(R0),@#TBL1   ;TBL1=000252
3177  006570  155037  006537                    BISB    @-(R0),@#TBL1+1 ;TBL1=125252
3178  006574  025037  006536                    CMP     @-(R0),@#TBL1   ;CHECK RESULT
3179  006600  001411                            BEQ     TST113
3180                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3181                                                                    ;           CONDITIONAL BRANCH INST. AND   <====
3182                                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
3183                                                                    ;           WHICH FOLLOWS W/ 763           <====
3184  006602                                    DOP5:
3185  006602  012742  000174                          MOV     #174,-(R2)      ;MOVE TO MAILBOX #  *******  174  *******
3186  006606  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3187  006610  000000                                  HALT                    ;RESULT OF MODE 5 INSTS. INCORRECT
3188                                                                          ;  OR SEQUENCE ERROR
3189  006612  006526                                  TBL1-10
3190  006614  006530                                  TBL1-6
3191  006616  006531                                  TBL1-5
3192  006620  006532                                  TBL1-4
3193  006622  006534                    TBL2:         TBL1-2
```

```
                                        ;*****************************************************************************
                                        ;
                                        ;       THIS TEST VERIFIES MODE 6 DOUBLE OPERAND INSTRUCTIONS.
                                        ;IT USES THE SAME DATA AS THAT USED IN THE MODE 4 TESTS.
                                        ;THIS TIME THE DATA IS ACCESSED USING MODE 6.  R0 IS SET
                                        ;TO POINT TO THE MIDDLE OF THE TABLE.  THE TABLE IS ACCESSED FROM
                                        ;BOTTOM TO TOP BY VARYING THE OFFSET IN THE MODE 6 INSTRUCTIONS.
                                        ;THE DATA RESULTS ARE IDENTICAL TO THOSE EXPECTED IN THE MODE 4
                                        ;TESTS.
                                        ;
                                        ;*****************************************************************************
                                        ;TEST 113       TEST MODE 6 W/ DOP INSTS.
                                        ;*****************************************************************************
006624  005212                  TST113: INC     (R2)            ;UPDATE TEST NUMBER
006626  022712  000113                  CMP     #113,(R2)       ;SEQUENCE ERROR?
006632  001022                          BNE     TST114-10       ;BR TO ERROR HALT ON SEQ ERROR
006634  012700  006532                  MOV     #TBL1-4,R0      ;INITIALIZE R0
006640  016037  000002  006536          MOV     2(R0),@#TBL1    ;TBL1=125252
006646  066037  000000  006536          ADD     0(R0),@#TBL1    ;TBL1=000377
006654  146037  177777  006536          BICB    -1(R0),@#TBL1   ;TBL1=000252
006662  156037  177776  006537          BISB    -2(R0),@#TBL1+1 ;TBL1=125252
006670  026037  177774  006536          CMP     -4(R0),@#TBL1   ;CHECK RESULT
006676  001404                          BEQ     TST114
                                        ;  TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                        ;           WHICH FOLLOWS W/ 756           <====
006700  012742  000175                  MOV     #175,-(R2)      ;MOVE TO MAILBOX #  *******  175  *******
006704  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
006706  000000                          HALT                    ;RESULT OF MODE 6 INSTS. INCORRECT
                                        ;  OR SEQUENCE ERROR
;*****************************************************************************
;
;       THIS TEST VERIFIES MODE 7 DOUBLE OPERAND INSTRUCTIONS.
;THIS TEST USES THE SAME ADDRESS TABLE AND DATA TABLE USED BY
;THE MODE 5 TESTS.  THIS TIME THE DATA IS ACCESSED USING MODE 7.
;R0 IS SET TO POINT TO THE MIDDLE OF THE ADDRESS TABLE IN THE MODE 5
;TEST.  THE TABLE IS ACCESSED FROM BOTTOM TO TOP BY VARYING THE OFFSET
;IN THE MODE 7 INSTRUCTIONS.  THE DATA RESULTS ARE IDENTICAL TO
;THOSE EXPECTED IN THE MODE 5 TESTS.
;
;*****************************************************************************
;TEST 114       TEST MODE 7 W/ DOP INSTS.
;*****************************************************************************
006710  005212                  TST114: INC     (R2)            ;UPDATE TEST NUMBER
006712  022712  000114                  CMP     #114,(R2)       ;SEQUENCE ERROR?
006716  001022                          BNE     TST115-10       ;BR TO ERROR HALT ON SEQ ERROR
006720  012700  006616                  MOV     #TBL2-4,R0      ;INITIALIZE R0
006724  017037  000004  006536          MOV     @4(R0),@#TBL1   ;TBL1=125252
006732  067037  000002  006536          ADD     @2(R0),@#TBL1   ;TBL1=000377
006740  147037  000000  006536          BICB    @0(R0),@#TBL1   ;TBL1=000252
006746  157037  177776  006537          BISB    @-2(R0),@#TBL1+1                ;TBL1=125252
006754  027037  177774  006536          CMP     @-4(R0),@#TBL1          ;CHECK RESULT
006762  001404                          BEQ     TST115
```

```
3250                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3251                                                    ;           CONDITIONAL BRANCH INST. AND   <====
3252                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
3253                                                    ;           WHICH FOLLOWS W/ 756           <====
3254  006764  012742  000176                  MOV     #176,-(R2)      ;MOVE TO MAILBOX #  *******  176  *******
3255  006770  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3256  006772  000000                            HALT                    ;RESULT OF MODE 7 INSTS INCORRECT
3257                                                                    ;  OR SEQUENCE ERROR
3258
3259                    ;*************************************************************************
3260                    ;
3261                    ;       THIS TEST VERIFIES THE ROTATE MODE 0 INSTRUCTIONS.
3262                    ;R0 IS LOADED WITH A DATA PATTERN, THE C-BIT IS LOADED, AND
3263                    ;AN ROL INSTRUCTION IS EXECUTED WITH MODE 0.  THE OPERATION IS CHECKED
3264                    ;BY TESTING THE RESULTING DATA AND THE STATE OF THE C AND V BITS.
3265                    ;NEXT, THE SAME PROCEDURE IS EXECUTED TO TEST MODE 0 BYTE INSTRUCTIONS.
3266                    ;
3267                    ;*************************************************************************
3268                    ;TEST 115       TEST ROTATE INSTRUCTIONS OF MODE 0
3269                    ;*************************************************************************
3270  006774  005212                TST115: INC     (R2)            ;UPDATE TEST NUMBER
3271  006776  022712  000115                CMP     #115,(R2)       ;SEQUENCE ERROR?
3272  007002  001026                        BNE     TST116-10       ;BR TO ERROR HALT ON SEQ ERROR
3273  007004  012700  125252                MOV     #125252,R0      ;INITIALIZE DATA
3274  007010  000261                        SEC                     ;SET C-BIT
3275  007012  006100                        ROL     R0              ;TRY ROL W/ MODE 0
3276  007014  102004                        BVC     ROT0A           ;CC=0011
3277  007016  103003                        BCC     ROT0A
3279  007020  022700  052525                CMP     #052525,R0      ;CHECK DATA
3279  007024  001404                        BEQ     ROT0B
3280                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3281                                                    ;           CONDITIONAL BRANCH INST. AND   <====
3282                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
3283                                                    ;           WHICH FOLLOWS W/ 767           <====
3284  007026                        ROT0A:
3285  007026  012742  000177                  MOV     #177,-(R2)      ;MOVE TO MAILBOX #  *******  177  *******
3286  007032  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3287  007034  000000                            HALT                    ;ROL MODE 0 FAILED
3288  007036  012700  125252        ROT0B:  MOV     #125252,R0      ;INITIALIZE DATA
3289  007042  000261                        SEC                     ;SET C-BIT
3290  007044  106100                        ROLB    R0              ;TRY ROL W/ MODE 0 EVEN BYTE
3291  007046  102004                        BVC     ROT0C           ;CC=0011
3292  007050  103003                        BCC     ROT0C
3293  007052  022700  125125                CMP     #125125,R0      ;CHECK DATA
3294  007056  001404                        BEQ     TST116
3295                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3296                                                    ;           CONDITIONAL BRANCH INST. AND   <====
3297                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
3298                                                    ;           WHICH FOLLOWS W/ 752           <====
3299  007060                        ROT0C:
3300  007060  012742  000200                  MOV     #200,-(R2)      ;MOVE TO MAILBOX #  *******  200  *******
3301  007064  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3302  007066  000000                            HALT                    ;ROLB MODE 0 FAILED
3303                                                                    ;  OR SEQUENCE ERROR
```

```
                                        ;*****************************************************************************
                                        ;
                                        ;       THIS TEST VERIFIES THE ROTATE MODE 1 INSTRUCTIONS.
                                        ;THE DATA TO BE ROTATED IS IN LOC 0.  R0 IS USED AS THE
                                        ;ADDRESSING REGISTER.  THE C-BIT IS LOADED AND AN ROL IS EXECUTED.
                                        ;THE RESULTS ARE CHECKED BY COMPARING THE DATA RESULTS AND TESTING
                                        ;THE C AND V BITS.  THIS PROCEDURE IS THEN REPEATED TWICE MORE
                                        ;TO TEST THE BYTE ROTATES.  FIRST ON BYTE 0, THEN ON BYTE 1.
                                        ;
                                        ;*****************************************************************************
                                        ;TEST 116       TEST ROTATE INSTRUCTIONS W/ MODE 1
                                        ;*****************************************************************************
007070  005212                TST116: INC     (R2)            ;UPDATE TEST NUMBER
007072  022712  000116              CMP     #116,(R2)       ;SEQUENCE ERROR?
007076  001051                      BNE     TST117-10       ;BR TO ERROR HALT ON SEQ ERROR
007100  005000                      CLR     R0              ;POINT TO LOC. 0
007102  012710  052525              MOV     #52525,(R0)     ;INITIALIZE DATA
007106  000241                      CLC                     ;CLEAR C-BIT
007110  006110                      ROL     (R0)            ;TRY ROL W/ MODE 1
007112  102005                      BVC     ROT1A           ;CC=1010
007114  103404                      BCS     ROT1A
007116  023727  000000  125252      CMP     @#0,#125252     ;CHECK RESULT
007124  001404                      BEQ     ROT1B
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 765           <====
007126                  ROT1A:
007126  012742  000201              MOV     #201,-(R2)      ;MOVE TO MAILBOX #  *******  201  *******
007132  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
007134  000000                      HALT                    ;ROL MODE 1 FAILED
007136  000261                  ROT1B: SEC
007140  012710  125252              MOV     #125252,(R0)    ;INITIALIZE DATA
007144  106110                      ROLB    (R0)            ;TRY ROLB W/ MODE 1 EVEN BYTE
007146  102005                      BVC     ROT1C           ;CC=1011
007150  103004                      BCC     ROT1C
007152  022737  125125  000000      CMP     #125125,@#0     ;TEST RESULT
007160  001404                      BEQ     ROT1D
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 747           <====
007162                  ROT1C:
007162  012742  000202              MOV     #202,-(R2)      ;MOVE TO MAILBOX #  *******  202  *******
007166  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
007170  000000                      HALT                    ;ROLB W/ MODE 1 EVEN BYTE FAILED
007172  012710  125252      ROT1D:  MOV     #125252,(R0)
007176  005000                      CLR     R0              ;POINT TO ODD BYTE
007200  005200                      INC     R0
007202  000261                      SEC                     ;SET C-BIT
007204  106110                      ROLB    (R0)            ;TRY ROLB W/ MODE 1 ODD BYTE
007206  102005                      BVC     ROT1E           ;CC=0011
007210  103004                      BCC     ROT1E
007212  022737  052652  000000      CMP     #052652,@#0     ;CHECK DATA
007220  001404                      BEQ     TST117
```

```
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 727           <====
007222                          ROT1E:
007222  012742  000203                  MOV     #203,-(R2)      ;MOVE TO MAILBOX #  *******  203  *******
007226  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
007230  000000                          HALT                    ;ROLB W/ MODE 1 ODD BYTE FAILED
                                                                ;  OR SEQUENCE ERROR

                                ;*******************************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 2 ROTATE INSTRUCTIONS.
                                ;THE SAME PROCEDURE AS IN THE OTHER ROTATE TESTS ARE USED.  R0
                                ;IS USED AS THE ADDRESSING REGISTER AND IS CHECKED FOR PROPER
                                ;INCREMENTING.  BYTE INSTRUCTIONS ARE ALSO CHECKED.
                                ;
                                ;*******************************************************************************
                                ;TEST 117       TEST ROTATE INSTRUCTIONS W/ MODE 2
                                ;*******************************************************************************
007232  005212                  TST117: INC     (R2)            ;UPDATE TEST NUMBER
007234  022712  000117                  CMP     #117,(R2)       ;SEQUENCE ERROR?
007240  001057                          BNE     TST120-10       ;BR TO ERROR HALT ON SEQ ERROR
007242  005000                          CLR     R0              ;POINT TO LOC 0
007244  012710  173737                  MOV     #173737,(R0)    ;INITIALIZE DATA
007250  000241                          CLC                     ;CLEAR C-BIT
007252  006120                          ROL     (R0)+           ;TRY ROL W/ MODE 2
007254  103007                          BCC     ROT2A           ;CHECK C-BIT
007256  022737  167676  000000          CMP     #167676,@#0     ;CHECK DATA
007264  001003                          BNE     ROT2A           ;BRANCH IF RESULT INCORRECT
007266  005300                          DEC     R0              ;TEST R0
007270  005300                          DEC     R0
007272  001404                          BEQ     ROT2B
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 763           <====
007274                          ROT2A:
007274  012742  000204                  MOV     #204,-(R2)      ;MOVE TO MAILBOX #  *******  204  *******
007300  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
007302  000000                          HALT                    ;ROL W/ MODE 2 FAILED
007304  005000                  ROT2B:  CLR     R0              ;POINT TO LOC 0
007306  012710  004040                  MOV     #4040,(R0)      ;INITIALIZE DATA
007312  000241                          CLC                     ;CLEAR C-BIT
007314  106120                          ROLB    (R0)+           ;TRY ROLB W/ MODE 2 EVEN BYTE
007316  103406                          BCS     ROT2C           ;CHECK C-BIT
007320  022737  004100  000000          CMP     #4100,@#0       ;CHECK DATA
007326  001002                          BNE     ROT2C           ;BRANCH IF DATA INCORRECT
007330  005300                          DEC     R0              ;CHECK R0
007332  001404                          BEQ     ROT2D
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 743           <====
007334                          ROT2C:
007334  012742  000205                  MOV     #205,-(R2)      ;MOVE TO MAILBOX #  *******  205  *******
```

```
3416  007340  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3417  007342  000000                          HALT                    ;ROLB W/ MODE 2 EVEN BYTE FAILED
3418  007344  005000                  ROT2D:  CLR     R0              ;POINT TO LOC 0
3419  007346  012710  004040                  MOV     #4040,(R0)      ;INITIALIZE DATA
3420  007352  005200                          INC     R0              ;POINT TO ODD BYTE OF DATA
3421  007354  000261                          SEC                     ;SET C-BIT
3422  007356  106120                          ROLB    (R0)+           ;TRY ROL W/ MODE 2 ODD BYTE
3423  007360  103407                          BCS     ROT2E           ;CHECK C-BIT
3424  007362  022737  010440  000000          CMP     #10440,@#0      ;CHECK DATA
3425  007370  001003                          BNE     ROT2E           ;BRANCH IF DATA INCORRECT
3426  007372  005300                          DEC     R0              ;CHECK R0
3427  007374  005300                          DEC     R0
3428  007376  001404                          BEQ     TST120
3429                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
3430                                                                  ;           CONDITIONAL BRANCH INST. AND    <====
3431                                                                  ;           REPLACE THE MOVE INSTRUCTION    <====
3432                                                                  ;           WHICH FOLLOWS W/ 721            <====
3433  007400                          ROT2E:
3434  007400  012742  000206                  MOV     #206,-(R2)      ;MOVE TO MAILBOX #  *******  206  *******
3435  007404  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3436  007406  000000                          HALT                    ;ROLB W/ MODE 2 ODD BYTE FAILED
3437                                                                  ;  OR SEQUENCE ERROR
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 3 ROTATE INSTRUCTIONS.
                                ;THIS TEST USES THE SAME PROCEDURES AS IN THE OTHER ROTATE
                                ;TESTS.  THE DATA IS STORED IN LOC. 0 AND IS ADDRESSED USING
                                ;MODE 37.  BYTE ADDRESSING IS ALSO CHECKED FOR EVEN AND ODD BYTES.
                                ;
                                ;*****************************************************************************
                                ;TEST 120       TEST ROTATE INSTRUCTIONS /W MODE 3
                                ;*****************************************************************************
007410  005212                TST120: INC     (R2)            ;UPDATE TEST NUMBER
007412  022712  000120              CMP     #120,(R2)       ;SEQUENCE ERROR?
007416  001051                      BNE     TST121-10       ;BR TO ERROR HALT ON SEQ ERROR
007420  012737  052525  000000      MOV     #52525,@#0      ;INITIALIZE DATA IN LOC 0
007426  000261                      SEC                     ;SET C-BIT
007430  006137  000000              ROL     @#0             ;TRO ROL W/ MODE 3
007434  103404                      BCS     ROT3A           ;CHECK C-BIT
007436  022737  125253  000000      CMP     #125253,@#0     ;CHECK DATA
007444  001404                      BEQ     ROT3B
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 765           <====
007446                          ROT3A:
007446  012742  000207              MOV     #207,-(R2)      ;MOVE TO MAILBOX #  *******  207  *******
007452  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
007454  000000                      HALT                    ;ROL W/ MODE 3 FAILED
007456  012737  125252  000000  ROT3B: MOV     #125252,@#0     ;INITIALIZE DATA
007464  000241                      CLC                     ;CLEAR C-BIT
007466  106137  000000              ROLB    @#0             ;TRY ROL W/ MODE 3 EVEN BYTE
007472  103004                      BCC     ROT3C           ;CHECK C-BIT
007474  023727  000000  125124  4$:     CMP     @#0,#125124     ;CHECK DATA
007502  001404                      BEQ     ROT3D
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 746           <====
007504                          ROT3C:
007504  012742  000210              MOV     #210,-(R2)      ;MOVE TO MAILBOX #  *******  210  *******
007510  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
007512  000000                      HALT                    ;ROL W/ MODE 3 EVEN BYTE FAILED
007514  012737  125252  000000  ROT3D: MOV     #12525_,@#0     ;INITIALIZE DATA IN LOC. 0
007522  000261                      SEC                     ;SET C-BIT
007524  106137  000001              ROLB    @#1             ;TRY ROL W/ MODE 3 ODD BYTE
007530  103004                      BCC     ROT3E           ;CHECK C-BIT
007532  022737  052652  000000      CMP     #052652,@#0     ;CHECK DATA
007540  001404                      BEQ     TST121
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 727           <====
007542                          ROT3E:
007542  012742  000211              MOV     #211,-(R2)      ;MOVE TO MAILBOX #  *******  211  *******
007546  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
007550  000000                      HALT                    ;ROL W/ MODE 3 ODD BYTE FAILED
```

```
3494                                                    ;  OR SEQUENCE ERROR
```

```
3495
3496                                    ;*****************************************************************************
3497                                    ;
3498                                    ;       THIS TEST VERIFIES MODE 4 ROTATE INSTRUCTIONS.  THE DATA IS
3499                                    ;STORED IN LOC. 0.  R0 IS SET TO 2 AND THE CARRY IS SET.  AN ROL MODE 4
3500                                    ;IS USED TO ROTATE LOCATION 0 USING R0.  THE DATA IS CHECKED
3501                                    ;AND THE C AND V BITS ARE TESTED.  THE PROPER DECREMENTING OF
3502                                    ;R0 IS VERIFIED.
3503                                    ;
3504                                    ;*****************************************************************************
3505                                    ;TEST 121       TEST MODE 4 W/ ROTATE INSTRUCTIONS
3506                                    ;*****************************************************************************
3507  007552  005212                   TST121: INC     (R2)            ;UPDATE TEST NUMBER
3508  007554  022712  000121                   CMP     #121,(R2)       ;SEQUENCE ERROR?
3509  007560  001016                           BNE     TST122-10       ;BR TO ERROR HALT ON SEQ ERROR
3510  007562  012737  070707  000000           MOV     #070707,@#0     ;INITIALIZE DATA IN LOC. 0
3511  007570  012700  000002                   MOV     #2,R0           ;INITIALIZE R0 AS POINTER
3512  007574  000261                           SEC                     ;SET C-BIT
3513  007576  006140                           ROL     -(R0)           ;TRY ROL W/ MODE 4
3514  007600  103406                           BCS     ROT4            ;CHECK C-BIT
3515  007602  022737  161617  000000           CMP     #161617,@#0     ;CHECK DATA
3516  007610  001002                           BNE     ROT4            ;BRANCH IF DATA INCORRECT
3517  007612  005700                           TST     R0              ;CHECK MODE 4 REGISTER
3518  007614  001404                           BEQ     TST122
3519                                                                   ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
3520                                                                   ;           CONDITIONAL BRANCH INST. AND    <====
3521                                                                   ;           REPLACE THE MOVE INSTRUCTION    <====
3522                                                                   ;           WHICH FOLLOWS W/ 762            <====
3523  007616                           ROT4:
3524  007616  012742  000212                   MOV     #212,-(R2)      ;MOVE TO MAILBOX # \ *******  212  *******
3525  007622  005242                           INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3526  007624  000000                           HALT                    ;ROL MODE 4 FAILED
3527                                                                   ;  OR SEQUENCE ERROR
3528
3529                                    ;*****************************************************************************
3530                                    ;
3531                                    ;       THIS TEST VERIFIES MODE 5 ROTATE INSTRUCTIONS.
3532                                    ;THE DATA IS STORED IN A WORK LOCATION (ROTX) AT THE END OF THE
3533                                    ;TEST CODE.  LOC. 0 IS LOADED WITH THE ADDRESS OF THE DATA (ROTX).
3534                                    ;R0 IS SET TO 2.  THE CARRY IS CLEARED AND A MODE 5 ROL
3535                                    ;IS EXECUTED USING R0 AS AN ADDRESSING REGISTER.  THE DATA IS
3536                                    ;CHECKED, THE C AND V BITS TESTED, AND R0 CHECKED FOR PROPER
3537                                    ;DECREMENTING.
3538                                    ;
3539                                    ;*****************************************************************************
3540                                    ;TEST 122       TEST MODE 5 W/ ROTATE INSTRUCTIONS
3541                                    ;*****************************************************************************
3542  007626  005212                   TST122: INC     (R2)            ;UPDATE TEST NUMBER
3543  007630  022712  000122                   CMP     #122,(R2)       ;SEQUENCE ERROR?
3544  007634  001021                           BNE     ROT5            ;BR TO ERROR HALT ON SEQ ERROR
3545  007636  012737  007710  000000           MOV     #ROTX,@#0       ;MOVE POINTER TO LOC. 0
3546  007644  012700  000002                   MOV     #2,R0           ;SET MODE 5 REG. TO LOC. 0
3547  007650  012767  107070  000032           MOV     #107070,ROTX    ;INITIALIZE DATA
3548  007656  000241                           CLC                     ;CLEAR C-BIT
3549  007660  006150                           ROL     @-(R0)          ;TRY ROL W/ MODE 5
3550  007662  103006                           BCC     ROT5            ;CHECK C-BIT
```

```
3551  007664  022737  016160  007710          CMP     #016160,@#ROTX  ;CHECK DATA
3552  007672  001002                          BNE     ROT5            ;BRANCH IF DATA INCORRECT
3553  007674  005700                          TST     R0              ;CHECK MODE 5 REGISTER
3554  007676  001405                          BEQ     TST123
3555                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3556                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
3557                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
3558                                                                  ;           WHICH FOLLOWS W/ 757           <====
3559  007700                          ROT5:
3560  007700  012742  000213                  MOV     #213,-(R2)      ;MOVE TO MAILBOX #  *******  213  *******
3561  007704  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3562  007706  000000                          HALT                    ;ROL MODE 5 FAILED
3563                                                                  ;  OR SEQUENCE ERROR
3564  007710  000000                  ROTX:   0
3565
3566                                  ;*******************************************************************************
3567                                  ;
3568                                  ;       THIS TEST VERIFIES MODE 6 ROTATE INSTRUCTIONS.
3569                                  ;IT USES THE SAME PROCEDURE AS THE ABOVE TEST EXCEPT THE
3570                                  ;ROTATE INSTRUCTION USES MODE 6 ADDRESSING WITH REGISTER 7.
3571                                  ;THE DATA IS STILL OPERATED ON IN LOC. ROTX (SEE PREVIOUS TEST).
3572                                  ;
3573                                  ;*******************************************************************************
3574                                  ;TEST 123       TEST MODE 6 W/ ROTATE INSTRUCTIONS
3575                                  ;*******************************************************************************
3576  007712  005212                  TST123: INC     (R2)            ;UPDATE TEST NUMBER
3577  007714  022712  000123                  CMP     #123,(R2)       ;SEQUENCE ERROR?
      007720  001013                          BNE     TST124-10       ;BR TO ERROR HALT ON SEQ ERROR
      007722  012737  125252  007710          MOV     #125252,@#ROTX  ;INITIALIZE DATA
3580  007730  000261                          SEC                     ;SET C-BIT
3581  007732  006167  177752                  ROL     ROTX            ;TRY ROL W/ MODE 6
3582  007736  103004                          BCC     ROT6            ;CHECK C-BIT
3583  007740  022737  052525  007710          CMP     #52525,@#ROTX   ;CHECK DATA
3584  007746  001404                          BEQ     TST124
3585                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3586                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
3587                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
3588                                                                  ;           WHICH FOLLOWS W/ 765           <====
3589  007750                          ROT6:
3590  007750  012742  000214                  MOV     #214,-(R2)      ;MOVE TO MAILBOX #  *******  214  *******
3591  007754  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3592  007756  000000                          HALT                    ;ROL W/ MODE 6 FAILED
3593                                                                  ;  OR SEQUENCE ERROR
```

```
                                        ;*****************************************************************************
                                        ;
                                        ;THIS TEST VERIFIES MODE 7 ROTATE INSTRUCTIONS.
                                        ;THE DATA IS SET IN LOC. ROTX, (SEE PREVIOUS TEST).  THE ROL INSTRUCTION
                                        ;ADDRESSES IT INDIRECTLY USING MODE 7 AND INDIRECT ADDRESS LOCATION
                                        ;(ROTXAD) FOLLOWING THE TEST CODE.
                                        ;
                                        ;*****************************************************************************
                                        ;TEST 124       TEST MODE 7 W/ ROTATE INSTRUCTIONS
                                        ;*****************************************************************************
010000  007760  005212                  TST124: INC     (R2)            ;UPDATE TEST NUMBER
010002  007762  022712  000124                  CMP     #124,(R2)       ;SEQUENCE ERROR?
010006  007766  001016                          BNE     ROT7            ;BR TO ERROR HALT ON SEQ ERROR
010010  007770  012737  052525  007710          MOV     #52525,@#ROTX   ;INITIALIZE DATA
010016  007776  012737  007710  010034          MOV     #ROTX,@#ROTXAD  ;INITIALIZE ADDRESS POINTER
010024  010004  000241                          CLC                     ;CLEAR C-BIT
010026  010006  006177  000022                  ROL     @ROTXAD         ;TRY ROL W/ MODE 7
010032  010012  103404                          BCS     ROT7            ;CHECK C-BIT
010034  010014  023727  007710  125252          CMP     @#ROTX,#125252  ;CHECK DATA
010042  010022  001405                          BEQ     TST125
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                        ;           WHICH FOLLOWS W/ 762           <====
010044                                  ROT7:
010044  012742  000215                          MOV     #215,-(R2)      ;MOVE TO MAILBOX #  *******  215  *******
010050  005242                                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
010052  000000                                  HALT                    ;ROL W/ MODE 7 FAILED
                                                                        ;  OR SEQUENCE ERROR
010054  000000                          ROTXAD: 0


                                        ;*****************************************************************************
                                        ;
                                        ;       THIS TEST VERIFIES MODE 0 SWAB INSTRUCTION.  R0 IS SET TO
                                        ;177400.  A SWAB MODE 0 IS EXECUTED AND THE CONDITIONAL BRANCH
                                        ;IS USED TO CHECK THE SIGN OF THE RESULT.  ALSO, A COMPARISON
                                        ;IS MADE TO CHECK THE DATA RESULTS.
                                        ;
                                        ;*****************************************************************************
                                        ;TEST 125       TEST MODE 0 W/ SWAB INST.
                                        ;*****************************************************************************
010056  010036  005212                  TST125: INC     (R2)            ;UPDATE TEST NUMBER
010060  010040  022712  000125                  CMP     #125,(R2)       ;SEQUENCE ERROR?
010064  010044  001013                          BNE     TST126-10       ;BR TO ERROR HALT ON SEQ ERROR
010066  010046  012700  177400                  MOV     #177400,R0      ;MOVE TEST PATTERN TO R0
010072  010052  000300                          SWAB    R0              ;TRY SWAB MODE 0
010074  010054  100404                          BMI     SB0
                                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                        ;           WHICH FOLLOWS W/ 774           <====
010076  010056  012742  000216                  MOV     #216,-(R2)      ;MOVE TO MAILBOX #  *******  216  *******
010102  010062  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
010104  010064  000000                          HALT                    ;SWAB DID NOT SET CC'S CORRECT
```

```
3650  010066  022700  000377          SB5:    CMP     #377,R0         ;CHECK RESULT
3651  010072  001404                          BEQ     TST126
3652                                          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3653                                          ;           CONDITIONAL BRANCH INST. AND   <====
3654                                          ;           REPLACE THE MOVE INSTRUCTION   <====
3655                                          ;           WHICH FOLLOWS w/ 765           <====
3656  010074  012742  000217                  MOV     #217,-(R2)      ;MOVE TO MAILBOX #  *******  217  *******
3657  010100  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3658  010102  000000                          HALT                    ;RESULT OF SWAB MODE 5 FAILED
3659                                                                  ;  OR SEQUENCE ERROR
```

```
                                        ;*****************************************************************************
                                        ;
                                        ;       THIS TEST VERIFIES MODE 1 SWAB INSTRUCTION.  THE TEST
                                        ;PATTERN IS MOVED TO LOC 0.  R0 IS CLEARED AND USED AS THE ADDRESSING
                                        ;REGISTER IN THE MODE 1 SWAB.  THE DATA RESULTS ARE CHECKED WITH
                                        ;A COMPARE.
                                        ;
                                        ;*****************************************************************************
                                        ;TEST 126       TEST MODE 1 W/ SWAB INST
                                        ;*****************************************************************************
010104  005212                  TST126: INC     (R2)            ;UPDATE TEST NUMBER
010106  022712  000126                  CMP     #126,(R2)       ;SEQUENCE ERROR?
010112  001011                          BNE     TST127-10       ;BR TO ERROR HALT ON SEQ ERROR
010114  012737  125652  000000          MOV     #125652,@#0     ;MOVE TEST PATTERN TO LOC. 0
010122  005000                          CLR     R0              ;R0=0
010124  000310                          SWAB    (R0)            ;TRY SWAB MODE 1
010126  022737  125253  000000          CMP     #125253,@#0     ;CHECK RESULT
010134  001404                          BEQ     TST127
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 767           <====
010136  012742  000220                  MOV     #220,-(R2)      ;MOVE TO MAILBOX #  *******  220  *******
010142  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
010144  000000                          HALT                    ;RESULT OF SWAB MODE 1 FAILED
                                                                ;  OR SEQUENCE ERROR


                                        ;*****************************************************************************
                                        ;
                                        ;       THIS TEST VERIFIES MODE 2 SWAB INSTRUCTION.  THE TEST
                                        ;PATTERN IS MOVED TO LOC 0.  R0 IS CLEARED AND USED AS THE MODE
                                        ;2 ADDRESSING REGISTER.  THE RESULTS ARE CHECKED WITH A COMPARE.
                                        ;R0 IS CHECKED FOR PROPER DECREMENTING.
                                        ;
                                        ;*****************************************************************************
                                        ;TEST 127       TEST MODE 2 W/ SWAB INST
                                        ;*****************************************************************************
010146  005212                  TST127: INC     (R2)            ;UPDATE TEST NUMBER
010150  022712  000127                  CMP     #127,(R2)       ;SEQUENCE ERROR?
010154  001020                          BNE     TST130-10       ;BR TO ERROR HALT ON SEQ ERROR
010156  012737  125152  000000          MOV     #125152,@#0     ;MOVE TEST PATTERN TO LOC. 0
010164  005000                          CLR     R0              ;R0=0
010166  000320                          SWAB    (R0)+           ;TRY SWAB MODE 2
010170  022737  065252  000000          CMP     #65252,@#0      ;CHECK RESULT
010176  001404                          BEQ     SB2
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 767           <====
010200  012742  000221                  MOV     #221,-(R2)      ;MOVE TO MAILBOX #  *******  221  *******
010204  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
010206  000000                          HALT                    ;RESULT OF SWAB MODE 0 FAILED
010210  162700  000002          SB2:    SUB     #2,R0           ;CHECK EFFECT OF REG.
010214  001404                          BEQ     TST130
```

```
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                        ;           CONDITIONAL BRANCH INST. AND    <====
                                                        ;           REPLACE THE MOVE INSTRUCTION    <====
                                                        ;           WHICH FOLLOWS W/ 760            <====
3720  010216  012742  000222          MOV     #222,-(R2)  ;MOVE TO MAILBOX #  *******  222  *******
3721  010222  005242                  INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
3722  010224  000000                  HALT                ;REGISTER VALUE INCORRECT
                                                        ;  OR SEQUENCE ERROR
3723
3724
3725
3726                                ;*************************************************************************
3727                                ;
3728                                ;       THIS TEST VERIFIES MODE 3 SWAB INSTRUCTION.  THE TEST
3729                                ;PATTERN IS MOVED TO LOC 0.  A MODE 3 SWAB INSTRUCTION IS EXECUTED
3730                                ;USING R7 AS THE ADDRESSING REGISTER.  A COMPARE VERIFIES THE
3731                                ;DATA RESULTS.
3732                                ;
3733                                ;*************************************************************************
3734                                ;TEST 130       TEST MODE 3 W/SWAB INST.
3735                                ;*************************************************************************
3736  010226  005212                TST130: INC     (R2)        ;UPDATE TEST NUMBER
3737  010230  022712  000130                CMP     #130,(R2)   ;SEQUENCE ERROR?
3738  010234  001011                        BNE     TST131-10   ;BR TO ERROR HALT ON SEQ ERROR
3739  010236  012737  000377  000000        MOV     #377,@#0    ;MOVE TEST PATTERN TO LOC. 0
3740  010244  000337  000000                SWAB    @#0         ;TRY SWAB W/ MODE 3
3741  010250  022737  177400  000000        CMP     #177400,@#0 ;CHECK RESULT
3742  010256  001404                        BEQ     TST131
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                        ;           CONDITIONAL BRANCH INST. AND    <====
                                                        ;           REPLACE THE MOVE INSTRUCTION    <====
                                                        ;           WHICH FOLLOWS W/ 767            <====
3747  010260  012742  000223          MOV     #223,-(R2)  ;MOVE TO MAILBOX #  *******  223  *******
3748  010264  005242                  INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
3749  010266  000000                  HALT                ;RESULT OF SWAB INCORRECT
3750                                                    ;  OR SEQUENCE ERROR
```

```
3751
3752
3753                                    ;*****************************************************************************
3754                                    ;
3755                                    ;       THIS TEST VERIFIES MODE 4 SWAB INSTRUCTIONS.  THE DATA
3756                                    ;IS MOVED TO LOC 0.  R0 IS SET TO 2 AND USED AS THE MODE 4 ADDRESSING
3757                                    ;REGISTER.  THE DATA IS CHECKED WITH A COMPARE AND R0 IS CHECKED
3758                                    ;FOR PROPER DECREMENTING.
3759                                    ;
3760                                    ;*****************************************************************************
3761                                    ;TEST 131       TEST MODE 4 W/ SWAB INST
3762                                    ;*****************************************************************************
3763  010270  005212                    TST131: INC     (R2)                    ;UPDATE TEST NUMBER
3764  010272  022712  000131                    CMP     #131,(R2)               ;SEQUENCE ERROR?
3765  010276  001020                            BNE     TST132-10               ;BR TO ERROR HALT ON SEQ ERROR
3766  010300  012737  125652  000000            MOV     #125652,@#0             ;MOVE TEST PATTERN TO LOC. 0
3767  010306  012700  000002                    MOV     #2,R0                   ;SET UP REGISTER POINTER
3768  010312  000340                            SWAB    -(R0)                   ;TRY SWAB MODE 4
3769  010314  022737  125253  000000            CMP     #125253,@#0             ;CHECK RESULT
3770  010322  001404                            BEQ     SB4
3771                                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3772                                                                            ;           CONDITIONAL BRANCH INST. AND   <====
3773                                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
3774                                                                            ;           WHICH FOLLOWS W/ 766           <====
3775  010324  012742  000224                    MOV     #224,-(R2)              ;MOVE TO MAILBOX #  *******  224  *******
3776  010330  005242                            INC     -(R2)                   ;SET MSGTYP TO FATAL ERROR
3777  010332  000000                            HALT                            ;RESULT OF SWAB INCORRECT
3778  010334  005700                    SB4:    TST     R0                      ;CHECK EFFECT ON REG.
3779  010336  001404                            BEQ     TST132
3780                                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3781                                                                            ;           CONDITIONAL BRANCH INST. AND   <====
3782                                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
3783                                                                            ;           WHICH FOLLOWS W/ 760           <====
3784  010340  012742  000225                    MOV     #225,-(R2)              ;MOVE TO MAILBOX #  *******  225  *******
3785  010344  005242                            INC     -(R2)                   ;SET MSGTYP TO FATAL ERROR
3786  010346  000000                            HALT                            ;REGISTER VALUE INCORRECT
3787                                                                            ;  OR SEQUENCE ERROR
3789
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 5 SWAB INSTRUCTION.  THE TEST USES
                                ;TWO LOCATIONS FOLLOWING THE TEST CODE.  SB5X HOLDS THE DATA;
                                ;SB5XAD IS A POINTER TO THE DATA LOCATION.  THE DATA IS MOVED TO
                                ;SB5X AND R0 IS SET TO TWO PLUS THE ADDRESS OF SB5XAD   FOLLOWING
                                ;THE MODE 5 SWAB SB5X IS CHECKED FOR THE PROPER DATA.  R0 IS
                                ;CHECKED TO SEE THAT IT WAS DECREMENTED PROPERLY.
                                ;
                                ;*****************************************************************************
                                ;TEST 132       TEST MODE 5 W/ SWAB INST.
                                ;*****************************************************************************
010350  005212          TST132: INC     (R2)            ;UPDATE TEST NUMBER
010352  022712  000132          CMP     #132,(R2)       ;SEQUENCE ERROR?
010356  001021                  BNE     SB5             ;BR TO ERROR HALT ON SEQ ERROR
010360  012700  010436          MOV     #SB5XAD+2,R0    ;SET UP POINTER TO WORK LOCATION
010364  012767  125125  000040  MOV     #125125,SB5X    ;MOVE PATTERN TO WORK LOCATION
010372  000350                  SWAB    @-(R0)          ;TRY SWAB MODE 5
010374  022767  052652  000030  CMP     #52652,SB5X     ;CHECK RESULT
010402  001404                  BEQ     SB5A
                                ;  TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                ;            CONDITIONAL BRANCH INST. AND   <====
                                ;            REPLACE THE MOVE INSTRUCTION   <====
                                ;            WHICH FOLLOWS W/ 766           <====
010404  012742  000226          MOV     #226,-(R2)      ;MOVE TO MAILBOX #  *******  226  *******
010410  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
010412  000000                  HALT                    ;RESULT OF SWAB INCORRECT
010414  020027  010434  SB5A:   CMP     R0,#SB5XAD      ;CHECK RESULT OF REG.
010420  001406                  BEQ     TST133
                                ;  TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                ;            CONDITIONAL BRANCH INST. AND   <====
                                ;            REPLACE THE MOVE INSTRUCTION   <====
                                ;            WHICH FOLLOWS W/ 757           <===-
010422          SB5:
010422  012742  000227          MOV     #227,-(R2)      ;MOVE TO MAILBOX #  *******  227  *******
010426  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
010430  000000                  HALT                    ;REGISTER VALUE INCORRECT
                                ;  OR SEQUENCE ERROR
010432  000000          SB5X:   0                       ;WORK LOCATION
010434  010432          SB5XAD: SB5X
```

```
3831
3832                            ;*****************************************************************************
3833                            ;
3834                            ;       THIS TEST VERIFIES MODE 6 SWAB INSTRUCTION.  THIS TEST
3835                            ;USES A WORK LOCATION (SB6X) FOLLOWING THE TEST CODE.  TEST DATA
3836                            ;IS LOADED INTO THE WORK LOCATION.  R0, THE ADDRESSING REGISTER
3837                            ;IS LOADED WITH 6 LESS THEN THE ADDRESS OF THE WORK LOCATION.
3838                            ;THE MODE 6 SWAB IS EXECUTED WITH A +6 OFFSET.  THE DATA IS
3839                            ;VERIFIED WITH A COMPARE.
3840                            ;
3841                            ;*****************************************************************************
3842                            ;TEST 133       TEST MODE 6 W/ SWAB INST.
3843                            ;*****************************************************************************
3844  010436  005212            TST133: INC     (R2)            ;UPDATE TEST NUMBER
3845  010440  022712  000133            CMP     #133,(R2)       ;SEQUENCE ERROR?
3846  010444  001013                    BNE     SB6             ;BR TO ERROR HALT ON SEQ ERROR
3847  010446  012767  125125  000030    MOV     #125125,SB6X    ;MOVE PATTERN TO WORK LOCATION
3848  010454  012700  010476            MOV     #SB6X-6,R0      ;MOVE OFFSET POINTER TO R0
3849  010460  000360  000006            SWAB    6(R0)           ;TRY SWAB W/ MODE 6
3850  010464  022760  052652  000006    CMP     #52652,6(R0)    ;CHECK RESULT
3851  010472  001405                    BEQ     TST134
3852                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3853                                                            ;           CONDITIONAL BRANCH INST. AND   <====
3854                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
3855                                                            ;           WHICH FOLLOWS W/ 765           <====
3856  010474                    SB6:
3857  010474  012742  000230            MOV     #230,-(R2)      ;MOVE TO MAILBOX #  *******  230  *******
3858  010500  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3859  010502  000000                    HALT                    ;RESULT OF SWAB INCORRECT
3860                                                            ;  OR SEQUENCE ERROR
3861  010504  000000            SB6X:   0                       ;WORK LOCATION
3862
```

```
                                ;*******************************************************************
                                ;
                                ;       THIS TEST VERIFIES MODE 7 SWAB INSTRUCTION.  THIS TEST
                                ;USES TWO LOCATIONS FOLLOWING THE TEST CODE:  A WORK LOCATION
                                ;(SB7X) AND A POINTER TO THE WORK LOCATION (SB7XAD).  DATA IS MOVED
                                ;TO THE WORK LOCATION.  RO IS LOADED WITH 72 LESS THAN THE ADDRESS
                                ;OF THE ADDRESS POINTER.  THE DATA IS SWAB'ED USING A MODE 7
                                ;INSTRUCTION WITH AN OFFSET OF +72.  THE DATA IS VERIFIED WITH A
                                ;COMPARE.
                                ;
                                ;*******************************************************************
                                ;TEST 134       TEST MODE 7 W/ SWAB INST.
                                ;*******************************************************************
010506  005212                  TST134: INC     (R2)            ;UPDATE TEST NUMBER
010510  022712  000134                  CMP     #134,(R2)       ;SEQUENCE ERROR?
010514  001013                          BNE     SB7             ;BR TO ERROR HALT ON SEQ ERROR
010516  012767  177400  000030          MOV     #177400,SB7X    ;MOVE PATTERN TO WORK LOCATION
010524  012700  010464                  MOV     #SB7XAD-72,RO   ;MOVE OFFSET POINTER TO RO
010530  000370  000072                  SWAB    @72(RO)         ;TRY SWAB MODE 7
010534  027027  000072  000377          CMP     @72(RO),#377    ;CHECK RESULTS
010542  001406                          BEQ     TST135
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
                                                                ;           CONDITIONAL BRANCH INST. AND      <====
                                                                ;           REPLACE THE MOVE INSTRUCTION      <====
                                                                ;           WHICH FOLLOWS W/ 765              <====
010544                          SB7:
010544  012742  000231                  MOV     #231,-(R2)      ;MOVE TO MAILBOX #  *******  231  *******
010550  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
010552  000000                          HALT                    ;RESULT OF SWAB INCORRECT
                                                                ;  OR SEQUENCE ERROR
010554  000000                  SB7X:   0                       ;WORK LOCATION
010556  010554                  SB7XAD: SB7X                    ;POINTER TO WORK LOCATION
```

```
3897
3898                    ;*****************************************************************************
3899                    ;
3900                    ;       THIS TEST VERIFIES ALL LEGAL MODES OF THE JMP INSTRUCTION.
3901                    ;BECAUSE OF THE NATURE OF THE INSTRUCTION UNDER TEST, THIS TEST
3902                    ;UTILIZES SEVERAL DIFFERENT TECHNIQUES.  THE CODE IS NOT EXECUTED
3903                    ;IN A LINEAR FASHION.  THE DIFFERENT MODES ARE EXECUTED IN ORDER
3904                    ;FROM 1-7; HOWEVER, THE CODE IS ARRANGED SO THAT CONTROL LEAP
3905                    ;FROGS THRU THE TEST CODE.  THE ORDER OF APPEARANCE OF THE CODE
3906                    ;IS:
3907                    ;       JMP MODE 1
3908                    ;       JMP MODE 3
3909                    ;       JMP MODE 2
3910                    ;       JMP MODE 4
3911                    ;       JMP MODE 6
3912                    ;       JMP MODE 5
3913                    ;       JMP MODE 7
3914                    ;AN INTERNAL SEQUENCE TEST (JMPSEQ) IS USED TO INSURE THAT THE
3915                    ;JUMPS ARE OCCURRING IN THE PROGRAMMED SEQUENCE.
3916                    ;       THE TEST IS MADE UP OF SEVERAL BLOCKS OF CODE.  EACH CODE
3917                    ;BEGINS WITH A LABEL WHICH INDICATES THE MODE BEING EXECUTED IN
3918                    ;THAT BLOCK.  A SIMPLE PROCEDURE IS FOLLOWED IN EACH BLOCK.  FOR
3919                    ;EXAMPLE THE CODE BEGINNING AT JMP3 WILL FIRST COMPARE THE RESULTS
3920                    ;OF THE PREVIOUS MODE 2 JUMP.  (ANY REGISTER CHANGES ARE VERIFIED
3921                    ;AND THE SEQUENCE CHECK IS MADE).  THEN THE REGISTERS ARE SETUP
3922                    ;FOR A MODE 3 JUMP TO THE NEXT TEST BLOCK (HERE, JMP4), THE SEQUENCE
3923                    ;CHECKER IS UPDATED AND THE JUMP IS EXECUTED.
3924                    ;       IF A FAILURE OCCURS, THE SEQUENCE CHECKER WILL ASSIST IN
3925                    ;DETERMINING JUST WHICH MODE FAILED.  IF THE SEQUENCE IS CORRECT
3926                    ;THEN THE ERROR DETECTED WAS A MODE FAILURE (E.G. FAILURE OF THE
3927                    ;REGISTER TO BE INCREMENTED IN MODE 2 JUMP.)
3928                    ;
3929                    ;*****************************************************************************
3930                    ;TEST 135       TEST THE JMP INSTRUCTION IN ALL MODES
3931                    ;*****************************************************************************
3932  010560  005212    TST135: INC     (R2)            ;UPDATE TEST NUMBER
3933  010562  022712  000135    CMP     #135,(R2)       ;SEQUENCE ERROR?
3934  010566  001150            BNE     JMPCK+6         ;BR TO ERROR HALT ON SEQ ERROR
3935  010570  005067  000326    CLR     JMPSEQ          ;ESTABLISH A SEQUENCE CHECKER
3936  010574  012700  010654    MOV     #JMP2,R0        ;SET R0=JUMP TARGET
3937  010600  000110            JMP     (R0)            ;TRY JMP MODE 1
3938  010602  022700  010604    JMP3:   CMP     #.+2,R0         ;CHECK RESULT OF MODE 2 JUMP
3939  010606  001404            BEQ     JMP3A
3940                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3941                                                    ;           CONDITIONAL BRANCH INST. AND   <====
3942                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
3943                                                    ;           WHICH FOLLOWS W/ 770           <====
3944  010610  012742  000232            MOV     #232,-(R2)      ;MOVE TO MAILBOX #  *******  232  *******
3945  010614  005242            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
3946  010616  000000            HALT                    .
3947  010620  026727  000276  000001  JMP3A:  CMP     JMPSEQ,#1       ;MAKE SURE JMPS ARE IN SEQUENCE: JMPSEQ=1?
3948  010626  001404            BEQ     JMP3B
3949                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
3950                                                    ;           CONDITIONAL BRANCH INST. AND   <====
3951                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
3952                                                    ;           WHICH FOLLOWS W/ 760           <====
```

```
 3953  010630  012742  000233                 MOV     #233,-(R2)      ;MOVE TO MAILBOX #  *******  233  *******
 3954  010634  005242                         INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 3955  010636  000000                         HALT                    ;SHOULD BE HERE FROM JMP MODE 2 ONLY
 3956  010640  012700  010652       JMP3B:   MOV     #IJMP4,R0       ;POINT R0 TO INDIRECT JMP ADDR.
 3957  010644  005267  000252                 INC     JMPSEQ          ;UPDATE SEQUENCE CHECKER
 3958  010650  000130                         JMP     @(R0)+          ;TRY JMP MODE 3
 3959  010652  010704             IJMP4:      JMP4                    ;ADDRESS INDIRECT JUMP
 3960
 3961  010654  005767  000242       JMP2:    TST     JMPSEQ          ;CHECK THAT JMPS ARE IN SEQUENCE: JMPSEQ=0?
 3962  010660  001404                         BEQ     JMP2A
 3963                                                                 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 3964                                                                 ;           CONDITIONAL BRANCH INST. AND   <====
 3965                                                                 ;           REPLACE THE MOVE INSTRUCTION   <====
 3966                                                                 ;           WHICH FOLLOWS W/ 743           <====
 3967  010662  012742  000234                 MOV     #234,-(R2)      ;MOVE TO MAILBOX #  *******  234  *******
 3968  010666  005242                         INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 3969  010670  000000                         HALT                    ;SHOULD BE HERE FROM JMP MODE 1 ONLY
 3970  010672  005267  000224       JMP2A:   INC     JMPSEQ          ;UPDATE SEQUENCE CHECKER
 3971  010676  012700  010602                 MOV     #JMP3,R0        ;SET R0=JUMP TARGET
 3972  010702  000120                         JMP     (R0)+           ;TRY A JUMP MODE 2 TO "JMP3"
 3973  010704  022700  010654       JMP4:    CMP     #IJMP4+2,R0     ;CHECK RESULT OF REGISTER IN MODE 3 JUMP
 3974  010710  001404                         BEQ     JMP4A
 3975                                                                 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 3976                                                                 ;           CONDITIONAL BRANCH INST. AND   <====
 3977                                                                 ;           REPLACE THE MOVE INSTRUCTION   <====
 3978                                                                 ;           WHICH FOLLOWS W/ 727           <====
 3979  010712  012742  000235                 MOV     #235,-(R2)      ;MOVE TO MAILBOX #  *******  235  *******
 3980  010716  005242                         INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 3981  010720  000000                         HALT                    ;REGISTER VALUE AFTER MODE 3 JUMP INCORRECT
 3982  010722  022767  000002  000172 JMP4A:  CMP     #2,JMPSEQ       ;CHECK JUMP SEQUENCE: JMPSEQ=2?
 3983  010730  001404                         BEQ     JMP4B
 3984                                                                 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 3985                                                                 ;           CONDITIONAL BRANCH INST. AND   <====
 3986                                                                 ;           REPLACE THE MOVE INSTRUCTION   <====
 3987                                                                 ;           WHICH FOLLOWS W/ 717           <====
 3988  010732  012742  000236                 MOV     #236,-(R2)      ;MOVE TO MAILBOX #  *******  236  *******
 3989  010736  005242                         INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 3990  010740  000000                         HALT                    ;SHOULD BE ONLY FROM MODE 3 JUMP
 3991  010742  012700  011012       JMP4B:   MOV     #JMP5+2,R0      ;SET UP POINTER TO JUMP TARGET
 3992  010746  005267  000150                 INC     JMPSEQ          ;UPDATE SEQUENCE CHECKER
 3993  010752  000140                         JMP     -(R0)           ;TRY JUMP MODE 4 TO "JMP4"
 3994
 3995  010754  022767  000004  000140 JMP6:   CMP     #4,JMPSEQ       ;CHECK THAT JUMPS ARE IN SEQUENCE: JMPSEQ=4?
 3996  010762  001404                         BEQ     JMP6A
 3997                                                                 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 3998                                                                 ;           CONDITIONAL BRANCH INST. AND   <====
 3999                                                                 ;           REPLACE THE MOVE INSTRUCTION   <====
 4000                                                                 ;           WHICH FOLLOWS W/ 702           <====
 4001  010764  012742  000237                 MOV     #237,-(R2)      ;MOVE TO MAILBOX #  *******  237  *******
 4002  010770  005242                         INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 4003  010772  000000                         HALT                    ;SHOULD BE HERE ONLY FROM MODE 5 JUMP
 4004  010774  012700  011442       JMP6A:   MOV     #JMP7+376,R0    ;SET UP OFFSET POINTER TO JUMP TARGET
 4005  011000  005267  000116                 INC     JMPSEQ          ;UPDATE JUMP SEQUENCE
 4006  011004  000160  177402                 JMP     -376(R0)        ;TRY MODE 6 JUMP
 4007
 4008  011010  022767  000003  000104 JMP5:   CMP     #3,JMPSEQ       ;CHECK THAT JUMPS ARE IN SEQUENCE: JMPSEQ=3?
```

```
4009  011016  001404                          BEQ     JMP5A
4010                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4011                                                  ;           CONDITIONAL BRANCH INST. AND   <====
4012                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
4013                                                  ;           WHICH FOLLOWS W/ 664           <====
4014  011020  012742  000240                        MOV     #240,-(R2)  ;MOVE TO MAILBOX #  *******  240  *******
4015  011024  005242                                INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
4016  011026  000000                                HALT                ;SHOULD ONLY BE HERE FROM MODE 4 JUMP
4017  011030  012700  011044          JMP5A:  MOV     #IJMP5+2,R0 ;SET UP POINTER TO INDIRECT JUMP ADDR.
4018  011034  005267  000062                        INC     JMPSEQ      ;UPDATE JUMP SEQUENCE
4019  011040  000150                                JMP     @-(R0)      ;TRY JUMP MODE 5 TO "JMP6"
4020  011042  010754                  IJMP5:  JMP6                ;INDIRECT ADDRESS POINTER
4021
4022  011044  022767  000005  000050  JMP7:   CMP     #5,JMPSEQ   ;CHECK JUMPS IN SEQUENCE: JMPSEQ=5?
4023  011052  001404                          BEQ     JMP7A
4024                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4025                                                  ;           CONDITIONAL BRANCH INST. AND   <====
4026                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
4027                                                  ;           WHICH FOLLOWS W/ 646           <====
4028  011054  012742  000241                        MOV     #241,-(R2)  ;MOVE TO MAILBOX #  *******  241  *******
4029  011060  005242                                INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
4030  011062  000000                                HALT                ;SHOULD ONLY BE HERE FROM MODE 6 JUMP
4031  011064  012700  011110          JMP7A:  MOV     #IJMP+10,R0 ;SET UP OFFSET POINTER TO INDIRECT ADDR.
4032  011070  005267  000026                        INC     JMPSEQ      ;UPDATE JUMP SEQUENCE
4033  011074  000170  177770                        JMP     @-10(R0)    ;TRY MODE 7 JUMP
4034  011100  011102                  IJMP:   JMPCK               ;INDIRECT ADDRESS
4035
4036  011102  026727  000014  000006  JMPCK:  CMP     JMPSEQ,#6   ;CHECK JUMPS IN SEQUENCE: JMPSEQ
4037  011110  001405                          BEQ     TST136
4038                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4039                                                  ;           CONDITIONAL BRANCH INST. AND   <====
4040                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
4041                                                  ;           WHICH FOLLOWS W/ 627           <====
4042  011112  012742  000242                        MOV     #242,-(R2)  ;MOVE TO MAILBOX #  *******  242  *******
4043  011116  005242                                INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
4044  011120  000000                                HALT                ;SHOULD ONLY BE HERE FROM MODE 6 JUMP
4045                                                                      ;  OR SEQUENCE ERROR
4046  011122  000000                  JMPSEQ: 0
```

```
4047
4048                    ;*****************************************************************************
4049                    ;
4050                    ;       THIS TEST VERIFIES ALL LEGAL MODES OF THE JSR INSTRUCTION.
4051                    ;THE CONCEPT OF LEAP FROGGING AND SEQUENCE CHECKING (JSRSEQ) IS
4052                    ;IDENTICAL TO THAT USED IN JMP TEST (SEE PREVIOUS TEST).  EACH
4053                    ;BLOCK OF CODE VERIFIES THE PREVIOUS JSR BY CHECKING THE SEQUENCE,
4054                    ;CHECKING THAT THE PC WAS SAVED IN THE SPECIFIED REGISTER, CHECKING
4055                    ;THAT THE SP WAS DECREMENTED, CHECKING THAT THE REGISTER WAS
4056                    ;SAVED ON THE STACK, AND FINALLY CHECKING THAT ANY MODE ADDRESS
4057                    ;REGISTER ALTERATIONS (E.G. INCREMENT REGISTER IN MODE 2) WERE
4058                    ;SUCCESSFUL.  R1 IS USED AS THE REGISTER IN ALL JSR INSTRUCTIONS.
4059                    ;       IF A FAILURE OCCURS, THE SEQUENCE CHECKER WILL ASSIST IN
4060                    ;DETERMINING JUST WHICH MODE FAILED.  IF THE SEQUENCE IS CORRECT
4061                    ;THEN THE ERROR DETECTED WAS A FUNCTIONAL FAILURE (E.G., INCORRECT
4062                    ;REGISTER SAVED).
4063                    ;
4064                    ;*****************************************************************************
4065                    ;TEST 136       TEST JSR INSTRUCTION W/ ALL MODES
4066                    ;*****************************************************************************
4067  011124  005212    TST136: INC     (R2)            ;UPDATE TEST NUMBER
4068  011126  022712  000136          CMP     #136,(R2)       ;SEQUENCE ERROR?
4069  011132  001001                  BNE     JSR0            ;BR TO ERROR HALT ON SEQ ERROR
4070  011134  000402                  BR      JSR1
4071  011136  000137  011572  JSR0:   JMP     @#JSRCK1
4072
4073  011142  012706  000500  JSR1:   MOV     #STBOT,R6       ;SET STACK POINTER
4074  011146  012700  011254          MOV     #JSR2,R0        ;SET TARGET ADDRESS
4075  011152  005037  011552          CLR     @#JSRSEQ        ;INITIALIZE SEQUENCE CHECKER
4076  011156  005001                  CLR     R1              ;INITIALIZE R1
4077  011160  005101                  COM     R1
4078  011162  004110                  JSR     R1,(R0)         ;TRY JSR MODE 1
4079                                                          ; TO SCOPE: REPLACE THE MOVE INSTRUCTION   <====
4080                                                          ;           FOLLOWING W/ 774               <====
4081  011164          JSR1A:
4082  011164  012742  000243          MOV     #243,-(R2)      ;MOVE TO MAILBOX #  *******  243  *******
4083  011170  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4084  011172  000000                  HALT                    ;JSR MODE 1 FAILED
4085
4086  011174  022737  000001  011552  JSR3:   CMP     #1,@# JSRSEQ    ;CHECK SEQUENCE: JSRSEQ=1?
4087  011202  001014                  BNE     JSR3A           ;BRANCH IF OUT OF SEQUENCE
4088  011204  020127  011336          CMP     R1,#JSR4        ;PROPER PC SAVED?
4089  011210  001011                  BNE     JSR3A           ;BRANCH IF PC WRONG
4090  011212  022706  000476          CMP     #STBOT-2,R6     ;STACK POINTER DECREMENTED?
4091  011216  001006                  BNE     JSR3A           ;BRANCH IF SP WRONG
4092  011220  022716  125252          CMP     #125252,(R6)    ;REG SAVED ON STACK?
4093  011224  001003                  BNE     JSR3A           ;BRANCH IF REG. NOT SAVED
4094  011226  022700  011176          CMP     #JSR3+2,R0      ;MODE 2 INCREMENT CORRECT?
4095  011232  001404                  BEQ     JSR3B
4096                                                          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4097                                                          ;           CONDITIONAL BRANCH INST. AND   <====
4098                                                          ;           REPLACE THE MOVE INSTRUCTION   <====
4099                                                          ;           WHICH FOLLOWS W/ 740           <====
4100  011234          JSR3A:
4101  011234  012742  000244          MOV     #244,-(R2)      ;MOVE TO MAILBOX #  *******  244  *******
4102  011240  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
```

```
4103  011242  000000                        HALT                    ;JSR MODE 3 MALFUNCTIONED
4104  011244  005237  011552        JSR3B:  INC     @#JSRSEQ        ;UPDATE SEQUENCE CHECKER
4105  011250  004137  011336                JSR     R1,@#JSR4       ;TRY JSR MODE 4
4106
4107  011254  005737  011552        JSR2:   TST     @#JSRSEQ        ;CHECK SEQUENCE: JSRSEQ=0?
4108  011260  001011                        BNE     JSR2A           ;BRANCH IF OUT OF SEQUENCE
4109  011262  020127  011164                CMP     R1,#JSR1A       ;PROPER PC SAVED?
4110  011266  001006                        BNE     JSR2A           ;BRANCH IF PC WRONG
4111  011270  022706  000476                CMP     #STBOT-2,R6     ;R6 DECREMENT?
4112  011274  001003                        BNE     JSR2A           ;BRANCH IF R6 IS INCORRECT
4113  011276  021627  177777                CMP     (R6),#-1        ;REGISTER SAVED?
4114  011302  001404                        BEQ     JSR2B
4115                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4116                                                                ;           CONDITIONAL BRANCH INST. AND   <====
4117                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
4118                                                                ;           WHICH FOLLOWS W/ 714           <====
4119  011304                        JSR2A:
4120  011304  012742  000245                MOV     #245,-(R2)      ;MOVE TO MAILBOX #  *******  245  *******
4121  011310  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4122  011312  000000                        HALT                    ;JSR MODE 1 MALFUNCTIONED
4123  011314  012706  000500        JSR2B:  MOV     #STBOT,R6       ;INITIALIZE R6
4124  011320  012701  125252                MOV     #125252,R1      ;INITIALIZE R1
4125  011324  005237  011552                INC     @#JSRSEQ        ;UPDATE SEQUENCE CHECKER
4126  011330  012700  011174                MOV     #JSR3,R0        ;SET TARGET ADDRESS
4127  011334  004120                        JSR     R1,(R0)+        ;TRY JSR MODE 2
.28
4129  011336  022737  000002  011552  JSR4:   CMP     #2,@#JSRSEQ     ;CHECK SEQUENCE: JSRSEQ=2?
4130  011344  001003                        BNE     JSR4A           ;BRANCH IF OUT OF SEQUENCE
4131  011346  022701  011254                CMP     #JSR2,R1        ;PROPER PC SAVED?
4132  011352  001404                        BEQ     JSR4B
4133                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4134                                                                ;           CONDITIONAL BRANCH INST. AND   <====
4135                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
4136                                                                ;           WHICH FOLLOWS W/ 670           <====
4137  011354                        JSR4A:
4138  011354  012742  000246                MOV     #246,-(R2)      ;MOVE TO MAILBOX #  *******  246  *******
4139  011360  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4140  011362  000000                        HALT                    ;JSR MODE 3 MALFUNCTIONED
4141  011364  005237  011552        JSR4B:  INC     @#JSRSEQ        ;UPDATE SEQUENCE CHECKER
4142  011370  012700  011444                MOV     #JSR5+2,R0      ;SET TARGET ADDRESS
4143  011374  004140                        JSR     R1,-(R0)        ;TRY JSR MODE 4
4144
4145  011376  022767  000004  000146  JSR6:   CMP     #4,JSRSEQ       ;CHECK SEQUENCE: JSRSEQ=4?
4146  011404  001006                        BNE     JSR6A           ;BRANCH IF OUT OF SEQUENCE
4147  011406  022701  011510                CMP     #JSR7,R1        ;PROPER PC SAVED?
4148  011412  001003                        BNE     JSR6A           ;BRANCH IF PC WRONG
4149  011414  022700  011546                CMP     #JSR6AD,R0      ;MODE 5 REGISTER CORRECT?
4150  011420  001404                        BEQ     JSR6B
4151                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4152                                                                ;           CONDITIONAL BRANCH INST. AND   <====
4153                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
4154                                                                ;           WHICH FOLLOWS W/ 645           <====
4155  011422                        JSR6A:
4156  011422  012742  000247                MOV     #247,-(R2)      ;MOVE TO MAILBOX #  *******  247  *******
4157  011426  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4158  011430  000000                        HALT                    ;JSR MODE 5 FAILED
```

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4159  011432  005237  011552          JSR6B:  INC     @#JSRSEQ        ;UPDATE SEQUENCE CHECKER
4160  011436  004167  000046                  JSR     R1,JSR7         ;TRY JSR MODE 6
4161  011442  022767  000003  000122  JSR5:   CMP     #3,JSRSEQ       ;CHECK SEQUENCE: JSRSEQ=3?
4162  011450  001006                          BNE     JSR5A           ;BRANCH IF OUT OF SEQUENCE
4163  011452  022701  011376                  CMP     #JSR6,R1        ;PROPER PC SAVED?
4164  011456  001003                          BNE     JSR5A           ;BRANCH IF PC WRONG
4165  011460  022700  011442                  CMP     #JSR5,R0        ;CHECK MODE 4 REGISTER
4166  011464  001404                          BEQ     JSR5B
4167                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4168                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
4169                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
4170                                                                  ;           WHICH FOLLOWS W/ 623           <====
4171  011466                          JSR5A:
4172  011466  012742  000250                  MOV     #250,-(R2)      ;MOVE TO MAILBOX #  *******  250  *******
4173  011472  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4174  011474  000000                          HALT                    ;JSR MODE 4 MALFUNCTIONED
4175  011476  005237  011552          JSR5B:  INC     @#JSRSEQ        ;UPDATE SEQUENCE CHECKER
4176  011502  012700  011550                  MOV     #JSR6AD+2,R0    ;POINT R0 TO TARGET ADDRESS
4177  011506  004150                          JSR     R1,@-(R0)       ;TRY JSR MODE 5
4178
4179  011510  022737  000005  011552  JSR7:   CMP     #5,@#JSRSEQ     ;CHECK SEQUENCE: JSRSEQ=5?
4180  011516  001003                          BNE     JSR7A           ;BRANCH IF OUT OF SEQUENCE
4181  011520  022701  011442                  CMP     #JSR5,R1        ;PROPER PC SAVED?
4182  011524  001404                          BEQ     JSR7B
4183                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4184                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
4185                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
4186                                                                  ;           WHICH FOLLOWS W/ 603           <====
4187  011526                          JSR7A:
4188  011526  012742  000251                  MOV     #251,-(R2)      ;MOVE TO MAILBOX #  *******  251  *******
4189  011532  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4190  011534  000000                          HALT                    ;JSR MODE 6 FAILED
4191  011536  005237  011552          JSR7B:  INC     @#JSRSEQ        ;UPDATE SEQUENCE CHECKER
4192  011542  004177  000002                  JSR     R1,@JSRCKAD     ;TRY JSR MODE 7
4193
4194  011546  011376          JSR6AD: JSR6                            ;MODE 5 TARGET ADDRESS
4195  011550  011554          JSRCKAD:JSRCK                           ;MODE 7 TARGET ADDRESS
4196  011552  000000          JSRSEQ: 0                               ;SEQUENCE CHECKER
4197
4198  011554  022767  000006  177770  JSRCK:  CMP     #6,JSRSEQ       ;CHECK SEQUENCE: JSRSEQ=6?
4199  011562  001003                          BNE     JSRCK1          ;BRANCH IF OUT OF SEQUENCE
4200  011564  022701  011546                  CMP     #JSR6AD,R1      ;PROPER PC SAVED?
4201  011570  001404                          BEQ     TST137
4202                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4203                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
4204                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
4205                                                                  ;           WHICH FOLLOWS W/ 561           <====
4206  011572                          JSRCK1:
4207  011572  012742  000252                  MOV     #252,-(R2)      ;MOVE TO MAILBOX #  *******  252  *******
4208  011576  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4209  011600  000000                          HALT                    ;JSR MODE 7 MALFUNCTIONED
4210                                                                  ;  OR SEQUENCE ERROR
4211
4212
4213                          ;*****************************************************************************
4214                          ;
```

```
                                ;       THIS TEST VERIFIES THE RTS INSTRUCTION.  THE STACK POINTER
                                ;IS INITIALIZED AND A TEST PATTERN STORED ON STACK.  R0 IS LOADED
                                ;WITH RETURN ADDRESS.  AN RTS IS EXECUTED, AND, AT THE TARGET
                                ;ADDRESS, A CHECK IS MADE THAT R0 WAS PROPERLY RESTORED FROM THE
                                ;STACK.
                                ;*****************************************************************************
                                ;TEST 137       TEST RTS INSTRUCTION
                                ;*****************************************************************************
011602  005212                TST137: INC     (R2)            ;UPDATE TEST NUMBER
011604  022712  000137              CMP     #137,(R2)       ;SEQUENCE ERROR?
011610  001016                      BNE     TST140-10       ;BR TO ERROR HALT ON SEQ ERROR
011612  012706  000500              MOV     #STBOT,R6       ;INITIALIZE STACK POINTER
011616  012746  052525              MOV     #52525,-(R6)    ;INITIALIZE TOP OF STACK
011622  012700  011640              MOV     #RTS1,R0        ;INITIALIZE RETURN REGISTER
011626  000200                      RTS     R0              ;TRY RTS THROUGH R0
                                                            ; TO SCOPE: REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           FOLLOWING W/ 770               <====
011630  012742  000253              MOV     #253,-(R2)      ;MOVE TO MAILBOX #  *******  253  *******
011634  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
011636  000000                      HALT                    ;RTS FAILED
011640  022700  052525      RTS1:   CMP     #52525,R0       ;CHECK THAT R0 RESTORED FROM STACK
011644  001404                      BEQ     TST140
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 762           <====
011646  012742  000254              MOV     #254,-(R2)      ;MOVE TO MAILBOX #  *******  254  *******
011652  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
011654  000000                      HALT                    ;RTS MALFUNCTIONED
                                                            ;  OR SEQUENCE ERROR
```

```
                                     ;*******************************************************************************
                                     ;
                                     ;        THESE NEXT FOUR TESTS VERIFY THE FUNCTIONING OF A GROUP
                                     ;OF FOUR INSTRUCTIONS.  THE GROUP CONSISTS OF THE INSTRUCTIONS:
                                     ;MOV, BIC, BIT, AND BIS.  THESE INSTRUCTIONS ARE SIMILAR IN THE
                                     ;WAY THEY EFFECT THE C AND V BITS.  THEY ALL LEAVE THE V-BIT
                                     ;CLEAR AND THE C-BIT UNAFFECTED.
                                     ;        THE TEST PROCEDURE IS AS FOLLOWS:  THE N, Z, AND V BITS
                                     ;ARE LOADED WITH THE COMPLEMENT OF THE EXPECTED RESULTS, THE C-BIT
                                     ;IS LOADED WITH THE DESIRED RESULT.  THE INSTRUCTION IS EXECUTED
                                     ;WITH DIFFERENT DATA PATTERNS AND THE RESULTS ARE VERIFIED WITH
                                     ;A SERIES OF CONDITIONAL BRANCH INSTRUCTIONS.  THE DATA IS CHOSEN
                                     ;TO PRODUCT ALL POSSIBLE COMBINATIONS OF THE C AND V BITS.
                                     ;
                                     ;*******************************************************************************
                                     ;TEST 140        TEST MOV INSTRUCTION
                                     ;*******************************************************************************
011656  005212                       TST140: INC     (R2)            ;UPDATE TEST NUMBER
011660  022712  000140                       CMP     #140,(R2)       ;SEQUENCE ERROR?
011664  001022                               BNE     TST141-10       ;BR TO ERROR HALT ON SEQ ERROR
011666  000277                               SCC                     ;CC=0110
011670  000251                               +CLN!CLC
011672  012700  100000                       MOV     #100000,R0      ;CC=1000
011676  101402                               BLOS    MOV1
011700  102401                               BVS     MOV1
011702  100404                               BMI     MOV2
                                                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                     ;           CONDITIONAL BRANCH INST. AND    <====
                                                                     ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                     ;           WHICH FOLLOWS W/ 771            <====
011704                               MOV1:
011704  012742  000255                       MOV     #255,-(R2)      ;MOVE TO MAILBOX #  *******  255  *******
011710  005242                               INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
011712  000000                               HALT                    ;MOV DID NOT SET CC'S CORRECTLY

011714  000277                       MOV2:   SCC                     ;CC=1011
011716  000244                               CLZ
011720  012700  000000                       MOV     #0,R0           ;CC=0101
011724  101002                               BHI     MOV3            ;C OR Z = 0?
011726  102401                               BVS     MOV3            ;V=1?
011730  100004                               BPL     TST141
                                                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                     ;           CONDITIONAL BRANCH INST. AND    <====
                                                                     ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                     ;           WHICH FOLLOWS W/ 756            <====
011732                               MOV3:
011732  012742  000256                       MOV     #256,-(R2)      ;MOVE TO MAILBOX #  *******  256  *******
011736  005242                               INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
011740  000000                               HALT                    ;MOV DID NOT SET CC'S CORRECTLY
                                                                     ;  OR SEQUENCE ERROR


                                     ;*******************************************************************************
                                     ;TEST 141        TEST BIT INSTRUCTION
                                     ;*******************************************************************************
011742  005212                       TST141: INC     (R2)            ;UPDATE TEST NUMBER
```

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4301  011744  022712  000141                  CMP     #141,(R2)       ;SEQUENCE ERROR?
4302  011750  001024                          BNE     TST142-10       ;BR TO ERROR HALT ON SEQ ERROR
4303  011752  012700  100001                  MOV     #100001,R0
4304  011756  000277                          SCC                     ;CC=0110
4305  011760  000251                          +CLN!CLC
4306  011762  032700  100000                  BIT     #100000,R0      ;CC=1000
4307  011766  101402                          BLOS    BIT1
4308  011770  102401                          BVS     BIT1
4309  011772  100404                          BMI     BIT2
4310                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4311                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
4312                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
4313                                                                  ;           WHICH FOLLOWS W/ 767           <====
4314  011774                          BIT1:
4315  011774  012742  000257                  MOV     #257,-(R2)      ;MOVE TO MAILBOX #  *******  257  *******
4316  012000  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4317  012002  000000                          HALT                    ;BIT DID NOT SET CC'S CORRECTLY
4318
4319  012004  000277                  BIT2:   SCC                     ;CC=1011
4320  012006  000244                          CLZ
4321  012010  032700  077776                  BIT     #77776,R0       ;CC=0101
4322  012014  101002                          BHI     BIT3
4323  012016  102401                          BVS     BIT3
4324  012020  100004                          BPL     TST142
4325                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4326                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
4327                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
4328                                                                  ;           WHICH FOLLOWS W/ 754           <====
4329  012022                          BIT3:
4330  012022  012742  000260                  MOV     #260,-(R2)      ;MOVE TO MAILBOX #  *******  260  *******
4331  012026  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4332  012030  000000                          HALT                    ;BIT DID NOT SET CC'S CORRECTLY
4333                                                                  ;  OR SEQUENCE ERROR
4334
4335                                  ;*****************************************************************************
4336                                  ;TEST 142       TEST BIC INSTRUCTION
4337                                  ;*****************************************************************************
4338  012032  005212                  TST142: INC     (R2)            ;UPDATE TEST NUMBER
4339  012034  022712  000142                  CMP     #142,(R2)       ;SEQUENCE ERROR?
4340  012040  001024                          BNE     TST143-10       ;BR TO ERROR HALT ON SEQ ERROR
4341  012042  012700  177777                  MOV     #177777,R0
4342  012046  000277                          SCC                     ;CC=0110
4343  012050  000251                          +CLN!CLC
4344  012052  042700  077777                  BIC     #77777,R0       ;CC=1000
4345  012056  101402                          BLOS    BIC1
4346  012060  102401                          BVS     BIC1
4347  012062  100404                          BMI     BIC2
4348                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4349                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
4350                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
4351                                                                  ;           WHICH FOLLOWS W/ 767           <====
4352  012064                          BIC1:
4353  012064  012742  000261                  MOV     #261,-(R2)      ;MOVE TO MAILBOX #  *******  261  *******
4354  012070  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4355  012072  000000                          HALT                    ;BIC DID NOT SET CC'S CORRECTLY
4356  012074  000277                  BIC2:   SCC                     ;CC=1011
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4357  012076  000244                          CLZ
4358  012100  042700  100000                  BIC     #100000,R0      ;CC=0101
4359  012104  101002                          BHI     BIC3
4360  012106  102401                          BVS     BIC3
4361  012110  100004                          BPL     TST143
4362                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
4363                                                  ;           CONDITIONAL BRANCH INST. AND    <====
4364                                                  ;           REPLACE THE MOVE INSTRUCTION    <====
4365                                                  ;           WHICH FOLLOWS W/ 754            <====
4366  012112                          BIC3:
4367  012112  012742  000262                  MOV     #262,-(R2)      ;MOVE TO MAILBOX #  *******  262  *******
4368  012116  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4369  012120  000000                          HALT                    ;BIC DID NOT SET CC'S CORRECTLY
4370                                                                  ;  OR SEQUENCE ERROR
4371
4372                                  ;*****************************************************************************
4373                                  ;TEST 143       TEST BIS INSTRUCTION
4374                                  ;*****************************************************************************
4375  012122  005212                  TST143: INC     (R2)            ;UPDATE TEST NUMBER
4376  012124  022712  000143                  CMP     #143,(R2)       ;SEQUENCE ERROR?
4377  012130  001025                          BNE     TST144-10       ;BR TO ERROR HALT ON SEQ ERROR
4378  012132  005000                          CLR     R0              ;R0=0
4379  012134  000277                          SCC                     ;CC=1010
4380  012136  000251                          +CLN!CLC
4381  012140  052700  000000                  BIS     #0,R0           ;CC=0100  R0=0
4382  012144  103403                          BCS     BIS1
4383  012146  102402                          BVS     BIS1
4384  012150  100401                          BMI     BIS1
4385  012152  001404                          BEQ     BIS2
4386                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
4387                                                  ;           CONDITIONAL BRANCH INST. AND    <====
4388                                                  ;           REPLACE THE MOVE INSTRUCTION    <====
4389                                                  ;           WHICH FOLLOWS W/ 767            <====
4390  012154                          BIS1:
4391  012154  012742  000263                  MOV     #263,-(R2)      ;MOVE TO MAILBOX #  *******  263  *******
4392  012160  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4393  012162  000000                          HALT                    ;BIS DID NOT SET CC'S CORRECTLY
4394  012164  000277                  BIS2:   SCC                     ;CC=0111
4395  012166  000250                          CLN
4396  012170  052700  177777                  BIS     #177777,R0      ;CC=1001
4397  012174  103003                          BCC     BIS3
4398  012176  102402                          BVS     BIS3
4399  012200  001401                          BEQ     BIS3
4400  012202  100404                          BMI     TST144
4401                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
4402                                                  ;           CONDITIONAL BRANCH INST. AND    <====
4403                                                  ;           REPLACE THE MOVE INSTRUCTION    <====
4404                                                  ;           WHICH FOLLOWS W/ 753            <====
4405  012204                          BIS3:
4406  012204  012742  000264                  MOV     #264,-(R2)      ;MOVE TO MAILBOX #  *******  264  *******
4407  012210  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4408  012212  000000                          HALT                    ;BIS DID NOT SET CC'S CORRECTLY
4409                                                                  ;  OR SEQUENCE ERROR
4410
```

```
4411
4412                    ;*****************************************************************************
4413                    ;
4414                    ;       THESE NEXT TWO TESTS VERIFY THE FUNCTIONING OF THE INC AND
4415                    ;DEC INSTRUCTIONS.  THESE INSTRUCTIONS BOTH EFFECT THE C AND V
4416                    ;BITS THE SAME; THE C-BIT IS LEFT UNCHANGED AND THE V-BIT IS DEPENDENT
4417                    ;UPON THE DATA RESULTS.  THE SAME PROCEDURE IS USED.  THE CONDITION
4418                    ;CODE BITS ARE INITIALIZED, THE INSTRUCTION IS EXECUTED AND THE
4419                    ;RESULTS ARE VERIFIED WITH A SERIES OF CONDITIONAL BRANCH INSTRUCTIONS.
4420                    ;THIS PROCEDURE IS REPEATED WITH SEVERAL DATA PATTERNS TO PRODUCE
4421                    ;DIFFERENT COMBINATIONS OF THE C AND V BITS.
4422                    ;
4423                    ;*****************************************************************************
4424                    ;TEST 144       TEST INC INSTRUCTION
4425                    ;*****************************************************************************
4426  012214  005212    TST144: INC     (R2)            ;UPDATE TEST NUMBER
4427  012216  022712    000144  CMP     #144,(R2)       ;SEQUENCE ERROR?
4428  012222  001037            BNE     TST145-10       ;BR TO ERROR HALT ON SEQ ERROR
4429  012224  012700    077777  MOV     #077777,R0      ;R0=077777
4430  012230  000257            CCC                     ;CC=0100
4431  012232  000264            SEZ
4432  012234  005200            INC     R0              ;CC=1010   R0=10000
4433  012236  101402            BLOS    INC1
4434  012240  100001            BPL     INC1
4435  012242  102404            BVS     INC2
4436                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4437                                                    ;           CONDITIONAL BRANCH INST. AND   <====
4438                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
4439                                                    ;           WHICH FOLLOWS W/ 770           <====
4440  012244            INC1:
4441  012244  012742    000265          MOV     #265,-(R2)      ;MOVE TO MAILBOX #  *******  265  *******
4442  012250  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4443  012252  000000                    HALT                    ;INC DID NOT SET CC'S CORRECTLY
4444  012254  052700    077777  INC2:   BIS     #77777,R0       ;R0=177777
4445  012260  000261            SEC                     ;CC=1011
4446  012262  000244            CLZ
4447  012264  005200            INC     R0              ;CC=0101   R0=0
4448  012266  100403            BMI     INC3
4449  012270  102402            BVS     INC3
4450  012272  103001            BCC     INC3
4451  012274  001404            BEQ     INC4
4452                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4453                                                    ;           CONDITIONAL BRANCH INST. AND   <====
4454                                                    ;           REPLACE THE MOVE INSTRUCTION   <====
4455                                                    ;           WHICH FOLLOWS W/ 753           <====
4456  012276            INC3:
4457  012276  012742    000266          MOV     #266,-(R2)      ;MOVE TO MAILBOX #  *******  266  *******
4458  012302  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4459  012304  000000                    HALT                    ;INC DID NOT SET CC'S CORRECTLY
4460
4461  012306  000277    INC4:   SCC                     ;CC=1110
4462  012310  000241            CLC
4463  012312  005200            INC     R0              ;CC=0000   R0=1
4464  012314  101402            BLOS    INC5
4465  012316  100401            BMI     INC5
4466  012320  100004            BPL     TST145
```

```
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 741           <====
012322                          INC5:
012322  012742  000267                MOV     #267,-(R2)      ;MOVE TO MAILBOX #  *******  267  *******
012326  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
012330  000000                        HALT                    ;INC DID NOT SET CC'S CORRECTLY
                                                                ;  OR SEQUENCE ERROR

                                ;*****************************************************************************
                                ;TEST 145       TEST DEC INSTRUCTION
                                ;*****************************************************************************
012332  005212                TST145: INC     (R2)            ;UPDATE TEST NUMBER
012334  022712  000145                CMP     #145,(R2)       ;SEQUENCE ERROR?
012340  001051                        BNE     TST146-10       ;BR TO ERROR HALT ON SEQ ERROR
012342  012700  000002                MOV     #2,R0           ;R0=2
012346  000277                        SCC                     ;CC=1111
012350  005300                        DEC     R0              ;CC=0001   R0=1
012352  100403                        BMI     DEC1
012354  001402                        BEQ     DEC1
012356  102401                        BVS     DEC1
012360  103404                        BCS     DEC2
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 770           <====
012362                          DEC1:
012362  012742  000270                MOV     #270,-(R2)      ;MOVE TO MAILBOX #  *******  270  *******
012366  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
012370  000000                        HALT                    ;DEC DID NOT SET CC'S CORRECTLY
012372  000261                DEC2:   SEC                     ;CC=1011
012374  000244                        CLZ
012376  005300                        DEC     R0              ;CC=0101   R0=0
012400  101002                        BHI     DEC3
012402  100401                        BMI     DEC3
012404  102004                        BVC     DEC4
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 756           <====
012406                          DEC3:
012406  012742  000271                MOV     #271,-(R2)      ;MOVE TO MAILBOX #  *******  271  *******
012412  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
012414  000000                        HALT                    ;DEC DID NOT SET CC'S CORRECTLY
012416  000277                DEC4:   SCC                     ;CC=0110
012420  000251                        +CLN!CLC
012422  005300                        DEC     R0              ;CC=1000   R0=177777
012424  101402                        BLOS    DEC5
012426  102401                        BVS     DEC5
012430  100404                        BMI     DEC6
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 744           <====
012432                          DEC5:
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```
4523  012432  012742  000272                  MOV     #272,-(R2)      ;MOVE TO MAILBOX #  *******  272  *******
4524  012436  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4525  012440  000000                          HALT                    ;DEC DID NOT SET CC'S CORRECTLY
4526  012442  042700  077777          DEC6:   BIC     #77777,R0       ;R0=100000
4527  012446  000277                          SCC                     ;CC=0101
4528  012450  000252                          +CLN!CLV
4529  012452  005300                          DEC     R0              ;CC=1011   R0=77777
4530  012454  100403                          BMI     DEC7            ;CC=0011
4531  012456  001402                          BEQ     DEC7
4532  012460  102001                          BVC     DEC7
4533  012462  103404                          BCS     TST146
4534                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4535                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
4536                                                                  ;           REPLACE THE MOVE INSTRUCTION    ====
4537                                                                  ;           WHICH FOLLOWS W/ 727           <====
4538  012464                          DEC7:
4539  012464  012742  000273                  MOV     #273,-(R2)      ;MOVE TO MAILBOX #  *******  273  *******
4540  012470  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4541  012472  000000                          HALT                    ;DEC DID NOT SET CC'S CORRECTLY
4542                                                                  ;  OR SEQUENCE ERROR
4543
```

```
                                ;*****************************************************************************
                                ;
                                ;       THESE NEXT THREE TESTS VERIFY THE FUNCTIONING OF THE CLR,
                                ;TST, AND SWAB INSTRUCTIONS.  THESE THREE INSTRUCTIONS ALL LEAVE
                                ;THE C AND V BITS CLEARED.  AGAIN, THE CONDITION CODES ARE PRESET,
                                ;THE INSTRUCTION EXECUTED AND THE RESULTS CHECKED WITH CONDITIONAL
                                ;BRANCH INSTRUCTIONS.  THE PROCEDURE IS REPEATED TO PRODUCE OTHER
                                ;COMBINATIONS OF CONDITION CODES.
                                ;
                                ;*****************************************************************************
                                ;TEST 146       TEST CLR INSTRUCTION
                                ;*****************************************************************************
012474  005212                TST146: INC     (R2)            ;UPDATE TEST NUMBER
012476  022712  000146              CMP     #146,(R2)       ;SEQUENCE ERROR?
012502  001007                      BNE     TST147-10       ;BR TO ERROR HALT ON SEQ ERROR
012504  000277                      SCC                     ;CC=1011
012506  000244                      CLZ
012510  005000                      CLR     R0              ;CC=0100   R0=0
012512  100403                      BMI     CLR1
012514  102402                      BVS     CLR1
012516  103401                      BCS     CLR1
012520  001404                      BEQ     TST147
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 771           <====
012522                          CLR1.
012522  012742  000274                MOV     #274,-(R2)      ;MOVE TO MAILBOX #  *******  274  *******
012526  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
012530  000000                      HALT                    ;CLR DID NOT SET CC'S CORRECTLY
                                                            ;  OR SEQUENCE ERROR
                                ;*****************************************************************************
                                ;TEST 147       TEST TST INSTRUCTION
                                ;*****************************************************************************
012532  005212                TST147: INC     (R2)            ;UPDATE TEST NUMBER
012534  022712  000147              CMP     #147,(R2)       ;SEQUENCE ERROR?
012540  001022                      BNE     TST150-10       ;BR TO ERROR HALT ON SEQ ERROR
012542  000277                      SCC                     ;CC=1011
012544  000244                      CLZ
012546  005700                      TST     R0              ;CC=0100
012550  100403                      BMI     TEST1
012552  102402                      BVS     TEST1
012554  103401                      BCS     TEST1
012556  001404                      BEQ     TEST2
                                                            ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                            ;           CONDITIONAL BRANCH INST. AND   <====
                                                            ;           REPLACE THE MOVE INSTRUCTION   <====
                                                            ;           WHICH FOLLOWS W/ 771           <====
012560                          TEST1:
012560  012742  000275                MOV     #275,-(R2)      ;MOVE TO MAILBOX #  *******  275  *******
012564  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
012566  000000                      HALT                    ;TEST DID NOT SET CC'S CORRECTLY
012570  005300                TEST2:  DEC     R0              ;MAKE R0 NEGATIVE
012572  000277                      SCC                     ;CC=0111
```

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4600  012574  000250                    CLN
4601  012576  005700                    TST     R0              ;CC=1000
4602  012600  101402                    BLOS    TEST3
4603  012602  102401                    BVS     TEST3
4604  012604  100404                    BMI     TST15C
                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                        ;           WHICH FOLLOWS W/ 756           <====
4609  012606                    TEST3:
4610  012606  012742  000276            MOV     #276,-(R2)      ;MOVE TO MAILBOX #  *******  276  *******
4611  012612  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4612  012614  000000                    HALT                    ;TEST DID NOT SET CC'S CORRECTLY
                                        ;  OR SEQUENCE ERROR
4615  ;*****************************************************************************
4616  ;TEST 150       TEST SWAB INSTRUCTION
4617  ;*****************************************************************************
4618  012616  005212            TST150: INC     (R2)            ;UPDATE TEST NUMBER
4619  012620  022712  000150            CMP     #150,(R2)       ;SEQUENCE ERROR?
4620  012624  001023                    BNE     TST151-10       ;BR TO ERROR HALT ON SEQ ERROR
4621  012626  012700  170000            MOV     #170000,R0      ;R0=170000
4622  012632  000277                    SCC                     ;CC=0111
4623  012634  000250                    CLN
4624  012636  000300                    SWAB    R0              ;CC=1000   R0=360
4625  012640  101402                    BLOS    SWB1
4626  012642  102401                    BVS     SWB1
4627  012644  100404                    BMI     SWB2
                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                        ;           WHICH FOLLOWS W/ 77C           <====
4632  012646                    SWB1:
4633  012646  012742  000277            MOV     #277,-(R2)      ;MOVE TO MAILBOX #  *******  277  *******
4634  012652  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4635  012654  000000                    HALT                    ;SWAB DID NOT SET CC'S CORRECTLY
4636  012656  000277            SWB2:   SCC                     ;CC=1011
4637  012660  000244                    CLZ
4638  012662  000300                    SWAB    R0              ;CC=0100   R0=170000
4639  012664  102403                    BVS     SWB3
4640  012666  103402                    BCS     SWB3
4641  012670  100401                    BMI     SWB3
4642  012672  001404                    BEQ     TST151
                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                        ;           WHICH FOLLOWS W/ 755           <====
4647  012674                    SWB3:
4648  012674  012742  000300            MOV     #300,-(R2)      ;MOVE TO MAILBOX #  *******  300  *******
4649  012700  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4650  012702  000000                    HALT                    ;
4651
```

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                                ;*****************************************************************************
                                ;
                                ;       THESE NEXT TWO TESTS VERIFY THE FUNCTIONING OF THE ADD AND
                                ;ADC INSTRUCTIONS.  BOTH OF THESE INSTRUCTIONS HANDLE THE C AND
                                ;V BITS IDENTICALLY.  THE PROCEDURE IS TO PRESET THE CONDITION
                                ;CODES, EXECUTE THE INSTRUCTION WITH A PARTICULAR SET OF DATA, AND
                                ;THEN CHECK THE RESULTS BY EXECUTING A SERIES OF CONDITIONAL
                                ;BRANCHES.  THES PROCEDURE IS REPEATED SEVERAL TIMES WITH DIFFERENT
                                ;DATA TO PRODUCE EVERY COMBINATION OF C AND V BITS.
                                ;
                                ;*****************************************************************************
                                ;TEST 151        TEST ADD INSTRUCTION
                                ;*****************************************************************************
012704  005212                TST151: INC     (R2)            ;UPDATE TEST NUMBER
012706  022712  000151              CMP     #151,(R2)       ;SEQUENCE ERROR?
012712  001062                      BNE     TST152-10       ;BR TO ERROR HALT ON SEQ ERROR
012714  012700  040000              MOV     #40000,R0       ;R0=40000
012720  000277                      SCC                     ;CC=1111
012722  062700  030000              ADD     #30000,R0       ;CC=0000   R0=70000
012726  101402                      BLOS    ADD1
012730  102401                      BVS     ADD1
012732  100004                      BPL     ADD2
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 770           <====
012734                  ADD1:
012734  012742  000301              MOV     #301,-(R2)      ;MOVE TO MAILBOX #  *******  301  *******
012740  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
012742  000000                      HALT                    ;ADD DID NOT SET CC'S CORRECTLY
012744  000264                ADD2: SEZ                     ;CC=0100

012746  062700  010000              ADD     #10000,R0       ;CC=1010   40=100000
012752  101402                      BLOS    ADD3
012754  102001                      BVC     ADD3
012756  100404                      BMI     ADD4
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 756           <====
012760                  ADD3:
012760  012742  000302              MOV     #302,-(R2)      ;MOVE TO MAILBOX #  *******  302  *******
012764  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
012766  000000                      HALT                    ;ADD DID NOT SET CC'S CORRECTLY
012770  000257                ADD4: CCC                     ;CC=1000
012772  000270                      SEN
012774  062700  100000              ADD     #100000,R0      ;CC=0111   R0=0
013000  101002                      BHI     ADD5
013002  102001                      BVC     ADD5
013004  100004                      BPL     ADD6
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 743           <====
013006                  ADD5:
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4708  013006  012742  000303              MOV     #303,-(R2)      ;MOVE TO MAILBOX #  *******  303  *******
4709  013012  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4710  013014  000000                      HALT                    ;ADD DID NOT SET CC'S CORRECTLY
4711  013016  062700  177777    ADD6:     ADD     #177777,R0      ;CC=1000   R0=177777
4712  013022  101402                      BLOS    ADD7
4713  013024  102401                      BVS     ADD7
4714  013026  100404                      BMI     ADD8
4715                                                              ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4716                                                              ;           CONDITIONAL BRANCH INST. AND   <====
4717                                                              ;           REPLACE THE MOVE INSTRUCTION   <====
4718                                                              ;           WHICH FOLLOWS W/ 732           <====
4719  013030            ADD7:
4720  013030  012742  000304              MOV     #304,-(R2)      ;MOVE TO MAILBOX #  *******  304  *******
4721  013034  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4722  013036  000000                      HALT                    ;ADD DID NOT SET CC'S CORRECTLY
4723  013040  000277    ADD8:     SCC                             ;CC=1010
4724  013042  000245                      +CLC!CLZ
4725  013044  062700  000001              ADD     #1,R0           ;CC=0101   R=0
4726  013050  102403                      BVS     ADD9
4727  013052  103002                      BCC     ADD9
4728  013054  100401                      BMI     ADD9
4729  013056  001404                      BEQ     TST152
4730                                                              ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4731                                                              ;           CONDITIONAL BRANCH INST. AND   <====
4732                                                              ;           REPLACE THE MOVE INSTRUCTION   <====
4733                                                              ;           WHICH FOLLOWS W/ 716           <====
4734  013060            ADD9:
4735  013060  012742  000305              MOV     #305,-(R2)      ;MOVE TO MAILBOX #  *******  305  *******
4736  013064  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4737  013066  000000                      HALT                    ;ADD DID NOT SET CC'S CORRECTLY
4738                                                              ;  OR SEQUENCE ERROR
4739
4740                      ;*****************************************************************************
4741                      ;TEST 152       TEST ADC INSTRUCTION
4742                      ;*****************************************************************************
4743  013070  005212    TST152:   INC     (R2)            ;UPDATE TEST NUMBER
4744  013072  022712  000152              CMP     #152,(R2)       ;SEQUENCE ERROR?
4745  013076  001037                      BNE     TST153-10       ;BR TO ERROR HALT ON SEQ ERROR
4746  013100  012700  077777              MOV     #077777,R0
4747  013104  000277                      SCC                     ;CC=0101
4748  013106  000252                      +CLN!CLV
4749  013110  005500                      ADC     R0              ;CC=1010
4750  013112  101402                      BLOS    ADC1
4751  013114  102001                      BVC     ADC1
4752  013116  100404                      BMI     ADC2
4753                                                              ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
4754                                                              ;           CONDITIONAL BRANCH INST. AND   <====
4755                                                              ;           REPLACE THE MOVE INSTRUCTION   <====
4756                                                              ;           WHICH FOLLOWS W/ 770           <====
4757  013120            ADC1:
4758  013120  012742  000306              MOV     #306,-(R2)      ;MOVE TO MAILBOX #  *******  306  *******
4759  013124  005242                      INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4760  013126  000000                      HALT                    ;ADC DID NOT SET CC'S CORRECTLY
4761  013130  052700  077777    ADC2:     BIS     #77777,R0
4762  013134  000277                      SCC                     ;CC=1011
4763  013136  000244                      CLZ
```

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 4764  013140  005500                        ADC     R0              ;CC=0101   R0=0
 4765  013142  101002                        BHI     ADC3
 4766  013144  102401                        BVS     ADC3
 4767  013146  100004                        BPL     ADC4
 4768                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 4769                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
 4770                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
 4771                                                                  ;           WHICH FOLLOWS W/ 754           <====
 4772  013150                          ADC3:
 4773  013150  012742  000307                MOV     #307,-(R2)      ;MOVE TO MAILBOX #  *******  307  *******
 4774  013154  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 4775  013156  000000                        HALT                    ;ADC DID NOT SET CC'S CORRECTLY
 4776  013160  000277                ADC4:   SCC
 4777  013162  000245                        +CLZ!CLC                        ;CC=1010
 4778  013164  005500                        ADC     R0              ;CC=0100
 4779  013166  102403                        BVS     ADC5
 4780  013170  103402                        BCS     ADC5
 4781  013172  100401                        BMI     ADC5
 4782  013174  001404                        BEQ     TST153
 4783                                                                  ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 4784                                                                  ;           CONDITIONAL BRANCH INST. AND   <====
 4785                                                                  ;           REPLACE THE MOVE INSTRUCTION   <====
 4786                                                                  ;           WHICH FOLLOWS W/ 741           <====
 4787  013176                          ADC5:
 4788  013176  012742  000310                MOV     #310,-(R2)      ;MOVE TO MAILBOX #  *******  310  *******
 4789  013202  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 4790  013204  000000                        HALT                    ;ADC DID NOT SET CC'S CORRECTLY
 4791                                                                  ;  OR SEQUENCE ERROR
```

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                                ;*****************************************************************************
                                ;
                                ;       THESE NEXT THREE TESTS VERIFY THE FUNCTIONING OF THE NEG,
                                ;CMP, AND COM INSTRUCTIONS.  EACH OF THESE INSTRUCTIONS GENERATE
                                ;THE C AND V BITS IDENTICALLY.  THE CONDITION CODES ARE PRESET,
                                ;THE INSTRUCTIONS EXECUTED, AND THE RESULTS CHECKED WITH A SERIES
                                ;OF CONDITIONAL BRANCH INSTRUCTIONS.  THIS PROCEDURE IS REPEATED
                                ;SEVERAL TIMES WITH DIFFERENT DATA IN ORDER TO GENERATE DIFFERENT
                                ;COMBINATIONS OF THE C AND V BITS.
                                ;
                                ;*****************************************************************************
                                ;TEST 153        TEST NEG INSTRUCTION
                                ;*****************************************************************************
013206  005212                  TST153: INC     (R2)            ;UPDATE TEST NUMBER
013210  022712  000153                  CMP     #153,(R2)       ;SEQUENCE ERROR?
013214  001042                          BNE     TST154-10       ;BR TO ERROR HALT ON SEQ ERROR
013216  012700  000001                  MOV     #1,R0
013222  000277                          SCC                     ;CC=0110
013224  000251                          +CLN!CLC
013226  005400                          NEG     R0              ;CC=1001   R0=177777
013230  103003                          BCC     NEG1
013232  102402                          BVS     NEG1
013234  001401                          BEQ     NEG1
013236  100404                          BMI     NEG2
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 767           <====
013240                          NEG1:
013240  012742  000311                  MOV     #311,-(R2)      ;MOVE TO MAILBOX #  *******  311  *******
013244  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
013246  000000                          HALT                    ;NEG DID NOT SET CC'S CORRECTLY
013250  042700  077777          NEG2:   BIC     #77777,R0
013254  000257                          CCC                     ;CC=0100
013256  000264                          SEZ
013260  005400                          NEG     R0              ;CC=1011   R0=100000
013262  102003                          BVC     NEG3
013264  103002                          BCC     NEG3
013266  001401                          BEQ     NEG3
013270  100404                          BMI     NEG4
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                                ;           CONDITIONAL BRANCH INST. AND   <====
                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
                                                                ;           WHICH FOLLOWS W/ 752           <====
013272                          NEG3:
013272  012742  000312                  MOV     #312,-(R2)      ;MOVE TO MAILBOX #  *******  312  *******
013276  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
013300  000000                          HALT                    ;NEG DID NOT SET CC'S CORRECTLY
013302  005000          NEG4:           CLR     R0
013304  000277                          SCC                     ;CC=1011
013306  000244                          CLZ
013310  005400                          NEG     R0              ;CC=0100   R0=0
013312  102403                          BVS     NEG5
013314  103402                          BCS     NEG5
013316  001001                          BNE     NEG5
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013320 100004                          BPL     TST154
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 736           <====
013322                          NEG5:
013322 012742 000313                   MOV     #313,-(R2)     ;MOVE TO MAILBOX #  *******  313  *******
013326 005242                          INC     -(R2)          ;SET MSGTYP TO FATAL ERROR
013330 000000                          HALT                   ;NEG DID NOT SET CC'S CORRECTLY
                                                        ;  OR SEQUENCE ERROR

                                ;*************************************************************************
                                ;TEST 154       TEST CMP INSTRUCTION
                                ;*************************************************************************
013332 005212                   TST154: INC     (R2)           ;UPDATE TEST NUMBER
013334 022712 000154                   CMP     #154,(R2)      ;SEQUENCE ERROR?
013340 001060                          BNE     TST155-10      ;BR TO ERROR HALT ON SEQ ERROR
013342 012700 000005                   MOV     #5,R0
013346 000257                          CCC                    ;CC=1010
013350 000271                          +SEN!SEC
013352 022700 000005                   CMP     #5,R0          ;CC=0101
013356 101002                          BHI     CMP1
013360 102401                          BVS     CMP1
013362 100004                          BPL     CMP2
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 767           <====
013364                          CMP1:
013364 012742 000314                   MOV     #314,-(R2)     ;MOVE TO MAILBOX #  *******  314  *******
013370 005242                          INC     -(R2)          ;SET MSGTYP TO FATAL ERROR
013372 000000                          HALT                   ;CMP DID NOT SET CC'S CORRECTLY
013374 012700 100000            CMP2:  MOV     #100000,R0
013400 000277                          SCC                    ;CC=1101
013402 000242                          CLV
013404 020027 077777                   CMP     R0,#77777      ;CC=0010
013410 101402                          BLOS    CMP3
013412 102001                          BVC     CMP3
013414 100004                          BPL     CMP4
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 752           <====
013416                          CMP3:
013416 012742 000315                   MOV     #315,-(R2)     ;MOVE TO MAILBOX #  *******  315  *******
013422 005242                          INC     -(R2)          ;SET MSGTYP TO FATAL ERROR
013424 000000                          HALT                   ;CMP DID NOT SET CC'S CORRECTLY
013426 052700 040000            CMP4:  BIS     #40000,R0      ;R0=140000
013432 000257                          CCC                    ;CC=0100
013434 000264                          SEZ
013436 022700 040000                   CMP     #40000,R0      ;CC=1011
013442 102003                          BVC     CMP5
013444 103002                          BCC     CMP5
013446 001401                          BEQ     CMP5
013450 100404                          BMI     CMP6
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
```

```
4904                                                    ;           CONDITIONAL BRANCH INST. AND    <====
4905                                                    ;           REPLACE THE MOVE INSTRUCTION    <====
4906                                                    ;           WHICH FOLLOWS W/ 734            <====
4907  013452                            CMP5:
4908  013452  012742  000316                  MOV     #316,-(R2)      ;MOVE TO MAILBOX #  *******  316  *******
4909  013456  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4910  013460  000000                        HALT                    ;CMP DID NOT SET CC'S CORRECTLY
4911  013462  042700  040000        CMP6:   BIC     #40000,R0
4912  013466  000277                        SCC                     ;CC=1111
4913  013470  022700  177777              CMP     #-1,R0          ;CC=0000
4914  013474  101402                        BLOS    CMP7
4915  013476  102401                        BVS     CMP7
4916  013500  100004                        BPL     TST155
4917                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
4918                                                    ;           CONDITIONAL BRANCH INST. AND    <====
4919                                                    ;           REPLACE THE MOVE INSTRUCTION    <====
4920                                                    ;           WHICH FOLLOWS W/ 720            <====
4921  013502                            CMP7:
4922  013502  012742  000317                  MOV     #317,-(R2)      ;MOVE TO MAILBOX #  *******  317  *******
4923  013506  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4924  013510  000000                        HALT                    ;CMP DID NOT SET CC'S CORRECTLY
4925                                                    ;  OR SEQUENCE ERROR
4926
4927                                    ;*****************************************************************************
4928                                    ;TEST 155       TEST COM INSTRUCTION
4929                                    ;*****************************************************************************
4930  013512  005212                    TST155: INC     (R2)            ;UPDATE TEST NUMBER
4931  013514  022712  000155                  CMP     #155,(R2)       ;SEQUENCE ERROR?
4932  013520  001010                        BNE     TST156-10       ;BR TO ERROR HALT ON SEQ ERROR
4933  013522  012700  177777              MOV     #-1,R0
4934  013526  000257                        CCC                     ;CC=1010
4935  013530  000265                        +SEC!SEZ
4936  013532  005100                        COM     R0              ;CC=0101
4937  013534  101002                        BHI     COM1
4938  013536  102401                        BVS     COM1
4939  013540  100004                        BPL     TST156
4940                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
4941                                                    ;           CONDITIONAL BRANCH INST. AND    <====
4942                                                    ;           REPLACE THE MOVE INSTRUCTION    <====
4943                                                    ;           WHICH FOLLOWS W/ 770            <====
4944  013542                            COM1:
4945  013542  012742  000320                  MOV     #320,-(R2)      ;MOVE TO MAILBOX #  *******  320  *******
4946  013546  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
4947  013550  000000                        HALT                    ;COM DID NOT SET CC'S CORRECTLY
4948                                                    ;  OR SEQUENCE ERROR
4949
```

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                                ;*****************************************************************
                                ;
                                ;       THESE NEXT TWO TESTS VERIFY THE FUNCTIONING OF THE SUB
                                ;AND SBC INSTRUCTIONS.  BOTH OF THESE INSTRUCTIONS HANDLE THE
                                ;C AND V BITS IDENTICALLY.  THE PROCEDURE IS TO PRESET THE CONDITION
                                ;CODES, EXECUTE THE INSTRUCTION WITH A PARTICULAR SET OF DATA, AND
                                ;THEN CHECK THE RESULTS BY EXECUTING A SERIES OF CONDITIONAL
                                ;BRANCHES.  THIS PROCEDURE IS REPEATED SEVERAL TIMES WITH DIFFERENT
                                ;DATA PATTERNS TO PROVIDE EVERY COMBINATION OF THE C AND V BITS.
                                ;
                                ;*****************************************************************
                                ;TEST 156        TEST SUB INSTRUCTION
                                ;*****************************************************************
013552  005212                  TST156: INC     (R2)            ;UPDATE TEST NUMBER
013554  022712  000156                  CMP     #156,(R2)       ;SEQUENCE ERROR?
013560  001055                          BNE     TST157-10       ;BR TO ERROR HALT ON SEQ ERROR
013562  012700  125252                  MOV     #125252,R0
013566  000257                          CCC                     ;CC=1010
013570  000271                          +SEN!SEC
013572  162700  125252                  SUB     #125252,R0      ;CC=0101   R0=0
013576  101002                          BHI     SUB1
013600  102401                          BVS     SUB1
013602  100004                          BPL     SUB2
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                ;           CONDITIONAL BRANCH INST. AND    <====
                                                                ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                ;           WHICH FOLLOWS W/ 767            <====
013604                          SUB1:
013604  012742  000321                  MOV     #321,-(R2)      ;MOVE TO MAILBOX #  *******  321  *******
013610  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
013612  000000                          HALT                    ;SUB DID NOT SET CC'S CORRECTLY
013614  052700  100000          SUB2:   BIS     #100000,R0
013620  000277                          SCC                     ;CC=1101
013622  000242                          CLV
013624  162700  077777                  SUB     #77777,R0       ;CC=0010   R0=1
013630  101402                          BLOS    SUB3
013632  102001                          BVC     SUB3
013634  100004                          BPL     SUB4
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                ;           CONDITIONAL BRANCH INST. AND    <====
                                                                ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                ;           WHICH FOLLOWS W/ 752            <====
013636                          SUB3:
013636  012742  000322                  MOV     #322,-(R2)      ;MOVE TO MAILBOX #  *******  322  *******
013642  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
013644  000000                          HALT                    ;
013646  005100                  SUB4:   COM     R0              ;R0=177777
013650  000277                          SCC                     ;CC=11111

013652  162700  100000                  SUB     #100000,R0      ;CC=0000   R0=77777
013656  101402                          BLOS    SUB5
013660  102401                          BVS     SUB5
013662  100004                          BPL     SUB6
                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                ;           CONDITIONAL BRANCH INST. AND    <====
```

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                                                        ;               REPLACE THE MOVE INSTRUCTION     <====
                                                        ;               WHICH FOLLOWS W/ 737             <====
        013664                          SUB5:
        013664  012742  000323                  MOV     #323,-(R2)      ;MOVE TO MAILBOX #  *******  323  *******
        013670  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
        013672  000000                          HALT                    ;SUB DID NOT SET CC'S CORRECTLY
        013674  000257                  SUB6:   CCC                     ;CC=0100
        013676  000264                          SEZ
        013700  162700  140000                  SUB     #140000,R0      ;CC=1011
        013704  102003                          BVC     SUB7
        013706  103002                          BCC     SUB7
        013710  001401                          BEQ     SUB7
        013712  100404                          BMI     TST157
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS         <====
                                                        ;           CONDITIONAL BRANCH INST. AND         <====
                                                        ;           REPLACE THE MOVE INSTRUCTION         <====
                                                        ;           WHICH FOLLOWS W/ 723                 <====
        013714                          SUB7:
        013714  012742  000324                  MOV     #324,-(R2)      ;MOVE TO MAILBOX #  *******  324  *******
        013720  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
        013722  000000                          HALT                    ;

                                        ;**************************************************************************
                                        ;TEST 157       TEST SBC INSTRUCTION
                                        ;**************************************************************************
        013724  005212                  TST157: INC     (R2)            ;UPDATE TEST NUMBER
        013726  022712  000157                  CMP     #157,(R2)       ;SEQUENCE ERROR?
        013732  001053                          BNE     TST160-10       ;BR TO ERROR HALT ON SEQ ERROR
        013734  012700  000001                  MOV     #1,R0
        013740  000277                          SCC                     ;CC=1011
        013742  000244                          CLZ
        013744  005600                          SBC     R0              ;CC=0100   R=0
        013746  103403                          BCS     SBC1
        013750  102402                          BVS     SBC1
        013752  100401                          BMI     SBC1
        013754  001404                          BEQ     SBC2
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS         <====
                                                        ;           CONDITIONAL BRANCH INST. AND         <====
                                                        ;           REPLACE THE MOVE INSTRUCTION         <====
                                                        ;           WHICH FOLLOWS W/ 767                 <====
        013756                          SBC1:
        013756  012742  000325                  MOV     #325,-(R2)      ;MOVE TO MAILBOX #  *******  325  *******
        013762  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
        013764  000000                          HALT                    ;SBC DID NOT SET CC'S CORRECTLY
        013766  000277                  SBC2:   SCC                     ;CC=1010
        013770  000245                          +CLZ!CLC
        013772  005600                          SBC     R0              ;CC=0100   R=0
        013774  103403                          BCS     SBC3
        013776  102402                          BVS     SBC3
        014000  100401                          BMI     SBC3
        014002  001404                          BEQ     SBC4
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS         <====
                                                        ;           CONDITIONAL BRANCH INST. AND         <====
                                                        ;           REPLACE THE MOVE INSTRUCTION         <====
                                                        ;           WHICH FOLLOWS W/ 754                 <====
        014004                          SBC3:
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5062  014004  012742  000326          MOV     #326,-(R2)      ;MOVE TO MAILBOX #  *******  326  *******
5063  014010  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
5064  014012  000000                  HALT                    ;SBC DID NOT SET CC'S CORRECTLY
5065  014014  000277          SBC4:   SCC                     ;CC=0111
5066  014016  000250                  CLN
5067  014020  005600                  SBC     R0              ;CC=1001   R0=177777
5068  014022  103003                  BCC     SBC5
5069  014024  102402                  BVS     SBC5
5070  014026  001401                  BEQ     SBC5
5071  014030  100404                  BMI     SBC6
5072                                          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
5073                                          ;           CONDITIONAL BRANCH INST. AND   <====
5074                                          ;           REPLACE THE MOVE INSTRUCTION   <====
5075                                          ;           WHICH FOLLOWS W/ 741           <====
5076  014032          SBC5:
5077  014032  012742  000327          MOV     #327,-(R2)      ;MOVE TO MAILBOX #  *******  327  *******
5078  014036  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
5079  014040  000000                  HALT                    ;SBC DID NOT SET CC'S CORRECTLY
5080  014042  042700  077777  SBC6:   BIC     #77777,R0       ;R0=100000
5081  014046  000277                  SCC                     ;CC=1101
5082  014050  000242                  CLV
5083  014052  005600                  SBC     R0              ;CC=0010
5084  014054  101402                  BLOS    SBC7
5085  014056  102001                  BVC     SBC7
5086  014060  100004                  BPL     TST160
5087                                          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
5088                                          ;           CONDITIONAL BRANCH INST. AND   <====
5089                                          ;           REPLACE THE MOVE INSTRUCTION   <====
5090                                          ;           WHICH FOLLOWS W/ 725           <====
5091  014062          SBC7:
5092  014062  012742  000330          MOV     #330,-(R2)      ;MOVE TO MAILBOX #  *******  330  *******
5093  014066  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
5094  014070  000000                  HALT                    ;SBC DID NOT SET CC'S CORRECTLY
5095                                          ;  OR SEQUENCE ERROR
5096
```

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                                    ;*****************************************************************************
                                    ;
                                    ;         THESE NEXT FOUR TESTS VERIFY THE FUNCTIONING OF THE ROL,
                                    ;ROR, ASL AND ASR INSTRUCTIONS.  SPECIAL DATA PATTERNS ARE LOADED
                                    ;AND ROTATED SEVERAL TIMES FOR EACH TEST.  THE CONDITION CODES
                                    ;ARE PRESET BEFORE EACH ROTATION AND THE CONDITION CODES ARE
                                    ;CHECKED AFTER EACH ROTATION.  THE FINAL CHECK IN EACH TEST IS
                                    ;TO VERIFY THE COMMULATIVE DATA RESULT.  THE DATA PATTERNS HAVE
                                    ;BEEN SELECTED TO PRODUCE ALL COMBINATIONS OF THE C AND V BITS.
                                    ;
                                    ;*****************************************************************************
                                    ;TEST 160        TEST ROL INSTRUCTION
                                    ;*****************************************************************************
014072  005212                      TST160: INC     (R2)            ;UPDATE TEST NUMBER
014074  022712  000160                      CMP     #160,(R2)       ;SEQUENCE ERROR?
014100  001053                              BNE     TST161-10       ;BR TO ERROR HALT ON SEQ ERROR
014102  012700  144000                      MOV     #144000,R0      ;R0=144000
014106  000257                              CCC                     ;CC=0110
014110  000266                              +SEZ!SEV
014112  006100                              ROL     R0              ;CC=1001   R0=110000
014114  103003                              BCC     ROL1
014116  102402                              BVS     ROL1
014120  001401                              BEQ     ROL1
014122  100404                              BMI     ROL2
                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                    ;           CONDITIONAL BRANCH INST. AND    <====
                                                                    ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                    ;           WHICH FOLLOWS W/ 767            <====
014124                              ROL1:
014124  012742  000331                      MOV     #331,-(R2)      ;MOVE TO MAILBOX #  *******  331  *******
014130  005242                              INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
014132  000000                              HALT                    ;
014134  000277                      ROL2:   SCC                     ;CC=1100
014136  000243                              +CLV!CLC
014140  006100                              ROL     R0              ;CC=0011   R0=020000
014142  103003                              BCC     ROL3
014144  102002                              BVC     ROL3
014146  001401                              BEQ     ROL3
014150  100004                              BPL     ROL4
                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                    ;           CONDITIONAL BRANCH INST. AND    <====
                                                                    ;           REPLACE THE MOVE INSTRUCTION    <====
                                                                    ;           WHICH FOLLOWS W/ 754            <====
014152                              ROL3:
014152  012742  000332                      MOV     #332,-(R2)      ;MOVE TO MAILBOX #  *******  332  *******
014156  005242                              INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
014160  000000                              HALT                    ;ROL DID NOT SET CC'S CORRECTLY
014162  000277                      ROL4:   SCC                     ;CC=0111
014164  000250                              CLN
014166  006100                              ROL     R0              ;CC=0000   R0=040001
014170  101402                              BLOS    ROL5
014172  102401                              BVS     ROL5
014174  100004                              BPL     ROL6
                                                                    ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                                    ;           CONDITIONAL BRANCH INST. AND    <====
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                                                        ;               REPLACE THE MOVE INSTRUCTION
                                                        ;               WHICH FOLLOWS W/ 742
014176                          ROL5:
014176  012742  000333                  MOV     #333,-(R2)      ;MOVE TO MAILBOX #  *******  333  *******
014202  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
014204  000000                          HALT                    ;ROL DID NOT SET CC'S CORRECTLY
014206  000257                  ROL6:   CCC                     ;CC=0101
014210  000265                          +SEZ!SEC
014212  006100                          ROL     R0              ;CC=1010   R0=100003
014214  101405                          BLOS    ROL7
014216  102004                          BVC     ROL7
014220  100003                          BPL     ROL7
014222  022700  100003                  CMP     #100003,R0
014226  001404                          BEQ     TST161
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                        ;          CONDITIONAL BRANCH INST. AND     <====
                                                        ;          REPLACE THE MOVE INSTRUCTION     <====
                                                        ;          WHICH FOLLOWS W/ 725             <====
014230                          ROL7:
014230  012742  000334                  MOV     #334,-(R2)      ;MOVE TO MAILBOX #  *******  334  *******
014234  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
014236  000000                          HALT                    ;ROL MALFUNCTIONED
                                                        ;  OR SEQUENCE ERROR

                                ;*************************************************************************
                                ;TEST 161       TEST ROR INSTRUCTION
                                ;*************************************************************************
014240  005212                  TST161: INC     (R2)            ;UPDATE TEST NUMBER
014242  022712  000161                  CMP     #161,(R2)       ;SEQUENCE ERROR?
014246  001051                          BNE     TST162-10       ;BR TO ERROR HALT ON SEQ ERROR
014250  012700  000023                  MOV     #23,R0          ;R0=23
014254  000277                          SCC                     ;CC=0111
014256  000250                          CLN
014260  006000                          ROR     R0              ;CC=1001   R0=100011
014262  102403                          BVS     ROR1
014264  103002                          BCC     ROR1
014266  001401                          BEQ     ROR1
014270  100404                          BMI     ROR2
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                        ;          CONDITIONAL BRANCH INST. AND     <====
                                                        ;          REPLACE THE MOVE INSTRUCTION     <====
                                                        ;          WHICH FOLLOWS W/ 767             <====
014272                          ROR1:
014272  012742  000335                  MOV     #335,-(R2)      ;MOVE TO MAILBOX #  *******  335  *******
014276  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
014300  000000                          HALT                    ;ROR DID NOT SET CC'S CORRECTLY
014302  000257                  ROR2:   CCC                     ;CC=1100
014304  000274                          +SEN!SEZ
014306  006000                          ROR     R0              ;CC=0011   R0=040004
014310  102003                          BVC     ROR3
014312  103002                          BCC     ROR3
014314  001401                          BEQ     ROR3
014316  100004                          BPL     ROR4
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS    <====
                                                        ;          CONDITIONAL BRANCH INST. AND     <====
                                                        ;          REPLACE THE MOVE INSTRUCTION     <====
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                                                        ;           WHICH FOLLOWS W/ 754            <===-
014320                          ROR3:
014320  012742  000336                 MOV     #336,-(R2)      ;MOVE TO MAILBOX #  *******  336  *******
014324  005242                         INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
014326  000000                         HALT                    ;ROR DID NOT SET CC'S CORRECTLY
014330  000277                 ROR4:   SCC                     ;CC=1110
014332  000241                         CLC
014334  006000                         ROR     R0              ;CC=0000   R0=020002
014336  101403                         BLOS    ROR5
014340  102402                         BVS     ROR5
014342  001401                         BEQ     ROR5
014344  100004                         BPL     ROR6
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 741           <====
014346                          ROR5:
014346  012742  000337                 MOV     #337,-(R2)      ;MOVE TO MAILBOX #  *******  337  *******
014352  005242                         INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
014354  000000                         HALT                    ;ROR DID NOT SET CC'S CORRECTLY
014356  000257                 ROR6:   CCC                     ;CC=0101
014360  000265                         +SEC!SEZ
014362  006000                         ROR     R0              ;CC=1010   R0=110001
014364  101402                         BLOS    ROR7
014366  102001                         BVC     ROR7
014370  100404                         BMI     TST162
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 727           <====
014372                          ROR7:
014372  012742  000340                 MOV     #340,-(R2)      ;MOVE TO MAILBOX #  *******  340  *******
014376  005242                         INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
014400  000000                         HALT                    ;ROR DID NOT PRODUCE CORRECT RESULTS
                                                        ;  OR SEQUENCE ERROR

                                ;*****************************************************************************
                                ;TEST 162       TEST ASL INSTRUCTION
                                ;*****************************************************************************
014402  005212                 TST162: INC     (R2)            ;UPDATE TEST NUMBER
014404  022712  000162                 CMP     #162,(R2)       ;SEQUENCE ERROR?
014410  001054                         BNE     TST163-10       ;BR TO ERROR HALT ON SEQ ERROR
014412  012700  144000                 MOV     #144000,R0      ;R0=14000
014416  000257                         CCC                     ;CC=0110
014420  000271                         +SEN!SEC
014422  006300                         ASL     R0              ;CC=1001   R0=110000
014424  103003                         BCC     ASL1
014426  102402                         BVS     ASL1
014430  001401                         BEQ     ASL1
014432  100404                         BMI     ASL2
                                                        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
                                                        ;           CONDITIONAL BRANCH INST. AND   <====
                                                        ;           REPLACE THE MOVE INSTRUCTION   <====
                                                        ;           WHICH FOLLOWS W/ 767           <====
014434                          ASL1:
014434  012742  000341                 MOV     #341,-(R2)      ;MOVE TO MAILBOX #  *******  341  *******
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5265  014440  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
5266  014442  000000                        HALT                    ;
5267  014444  000277                ASL2:   SCC                     ;CC=1100
5268  014446  000243                        +CLV!CLC
5269  014450  006300                        ASL     R0              ;CC=0011   R0=020000
5270  014452  103003                        BCC     ASL3
5271  014454  102002                        BVC     ASL3
5272  014456  001401                        BEQ     ASL3
5273  014460  100004                        BPL     ASL4
5274                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
5275                                                                ;           CONDITIONAL BRANCH INST. AND   <====
5276                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
5277                                                                ;           WHICH FOLLOWS W/ 754           <====
5278  014462                        ASL3:
5279  014462  012742  000342                MOV     #342,-(R2)      ;MOVE TO MAILBOX #  *******  342  *******
5280  014466  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
5281  014470  000000                        HALT                    ;ASL DID NOT SET CC'S CORRECTLY
5282  014472  000277                ASL4:   SCC                     ;CC=0111
5283  014474  000250                        CLN
5284  014476  006300                        ASL     R0              ;CC=0000   R0=040000
5285  014500  101402                        BLOS    ASL5
5286  014502  102401                        BVS     ASL5
5287  014504  100004                        BPL     ASL6
5288                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
5289                                                                ;           CONDITIONAL BRANCH INST. AND   <====
5290                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
5291                                                                ;           WHICH FOLLOWS W/ 742           <====
5292  014506                        ASL5:
5293  014506  012742  000343                MOV     #343,-(R2)      ;MOVE TO MAILBOX #  *******  343  *******
5294  014512  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
5295  014514  000000                        HALT                    ;ASL DID NOT SET CC'S CORRECTLY
5296  014516  000257                ASL6:   CCC                     ;CC=0101
5297  014520  000265                        +SEZ!SEC
5298  014522  006300                        ASL     R0              ;CC=1010   R0=100000
5299  014524  103406                        BCS     ASL7
5300  014526  001405                        BEQ     ASL7
5301  014530  102004                        BVC     ASL7
5302  014532  100003                        BPL     ASL7
5303  014534  022700  100000                CMP     #100000,R0
5304  014540  001404                        BEQ     TST163
5305                                                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
5306                                                                ;           CONDITIONAL BRANCH INST. AND   <====
5307                                                                ;           REPLACE THE MOVE INSTRUCTION   <====
5308                                                                ;           WHICH FOLLOWS W/ 724           <====
5309  014542                        ASL7:
5310  014542  012742  000344                MOV     #344,-(R2)      ;MOVE TO MAILBOX #  *******  344  *******
5311  014546  005242                        INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
5312  014550  000000                        HALT                    ;ASL MALFUNCTIONED
5313                                                                ;  OR SEQUENCE ERROR
5314
5315                                ;*****************************************************************************
5316                                ;TEST 163       TEST ASR INSTRUCTION
5317                                ;*****************************************************************************
5318  014552  005212                TST163: INC     (R2)            ;UPDATE TEST NUMBER
5319  014554  022712  000163                CMP     #163,(R2)       ;SEQUENCE ERROR?
5320  014560  001060                        BNE     TST164-10       ;BR TO ERROR HALT ON SEQ ERROR
```

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 5321  014562  012700  100023          MOV     #100023,R0      ;R0=100023
 5322  014566  000277                  SCC                     ;CC=0110
 5323  014570  000250                  CLN
 5324  014572  006200                  ASR     R0              ;CC=1001   RP=140011
 5325  014574  102403                  BVS     ASR1
 5326  014576  103002                  BCC     ASR1
 5327  014600  001401                  BEQ     ASR1
 5328  014602  100404                  BMI     ASR2
 5329                                          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 5330                                          ;           CONDITIONAL BRANCH INST. AND   <====
 5331                                          ;           REPLACE THE MOVE INSTRUCTION   <====
 5332                                          ;           WHICH FOLLOWS W/ 767           <====
 5333  014604                  ASR1:
 5334  014604  012742  000345          MOV     #345,-(R2)      ;MOVE TO MAILBOX #  *******  345  *******
 5335  014610  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 5336  014612  000000                  HALT                    ;ASR DID NOT SET CC'S CORRECTLY
 5337  014614  042700  100000  ASR2:   BIC     #100000,R0      ;R0=40011
 5338  014620  000277                  SCC                     ;CC=1100
 5339  014622  000243                  +CLV!CLC
 5340  014624  006200                  ASR     R0              ;CC=0011   R0=020004
 5341  014626  102003                  BVC     ASR3
 5342  014630  103002                  BCC     ASR3
 5343  014632  001401                  BEQ     ASR3
 5344  014634  100004                  BPL     ASR4
 5345                                          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 5346                                          ;           CONDITIONAL BRANCH INST. AND   <====
 5347                                          ;           REPLACE THE MOVE INSTRUCTION   <====
 5348                                          ;           WHICH FOLLOWS W/ 752           <====
 5349  014636                  ASR3:
 5350  014636  012742  000346          MOV     #346,-(R2)      ;MOVE TO MAILBOX #  *******  346  *******
 5351  014642  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 5352  014644  000000                  HALT                    ;ASR DID NOT SET CC'S CORRECTLY
 5353  014646  000277          ASR4:   SCC                     ;CC=1111
 5354
 5355  014650  006200                  ASR     R0              ;CC=0000   R0=010002
 5356  014652  101403                  BLOS    ASR5
 5357  014654  102402                  BVS     ASR5
 5358  014656  001401                  BEQ     ASR5
 5359  014660  100004                  BPL     ASR6
 5360                                          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
 5361                                          ;           CONDITIONAL BRANCH INST. AND   <====
 5362                                          ;           REPLACE THE MOVE INSTRUCTION   <====
 5363                                          ;           WHICH FOLLOWS W/ 740           <====
 5364  014662                  ASR5:
 5365  014662  012742  000347          MOV     #347,-(R2)      ;MOVE TO MAILBOX #  *******  347  *******
 5366  014666  005242                  INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
 5367  014670  000000                  HALT                    ;ASR DID NOT SET CC'S CORRECTLY
 5368  014672  052700  100000  ASR6:   BIS     #100000,R0      ;R0=110002
 5369  014676  000257                  CCC                     ;CC=0101
 5370  014700  000265                  +SEZ!SEC
 5371  014702  006200                  ASR     R0              ;C=1010   R0=144001
 5372  014704  101406                  BLOS    ASR7
 5373  014706  102005                  BVC     ASR7
 5374  014710  100004                  BPL     ASR7
 5375  014712  001403                  BEQ     ASR7
 5376  014714  022700  144001          CMP     #144001,R0      ;CHECK RESULT OF ASR'S
```

```
MAINDEC-11-DGKAA  11 04 CPU TEST        MACY11 27(732)  06-OCT-76  14:01  PAGE 275
DGKAAA.P11       *163    TEST ASR INSTRUCTION

  5377  014720  001404                          BEQ     TST164
  5378                                                          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <====
  5379                                                          ;           CONDITIONAL BRANCH INST. AND   <====
  5380                                                          ;           REPLACE THE MOVE INSTRUCTION   <====
  5381                                                          ;           WHICH FOLLOWS W/ 720           <====
  5382  014722                          ASR7:
  5383  014722  012742  000350                    MOV     #350,-(R2)      ;MOVE TO MAILBOX #  *******  350  *******
  5384  014726  005242                          INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
  5385  014730  000000                          HALT                    ;ASR DID NOT FUNCTION CORRECTLY
  5386                                                                  ;  OR SEQUENCE ERROR
  5387
  5388
```

```
                                ;*****************************************************************************
                                ;
                                ;       THIS TEST VERIFIES THE CONTENTS OF THE BRANCH ROM.  THE TEST
                                ;EXECUTES EVERY POSSIBLE BRANCH WITH EVERY POSSIBLE CONDITION
                                ;CODE COMBINATION.
                                ;       THE ROUTINE USES TWO TABLES.  THE BRANCH TABLE HOLDS ALL THE
                                ;POSSIBLE BRANCH INSTRUCTIONS, THE OTHER TABLE (YNTAB) HOLDS BIT MAPS FOR
                                ;EACH BRANCH.  A ONE IN THE BIT MAP INDICATES THAT THE CORRESPONDING
                                ;BRANCH INSTRUCTION SHOULD BRANCH FOR THE CONDITION CODE SETTING WHICH
                                ;CORRESPONDS TO THE BIT POSITION WITHIN THE MAP.  FOR EXAMPLE IF THE LEFT
                                ;MOST BIT IS A ONE THEN THE CORRESPONDING BRANCH INSTRUCTION SHOULD BRANCH
                                ;WHEN THE CONDITION CODES ARE 0.
                                ;       THE ROUTINE CONSISTS OF NESTED LOOPS; THE OUTTER LOOP SETS UP
                                ;ALL THE POSSIBLE BRANCH INSTRUCTIONS.  THE INNER LOOP SETS UP EVERY POSSIBLE
                                ;CONDITION CODE FOR EACH BRANCH.
                                ;       THE BIT MAP IS USED TO SET THE ADDRESS LOCATION IN TWO
                                ;JUMP MODE 3 INSTRUCTIONS.  THE ADDRESSES ARE CHANGED TO ALLOW THE
                                ;PROGRAM TO CONTINUE OR JUMP TO AN ERROR ROUTINE DEPENDING UPON
                                ;WHETHER IT HANDLED THE BRANCH INSTRUCTION CORRECTLY.
                                ;       AT ANY ERROR HALT, LOCATION, BRH, HOLDS THE BRANCH INSTRUCTION
                                ;UNDER TEST AND LOCATION, CC, HOLDS THE VALUE OF THE CONDITION CODES
                                ;AT THE TIME THE BRANCH WAS EXECUTED.
                                ;
                                ;*****************************************************************************
                                ;TEST 164       TEST THE BRANCH ROM
                                ;*****************************************************************************
014732  005212                  TST164: INC     (R2)            ;UPDATE TEST NUMBER
014734  022712  000164                  CMP     #164,(R2)       ;SEQUENCE ERROR?
014740  001062                          BNE     ER              ;BR TO ERROR HALT ON SEQ ERROR
014742  012700  015332          SETUP:  MOV     #BRTAB,R0       ;INITIALIZE BRANCH TABLE POINTER
014746  012704  015370                  MOV     #YNTAB,R4       ;INITIALIZE YES/NO BRANCH MAP POINTER
014752  012767  000015  000142          MOV     #15,BRCT        ;INITIALIZE BRANCH TABLE COUNT
014760  012067  000110          SETBR:  MOV     (R0)+,BRH       ;GET NEXT BRANCH INST.
014764  012401                          MOV     (R4)+,R1        ;GET NEXT BRANCH MAP
014766  012767  177777  000074          MOV     #-1,CC          ;INITIALIZE CONDITION CODE VALUE
014774  012703  000016                  MOV     #16,R3          ;INITIALIZE CONDITION CODE COUNT
015000  005267  000064          SETCC:  INC     CC              ;SET FOR NEXT CC VALUE
015004  032701  100000                  BIT     #100000,R1      ;SEE IF SHOULD BR W/ THESE CC'S
015010  013705  177776                  MOV     @#177776,R5     ;SIMULATE A JNE
015014  042705  177773                  BIC     #177773,R5      ;       (JUMP NOT EQUAL)
015020  000165  015024                  JMP     .+4(R5)         ;       TO SET2BR
015024  000167  000020                  JMP     SET2BR
015030  012767  015124  000042          MOV     #CONT,NBR       ;SET TO CONTINUE IF NO BRANCH
015036  012767  015106  000040          MOV     #ER,YBR         ;SET TO REPORT ERROR IF BRANCH
015044  000167  000014                  JMP     AROUND          ;GO AROUDND OPPOSITE CONDITION
015050  012767  015106  000022  SET2BR: MOV     #ER,NBR         ;SET TO REPORT ERROR IF NO BRANCH
015056  012767  015124  000020          MOV     #CONT,YBR       ;SET TO CONTINUE IF BRANCH
015064  006101                  AROUND: ROL     R1              ;UPDATE BIT MAP
                                ;
015066  012737                          MOV     (PC)+,@(PC)+    ;SET CONDITION CODE
015070  000000          CC:     0                               ;NEW CC VALUE GOES HERE
015072  177776                  177776
015074  000000          BRH:    0                               ;BRANCH INST. GOES HERE
015076  000137                  JMP     @(PC)+                  ;THIS JUMP IF NO BRANCH
015100  000000          NBR:    0                               ;WHERE TO GO IF NO BRANCH OCCURS
```

```
5445  015102  000137                    JMP     @(PC)+          ;THIS JUMP IF BRANCH OCCURS
5446  015104  000000            YBR:    0                       ;WHERE TO GO IF BRANCH OCCURS
5447  015106  012702  000304    ER:     MOV     #$TESTN,R2      ;RESTORE POINTER
5448  015112  012742  000351            MOV     #351,-(R2)      ;MOVE TO MAILBOX #  *******  351  *******
5449  015116  005242                    INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
5450  015120  000000                    HALT                    ;
5451  015122  000000            BRCT:   0
5452  015124  005303            CCNT:   DEC     R3              ;CC'S DONE?
5453  015126  013705  177776            MOV     @#177776,R5     ;SIMULATE A JNE
5454  015132  042705  177773            BIC     #177773,R5      ;       (JUMP NOT EQUAL)
5455  015136  000165  015142            JMP     .+4(R5)         ;       TO SETCC
5456  015142  000167  177632            JMP     SETCC
5457  015146  005367  177750            DEC     BRCT            ;BR'S DONE?
5458  015152  013705  177776            MOV     @#177776,R5     ;SIMULATE A JNE
5459  015156  042705  177773            BIC     #177773,R5      ;       (JUMP NOT EQUAL)
5460  015162  000165  015166            JMP     .+4(R5)         ;       TO SETBR
5461  015166  000167  177566            JMP     SETBR
```

```
5462                                    ;*****************************************************************************
5463                                    ;TEST 165       END OF PASS SEQUENCE
5464                                    ;*****************************************************************************
5465  015172  005212                    TST165: INC     (R2)            ;UPDATE TEST NUMBER
5466  015174  022712  000165                    CMP     #165,(R2)       ;SEQUENCE ERROR?
5467  015200  001037                            BNE     EOP1            ;BR TO ERROR HALT ON SEQ ERROR
5468  015202  005237  000306                    INC     @#$PASS
5469  015206  105267  000076                    INCB    PASSPT          ;SHOULD PRINT THIS PASS?
5470  015212  001020                            BNE     ACT             ;NO
5471  015214  132767  000040  163077            BITB    #40,$ENVM       ;WILL APT ALLOW PRINTING?
5472  015222  001014                            BNE     ACT             ;NO
5473  015224  023727  000042  015264            CMP     @#42,#SENDAD    ;UNDER ACT AUTO ACCEPT?
5474  015232  001410                            BEQ     ACT             ;IF SO SKIP PRINTOUT
5475  015234  012700  015312                    MOV     #MSG,R0         ;GET MSG ADDR.
5476  015240  105737  177564            WAIT:  TSTB    @#TPS           ;TTY READY
5477  015244  100375                            BPL     WAIT            ;NO WAIT
5478  015246  112037  177566                    MOVB    (R0)+,@#TPB     ;PRINT CHARACTER
5479  015252  001372                            BNE     WAIT            ;NEXT IF NOT DONE.
5480  015254  013700  000042            ACT:   MOV     @#42,R0         ;CHECK ACT
5481  015260  001405                            BEQ     GOAGIN          ;KEEP GOING
5482  015262  000005                            RESET
5483  015264  004710                    SENDAD: JSR     PC,(R0)         ;ACT HOOKS
5484  015266  000240                            NOP
5485  015270  000240                            NOP
5486  015272  000240                            NOP
5487  015274  000167  163222            GOAGIN: JMP     RESTRT          ;DO NEXT PASS
5488  015300                            EOP1:
5489  015300  012742  000352                    MOV     #352,-(R2)      ;MOVE TO MAILBOX #  *******  352  *******
5490  015304  005242                            INC     -(R2)           ;SET MSGTYP TO FATAL ERROR
5491  015306  000000                            HALT                    ;SEQUENCE ERROR
5492  015310  177777                    PASSPT: -1
5493  015312  047105  020104  043117    MSG:   .ASCIZ  .END OF DGKAA.<15><12>
5494  015320  042040  045507  040501
5495  015326  005015      000
```

```
5496                015332                  .EVEN
5497
5498  015332  000402                BRTAB:  BR      .+6
5499  015334  001002                        BNE     .+6
5500  015336  001402                        BEQ     .+6
5501  015340  002002                        BGE     .+6
5502  015342  002402                        BLT     .+6
5503  015344  003002                        BGT     .+6
5504  015346  003402                        BLE     .+6
5505  015350  100002                        BPL     .+6
5506  015352  100402                        BMI     .+6
5507  015354  101002                        BHI     .+6
5508  015356  101402                        BLOS    .+6
5509  015360  102002                        BVC     .+6
5510  015362  102402                        BVS     .+6
5511  015364  103002                        BCC     .+6
5512  015366  103402                        BCS     .+6
5513
5514              000002                    .RADIX  2
5515  015370  177777                YNTAB:  1111111111111111        ;BR
5516  015372  170360                        1111000011110000        ;BNE:  Z=0
5517  015374  007417                        0000111100001111        ;BEQ:  Z=1
5518  015376  146063                        1100110000110011        ;BGE:  N XOR V =0
5519  015400  031714                        0011001111001100        ;BLT:  N XOR V =1
5520  015402  140060                        1100000000110000        ;BGT:  Z+(N XOR V) =0
5521  015404  037717                        0011111111001111        ;BLE:  Z+(N XOR V) =1
5522
5523  015406  177400                        1111111100000000        ;BPL:  N=0
5524  015410  000377                        0000000011111111        ;BMI:  N=1
5525  015412  120240                        1010000010100000        ;BHI:  C+Z=0
5526  015414  057537                        0101111101011111        ;BLOS: C+Z=1
5527  015416  146314                        1100110011001100        ;BVC:  V=0
5528  015420  031463                        0011001100110011        ;BVS:  V=1
5529  015422  125252                        1010101010101010        ;BCC:  C=0
5530  015424  052525                        0101010101010101        ;BCS:  C=1
5531
5532              000010                    .RADIX  8
5533  015426  012737  015436  000024  PWRDN:  MOV     #PWRUP,@#24             ;SET UP FOR A POWER UP
5534  015434  000000                        HALT
5535
5536  015436  012737  015426  000024  PWRUP:  MOV     #PWRDN,@#24             ;SET UP FOR A POWER FAIL
5537  015444  012706  000500                MOV     #STBOT,R6               ;SET UP STACK POINTER
5538  015450  132767  000040  162643        BITB    #40,$ENVM               ;SHOULD PRINT?
5539  015456  001010                        BNE     PWR2                    ;IF NOT: BR
5540  015460  012700  015504                MOV     #PFMES,R0               ;GET POWER FAIL MESSG.
5541  015464  105737  177564        WATE:   TSTB    @#TPS                   ;TTY READY?
5542  015470  100375                        BPL     WATE                    ;IF NOT: BR
5543  015472  112037  177566                MOVB    (R0)+,@#TPB             ;PRINT NEXT CHAR.
5544  015476  001372                        BNE     WATE                    ;IF NOT DONE:  BR
5545  015500  000137  000500        PWR2:   JMP     @#START                 ;START PROGRAM AGAIN
5546
5547  015504  006412  047520  042527  PFMES:  .ASCIZ  <12><15>.POWER FAILURE.<12><15>
5548  015512  020122  040506  046111
5549  015520  051125  005105  000015
5550
5551              00000:                    .END
```

```
ABASE = 0C0000          424
ACDW1 = 000000          424
ACDW2 = 000000          424
ACPUOP= 000000          424     439
ACT     015254         5470    5472    5474    5480#
ADC1    013120         4750    4751    4757#
ADC2    013130         4752    4761#
ADC3    013150         4765    4766    4772#
ADC4    013160         4767    4776#
ADC5    013176         4779    4780    4781    4787#
ADDM0 = 000000          424
ADDM1 = 000000          424
ADDM10= 000000          424
ADDM11= 000000          424
ADDM12= 000000          424
ADDM13= 000000          424
ADDM14= 000000          424
ADDM15= 000000          424
ADDM2 = 000000          424
ADDM3 = 000000          424
ADDM4 = 000000          424
ADDM5 = 000000          424
ADDM6 = 000000          424
ADDM7 = 000000          424
ADDM8 = 000000          424
ADDM9 = 000000          424
ADD1    012734         4672    4673    4679#
ADD2    012744         4674    4683#
ADD3    012760         4686    4687    4693#
ADD4    012770         4688    4697#
ADD5    013006         4700    4701    4707#
ADD6    013016         4702    4711#
ADD7    013030         4712    4713    4719#
ADD8    013040         4714    4723#
ADD9    013060         4726    4727    4728    4734#
ADEVCT= 000000          424     430
ADEVM = 000000          424
AENV  = 000000          424     435
AENVM = 000000          424     436
AFATAL= 000000          424     427
AMADR1= 000000          424
AMADR2= 000000          424
AMADR3= 000000          424
AMADR4= 000000          424
AMAMS1= 000000          424
AMAMS2= 000000          424
AMAMS3= 000000          424
AMAMS4= 000000          424
AMSGAD= 000000          424     432
AMSGLG= 000000          424     433
AMSGTY= 000000          424     426
AMTYP1= 000000          424
AMTYP2= 000000          424
AMTYP3= 000000          424
AMTYP4= 000000          424
APASS = 000000          424     429
```

```
APRIOR= 000000            424
AROUND  015064           5434    5437*
ASL1    014434           5255    5256    5257    5263*
ASL2    014444           5258    5267*
ASL3    014462           5270    5271    5272    5278*
ASL4    014472           5273    5282*
ASL5    014506           5285    5286    5292*
ASL6    014516           5287    5296*
ASL7    014542           5299    5300    5301    5302    5309*
ASR1    014604           5325    5326    5327    5333*
ASR2    014614           5328    5337*
ASR3    014636           5341    5342    5343    5349*
ASR4    014646           5344    5353*
ASR5    014662           5356    5357    5358    5364*
ASR6    014672           5359    5368*
ASR7    014722           5372    5373    5374    5375    5382*
ASWREG= 000000            424     437
ATESTN= 000000            424     429
AUNIT = 000000            424     431
AUSWR = 000000            424     438
AVECT1= 000000            424
AVECT2= 000000            424
BIC1    012064           4345    4346    4352*
BIC2    012074           4347    4356*
BIC3    012112           4359    4360    4366*
BIS1    012154           4382    4383    4384    4390*
BIS2    012164           4385    4394*
BIS3    012204           4397    4398    4399    4405*
BIT1    011774           4307    4308    4314*
BIT2    012004           4309    4319*
BIT3    012022           4322    4323    4329*
BRCT    015122           5421*   5451*   5457*
BRC1    002350           1228    1234*
BRC2    002360           1229    1239*
BRC3    002370           1241    1247*
BRH     015074           5422*   5442*
BRN1    002230           1134    1140*
BRN2    002240           1135    1145*
BRN3    002250           1147    1153*
BRTAB   015332           5419    5498*
BRV1    002300           1181    1187*
BRV2    002310           1182    1192*
BRV3    002320           1194    1200*
BRZ1    002160           1087    1093*
BRZ2    002170           1088    1098*
BRZ3    002200           1100    1106*
BR1     000572            504     510*
BR2     000602            505     514*
BR3     000614            515     523*
BR4     000622            524     530*
BR5     000632            525     534*
CC      015070           5424*   5426*   5440*
CLR1    012522           4563    4564    4565    4571*
CMP1    013364           4869    4870    4876*
CMP2    013374           4871    4880*
CMP3    013416           4884    4885    4891*
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CMP4    013426          4886    4895#
CMP5    013452          4899    4900    4901    4907#
CMP6    013462          4902    4911#
CMP7    013502          4914    4915    4921#
COM1    013542          4937    4938    4944#
CONT    015124          5432    5436    5452#
DEC1    012362          4486    4487    4488    4494#
DEC2    012372          4489    4498#
DEC3    012406          4501    4502    4508#
DEC4    012416          4503    4512#
DEC5    012432          4515    4516    4522#
DEC6    012442          4517    4526#
DEC7    012464          4530    4531    4532    4538#
DNM1    005536          2707    2715#
DNM2    005552          2716    2724#
DNM3    005570          2726    2734#
DNM4    005612          2738    2746#
DOP82A  006212          2977    2985#
DOP82B  006270          3015    3023#
DOPOA   005370          2631    2639#
DOPOB   005414          2644    2652#
DOPOC   005434          2655    2663#
DOPOD   005464          2670    2678#
DOP1    006024          2869    2877#
DOP2    006136          2937    2945#
DOP4    006516          3134    3146#
DOP5    006602          3172    3184#
EOP1    015300          5467    5488#
ER      015106          5418    5433    5435    5447#
GOAGIN  015274          5481    5487#
IJMP    011100          4031    4034#
IJMP4   010652          3956    3959#   3973
IJMP5   011042          4017    4020#
INC1    012244          4433    4434    4440#
INC2    012254          4435    4444#
INC3    012276          4448    4449    4450    4456#
INC4    012306          4451    4461#
INC5    012322          4464    4465    4471#
JMPCK   011102          3934    4034    4036#
JMPSEQ  011122          3935#   3947    3957#   3961    3970#   3982    3992#   3995    4005#   4008    4018#   4022    4032#
                        4036    4046#
JMP2    010654          3936    3961#
JMP2A   010672          3962    3970#
JMP3    010602          3938#   3971
JMP3A   010620          3939    3947#
JMP3B   010640          3948    3956#
JMP4    010704          3959    3973#
JMP4A   010722          3974    3982#
JMP4B   010742          3983    3991#
JMP5    011010          3991    4008#
JMP5A   011030          4009    4017#
JMP6    010754          3995#   4020
JMP6A   010774          3996    4004#
JMP7    011044          4004    4022#
JMP7A   011064          4023    4031#
JSRCK   011554          4195    4198#
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JSRCKA  011550          4192    4195#
JSRCK1  011572          4071    4199    4206#
JSRSEQ  011552          4075#   4086    4104#   4107    4125#   4129    4141#   4145    4159#   4161    4175#   4179    4195#
                        4196#   4198
JSR0    011136          4069    4071#
JSR1    011142          4070    4073#
JSR1A   011164          4081#   4109
JSR2    011254          4074    4107#   4131
JSR2A   011304          4108    4110    4112    4119#
JSR2B   011314          4114    4123#
JSR3    011174          4086#   4094    4126
JSR3A   011234          4087    4089    4091    4093    4100#
JSR3B   011244          4095    4104#
JSR4    011336          4088    4105    4129#
JSR4A   011354          4130    4137#
JSR4B   011364          4132    4141#
JSR5    011442          4142    4161#   4165    4181
JSR5A   011466          4162    4164    4171#
JSR5B   011476          4166    4175#
JSR6    011376          4145#   4163    4194
JSR6A   011422          4146    4148    4155#
JSR6AD  011546          4149    4176    4194#   4200
JSR6B   011432          4150    4159#
JSR7    011510          4147    4160    4179#
JSR7A   011526          4180    4187#
JSR7B   011536          4182    4191#
MOV1    011704          4269    4270    4276#
MOV2    011714          4271    4281#
MOV3    011732          4284    4285    4291#
MSG     015312          5475    5493#
NBR     015100          5432#   5435#   5444#
NEG1    013240          4813    4814    4815    4821#
NEG2    013250          4816    4825#
NEG3    013272          4829    4830    4831    4837#
NEG4    013302          4832    4841#
NEG5    013322          4845    4846    4847    4853#
PASSPT  015310           491#   5469#   5492#
PC     =%000007          483    5439#   5443    5445    5483#
PFMES   015504          5540    5547#
PS     = 177776          406#    874#    875     892#    893     910#    911     928#    929
PWRDN   015426           489    5533#   5536
PWRUP   015436          5533    5536#
PWR2    015500          5539    5545#
REG1    001216           739#    740
REG2    001252           759#    760
REG2A   001274           756     761     770#
REG3    001316           779#    780
REG4    001352           799#    800
REG5    001406           819#    820
REG6    001442           839#    840
RESTRT  000522           492#   5487
ROL1    014124          5118    5119    5120    5126#
ROL2    014134          5121    5130#
ROL3    014152          5133    5134    5135    5141#
ROL4    014162          5136    5145#
ROL5    014176          5148    5149    5155#
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ROL6    014206          5150    5159*
ROL7    014230          5162    5163    5164    5171*
ROR1    014272          5187    5188    5189    5195*
ROR2    014302          5190    5199*
ROR3    014220          5202    5203    5204    5210*
ROR4    014330          5205    5214*
ROR5    014346          5217    5218    5219    5225*
ROR6    014356          5220    5229*
ROR7    014372          5232    5233    5239*
ROTX    007710          3545    3547*   3551    3564*   3579*   3581*   3585    3608*   3609    3613
ROTXAD  010034          3609*   3611*   3624*
ROTOA   007026          3276    3277    3284*
ROTOB   007036          3279    3288*
ROTOC   007060          3291    3292    3299*
ROT1A   007126          3324    3325    3332*
ROT1B   007136          3327    3336*
ROT1C   007162          3339    3340    3347*
ROT1D   007172          3342    3351*
ROT1E   007222          3356    3357    3364*
ROT2A   007274          3387    3389    3397*
ROT2B   007304          3392    3401*
ROT2C   007334          3405    3407    3414*
ROT2D   007344          3409    3418*
ROT2E   007400          3423    3425    3433*
ROT3A   007446          3455    3462*
ROT3B   007456          3457    3466*
ROT3C   007504          3469    3476*
ROT3D   007514          3471    3480*
ROT3E   007542          3483    3490*
ROT4    007616          3514    3516    3523*
ROT5    007700          3544    3550    3552-   3559*
ROT6    007750          3582    3589*
ROT7    010024          3607    3612    3619*
RTS1    011640          4228    4235*
R0      =%000000         665*    666     683*    684     701*    702     719*    720     1294*   1303*   1304*   1313*   1340*
                        1341*   1351*   1354*   1356*   1357*   1381*   1390*   1392*   1418*   1419*   1428*   1431*   1456*
                        1457*   1458*   1459*   1468*   1470*   1472*   1500*   1501*   1502*   1503*   1504*   1513*   1514*
                        1515*   1516*   1518*   1546*   1547*   1548*   1549*   1550*   1551*   1560*   1561*   1562*   1564*
                        1565*   1566*   1594*   1595*   1596*   1597*   1598*   1599*   1608*   1609*   1610*   1612*   1613*
                        1636*   1637*   1638*   1639*   1640*   1641*   1642*   1651*   1652*   1653*   1654*   1655*   1657*
                        1658*   1690*   1691*   1692*   1693*   1694*   1703*   1704*   1705*   1707*   1740*   1741*   1742*
                        1791*   1792*   1793*   1794*   1795*   1796*   1805*   1806*   1807*   1808*   1809*   1810*   1812*
                        1830*   1831*   1832*   1833*   1842*   1843*   1844*   1846*   1847*   1848*   1881*   1882*   1883*
                        1884*   1893*   1894*   1895*   1897*   1923*   1924*   1925*   1926*   1935*   1937*   1964*   1965*
                        1966*   1967*   1976*   1978*   2044*   2047    2076*   2077*   2080    2108*   2109*   2112    2140*
                        2141*   2142*   2145    2157*   2158*   2161    2189*   2190*   2193    2206*   2207*   2232*   2233*
                        2234*   2237    2249*   2258*   2261    2274*   2275*   2299*   2300*   2301*   2302*   2305    2318*
                        2319*   2345*   2346*   2347*   2348*   2349*   2350    2353    2367    2380    2381    2405*   2406*
                        2407*   2410    2422    2446*   2447*   2448*   2449*   2450*   2453    2465*   2466*   2490*   2491*
                        2492*   2493*   2496    2508*   2532*   2533*   2534*   2535*   2538    2550*   2573*   2574*   2576
                        2600*   2602*   2603    2629*   2630    2639*   2640*   2642    2652    2663*   2664*   2667    2668
                        2678    2703*   2706    2715    2724*   2725    2734*   2735*   2737    2747    2771*   2772*   2776*
                        2799*   2800*   2801*   2803    2828*   2829*   2830*   2833    2861*   2862*   2863*   2864*   2867
                        2877*   2878    2902*   2903*   2907*   2908*   2932*   2933*   2934*   2935    2945*   2946*   2972*
                        2973*   2974*   2975*   3008*   3010*   3011*   3012*   3013    3023    3024    3050*   3051*   3052*
                        3077*   3078*   3079    3104*   3105*   3106    3135*   3136    3137    3138    3139    3140    3173*
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CROSS REFERENCE TABLE -- USER SYMBOLS

```
                3174    3175    3176    3177    3178    3211*   3212    3213    3214    3215    3216    3243*   [illegible]
                3245    3246    3247    3248    3273*   3275*   3278    3288*   3290*   3293    3320*   332.*   3323*
                3337*   3338*   3351*   3352*   3353*   3355*   3383*   3384*   3386*   3390*   3391*   3401*   3402*
                3404*   3408*   3418*   3419*   3420*   3422*   3426*   3427*   3511*   3513*   3517    3546*   3549*
                3553    3640*   3641*   3650    3675*   3676*   3703*   3704*   3714*   3767*   3768*   3778    3805*
                3807*   3817    3848*   3849*   3850    3881*   3882*   3883    3936*   3937    3938    3956*   3958
                3971*   3972    3973    3991*   3993    4004*   4006    4017*   4019    4031*   4033    4074*   4078
                4094    4126*   4127    4142*   4143    4149    4165    4176*   4177    4228*   4229*   4235    4268*
                4283*   4303*   4306    4321    4341*   4344*   4358*   4378*   4381*   4396*   4429*   4432*   4444*
                4447*   4463*   4483*   4485*   4500*   4514*   4526*   4529*   4562*   4585    4598*   4601    4621*
                4624*   4638*   4669*   4671*   4685*   4699*   4711*   4725*   4746*   4749*   4761*   4764*   4778*
                4809*   4812*   4825*   4828*   4841*   4844*   4865*   4868    4880*   4883    4895*   4898    4911*
                4913    4933*   4936*   4967*   4970*   4982*   4985*   4997*   5000*   5014*   5034*   5037*   5052*
                5067*   5080*   5083*   5114*   5117*   5132*   5147*   5161*   5165    5183*   5186*   5201*   5216*
                5231*   5251*   5254*   5269*   5284*   5298*   5303    5321*   5324*   5337*   5340*   5355*   5368*
                5371*   5376    5419*   5422    5475*   5478    5480*   5483    5540*   5543
R1      =%000001  737*    739*    4076*   4077*   4078*   4088    4105*   4109    4124*   4127*   4131    4143*   4147
                4160*   4163    4177*   4181    4192*   4200    5423*   5427    5437*
R2      =%000002  482*    493*    500*    501     511*    512*    520*    521*    531*    532*    540*    541*    562*
                563     573*    574*    581*    582     592*    593*    600*    601     611*    612*    619*    620
                629*    630*    661*    662     672*    673*    680*    681     690*    691*    698*    699     708*
                709*    716*    717     726*    727*    734*    735     746*    747*    754*    755     757*    759*
                766*    767*    768*    770*    774*    775     786*    787*    794*    795     806*    807*    814*
                815     826*    827*    834*    835     846*    847*    870*    871     881*    882*    889*    890
                899*    900*    907*    908     917*    918*    925*    926     935*    936*    958*    959     970*
                971*    978*    979     989*    990*    999*    1000*   1007*   1008    1019*   1020*   1027*   1028
                1039*   1040*   1047*   1048    1059*   1060*   1081*   1082    1094*   1095*   1107*   1108*   1128*
                1129    1141*   1142*   1154*   1155*   1175*   1176    1188*   1189*   1201*   1202*   1222*   1223
                1235*   1236*   1248*   1249*   1291*   1292    1300*   1301*   1310*   1311*   1319*   1320*   1337*
                1338    1347*   1348*   1364*   1365*   1378*   1379    1387*   1388*   1399*   1400*   1415*   1416
                1425*   1426*   1438*   1439*   1453*   1454    1465*   1466*   1479*   1480*   1497*   1498    1510*
                1511*   1525*   1526*   1543*   1544    1557*   1558*   1573*   1574*   1591*   1592    1605*   1606*
                1620*   1621*   1633*   1634    1648*   1649*   1665*   1666*   1687*   1688    1700*   1701*   1714*
                1715*   1734*   1735    1749*   1750*   1767*   1768*   1788*   1789    1802*   1803*   1819*   1820*
                1827*   1828    1839*   1840*   1855*   1856*   1878*   1879    1890*   1891*   1904*   1905*   1920*
                1921    1932*   1933*   1944*   1945*   1961*   1962    1973*   1974*   1985*   1986*   2001*   2002
                2011*   2012*   2024*   2025*   2041*   2042    2057*   2058*   2073*   2074    2089*   2090*   2105*
                2106    2122*   2123*   2137*   2138    2154*   2155*   2171*   2172*   2186*   2187    2203*   2204*
                2213*   2214*   2229*   2230    2246*   2247*   2255*   2256*   2271*   2272*   2281*   2282*   2296*
                2297    2315*   2316*   2325*   2326*   2342*   2343    2362*   2363*   2377*   2378*   2387*   2388*
                2402*   2403    2419*   2420*   2428*   2429*   2443*   2444    2462*   2463*   2472*   2473*   2487*
                2488    2505*   2506*   2514*   2515*   2529*   2530    2547*   2548*   2556*   2557*   2570*   2571
                2583*   2584*   2597*   2598    2610*   2611*   2626*   2627    2636*   2637*   2649*   2650*   2660*
                2661*   2675*   2676*   2686*   2687*   2700*   2701    2712*   2713*   2721*   2722*   2731*   2732*
                2743*   2744*   2753*   2754*   2768*   2769    2782*   2783*   2796*   2797    2810*   2811*   2825*
                2826    2839*   2840*   2858*   2859    2874*   2875*   2884*   2885*   2899*   2900    2914*   2915*
                2929*   2930    2942*   2943*   2952*   2953*   2969*   2970    2982*   2983*   2991*   2992*   3005*
                3006    3020*   3021*   3030*   3031*   3046*   3047    3058*   3059*   3073*   3074    3085*   3086*
                3100*   3101    3112*   3113*   3132*   3133    3147*   3148*   3170*   3171    3185*   3186*   3208*
                3209    3222*   3223*   3240*   3241    3254*   3255*   3270*   3271    3285*   3286*   3300*   3301*
                3317*   3318    3333*   3334*   3348*   3349*   3365*   3366*   3380*   3381    3398*   3399*   3415*
                3416*   3434*   3435*   3449*   3450    3463*   3464*   3477*   3478*   3491*   3492*   3507*   3508
                3524*   3525*   3542*   3543    3560*   3561*   3576*   3577    3590*   3591*   3605*   3606    3620*
                3621*   3637*   3638    3647*   3648*   3656*   3657*   3671*   3672    3683*   3684*   3699*   3700
                3711*   3712*   3720*   3721*   3736*   3737    3747*   3748*   3763*   3764    3775*   3776*   3784*
                3785*   3802*   3803    3814*   3815*   3824*   3825*   3844*   3845    3857*   3858*   3877*   3878
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		3890*	3891*	3932*	3933	3944*	3945*	3953*	3954*	3967*	3968*	3979*	3980*	3988*
		3989*	4001*	4002*	4014*	4015*	4028*	4029*	4042*	4043*	4067*	4068	4082*	4083*
		4101*	4102*	4120*	4121*	4138*	4139*	4156*	4157*	4172*	4173*	4188*	4189*	4207*
		4208*	4223*	4224	4232*	4233*	4241*	4242*	4263*	4264	4277*	4278*	4292*	4293*
		4300*	4301	4315*	4316*	4330*	4331*	4338*	4339	4353*	4354*	4367*	4368*	4375*
		4376	4391*	4392*	4406*	4407*	4426*	4427	4441*	4442*	4457*	4458*	4472*	4473*
		4480*	4481	4495*	4496*	4509*	4510*	4523*	4524*	4539*	4540*	4557*	4558	4572*
		4573*	4580*	4581	4595*	4596*	4610*	4611*	4618*	4619	4633*	4634*	4648*	4649*
		4666*	4667	4680*	4681*	4694*	4695*	4708*	4709*	4720*	4721*	4735*	4736*	4743*
		4744	4758*	4759*	4773*	4774*	4788*	4789*	4806*	4807	4822*	4823*	4838*	4839*
		4854*	4855*	4862*	4863	4877*	4878*	4892*	4893*	4908*	4909*	4922*	4923*	4930*
		4931	4945*	4946*	4964*	4965	4979*	4980*	4994*	4995*	5009*	5010*	5024*	5025*
		5031*	5032	5047*	5048*	5062*	5063*	5077*	5078*	5092*	5093*	5111*	5112	5127*
		5128*	5142*	5143*	5156*	5157*	5172*	5173*	5180*	5181	5196*	5197*	5211*	5212*
		5226*	5227*	5240*	5241*	5248*	5249	5264*	5265*	5279*	5280*	5293*	5294*	5310*
		5311*	5318*	5319	5334*	5335*	5350*	5351*	5365*	5366*	5383*	5384*	5416*	5417
		5447*	5448*	5449*	5465*	5466	5489*	5490*						
R3	=%000003	777*	779*	5425*	5452*									
R4	=%000004	797*	799*	1737*	1738*	1739*	1743*	1752*	1753*	1754*	1756*	1758*	1759*	1760*
		2575*	2576*	2577*	2601*	2603*	2604*	2630*	2641*	2642*	2643*	2652*	2653*	2654*
		2665*	2666*	2667*	2668*	2669*	2678*	2679*	2680*	2704*	2705*	2706	2715	2725
		2736*	2737	2746*	2747	2773*	2774*	2775*	2776	2802*	2803*	2804*	2831*	2832*
		2833	2865*	2866*	2867*	2868	2878*	2904*	2905*	2906*	2907	2935*	2936*	3009*
		3013*	3014*	5420*	5423									
R5	=%000005	817*	819*	5428*	5429*	5430	5453*	5454*	5455	5458*	5459*	5460		
R6	=%000006	405*	481*	492*	837*	839*	873*	4073*	4090	4092	4111	4113	4123*	4226*
		4227*	5537*											
R7	=%000007	404*	2004*											
SBC1	013756	5038	5039	5040	5046*									
SBC2	013766	5041	5050*											
SBC3	014004	5053	5054	5055	5061*									
SBC4	014014	5056	5065*											
SBC5	014032	5068	5069	5070	5076*									
SBC6	014042	5071	5080*											
SBC7	014062	5084	5085	5091*										
SB0	010066	3642	3650*											
SB2	010210	3706	3714*											
SB4	010334	3770	3778*											
SB5	010422	3804	3823*											
SB5A	010414	3809	3817*											
SB5X	010432	3806*	3808	3828*	3829									
SB5XAD	010434	3805	3817	3829*										
SB6	010474	3846	3856*											
SB6X	010504	3847*	3848	3861*										
SB7	010544	3879	3889*											
SB7X	010554	3880*	3894*	3895										
SB7XAD	010556	3881	3895*											
SCOPE =	000240	403*												
SETBR	014760	5422*	5461											
SETCC	015000	5426*	5456											
SETUP	014742	5419*												
SET2BR	015050	5431	5435*											
SHL	002014	1012*	1013											
SHR	002120	1052*	1053											
SNMB0A	004172	2081	2082	2088*										
SNMB1A	004276	2146	2147	2153*										

SNMB1B	004306	2148	2157*		
SNMB1C	004330	2162	2163	2164	2170*
SNMB2A	004452	2238	2239	2245*	
SNMB2B	004462	2240	2249*		
SNMB2C	004476	2250	2258*		
SNMB2D	004516	2262	2263	2264	2270*
SNMB2E	004526	2265	2274*		
SNMB3A	004670	2354	2355	2361*	
SNMB3B	004700	2356	2365*		
SNMB3C	004716	2368	2369	2370	2376*
SNMB3D	004726	2371	2380*		
SNM0A	004132	2048	2049	2050	2056*
SNM1A	004234	2113	2114	2115	2121*
SNM2A	004372	2194	2195	2196	2202*
SNM2B	004402	2197	2206*		
SNM3A	004602	2306	2307	2308	2314*
SNM3B	004612	2309	2318*		
SNM4A	004776	2411	2412	2418*	
SNM4B	005006	2413	2422*		
SNM5A	005060	2454	2455	2461*	
SNM5B	005070	2456	2465*		
SNM6A	005144	2497	2498	2504*	
SNM6B	005154	2499	2508*		
SNM7A	005226	2539	2540	2546*	
SNM7B	005236	2541	2550*		
SOPA	004050	2006	2014*		
SOPB	004070	2003	2016	2023*	
SOPB0A	002562	1382	1390*		
SOPB0B	002572	1391	1398*		
SOPB1A	002704	1460	1468*		
SOPB1B	002720	1469	1471	1478*	
SOPB1C	002764	1505	1513*		
SOPB1D	003002	1517	1524*		
SOPB2A	003136	1600	1608*		
SOPB2B	003154	1611	1619*		
SOPB2C	003224	1643	1651*		
SOPB2D	003246	1656	1664*		
SOPB3A	003376	1744	1752*		
SOPB3B	003422	1755	1757	1766*	
SOPB3C	003470	1797	1805*		
SOPB3D	003512	1811	1818*		
SOP>	004034	2005*	2014*	2015*	2028
SOP>A9	004100	2017*	2028*		
SOPZA	003050	1552	1560*		
SOP0A	002424	1295	1303*		
SOP0B	002442	1305	1313*		
SOP0C	002504	1342	1350*		
SOP0D	002526	1352	1355	1363*	
SOP1A	002630	1420	1428*		
SOP1B	002642	1429	1437*		
SOP2B	003070	1563	1572*		
SOP3A	003312	1695	1703*		
SOP3B	003326	1706	1713*		
SOP4A	003554	1834	1842*		
SOP4B	003574	1845	1854*		
SOP5A	003636	1885	1893*		

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SOP5B   003652          1896    1903#
SOP6A   003716          1927    1935#
SOP6B   003732          1936    1943#
SOP7A   003776          1968    1976#
SOP7B   004012          1977    1984#
START   000500           479     489#  5545
STBOT = 000500           400#    481    492    873   4073   4090   4111   4123   4226   5537
SUB1    013604          4971    4972   4978#
SUB2    013614          4973    4982#
SUB3    013636          4986    4987   4993#
SUB4    013646          4988    4997#
SUB5    013664          5001    5002   5008#
SUB6    013674          5003    5012#
SUB7    013714          5015    5016   5017   5023#
SWB1    012646          4625    4626   4632#
SWB2    012656          4627    4636#
SWB3    012674          4639    4640   4641   4647#
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                        3190    3191   3192   3193   3211   3212*  3213*  3214*  3215*  3216   3244*  3245*  3246*
                        3247*   3248
TBL2    006622          3173    3193#  3243
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TEST2   012570          4589    4598#
TEST3   012606          4602    4603   4609#
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TPS   = 177564           407#   5476   5541
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TST10   001114           682     685    698#
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TST101  005762          2827    2834   2858#
TST102  006042          2860    2879   2899#
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TST104  006154          2931    2947   2965-
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TST110  006412          3075    3080   3100#
TST111  006454          3102    3107   3132#
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TST113  006624          3179    3208#
TST114  006710          3210    3217   3240#
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TST137	011602	4201	4223#		
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TST141	011742	4265	4286	4300#	
TST142	012032	4302	4324	4338#	
TST143	012122	4340	4361	4375#	
TST144	012214	4377	4400	4426#	
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 468#
 438#
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                     797    804    817    824    837    844    873    879    892    897    910    915    928
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F11


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PUSH        1#
REPORT      1#
SETPRI      1#
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CROSS REFERENCE TABLE -- MACRO NAMES

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[illegible] CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

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CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

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.REM               1
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.SBTTL           410     421     448     500     546     562     581     600     619     635     661     680     698     716     734
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ERRORS DETECTED: 0
DEFAULT GLOBALS GENERATED: 0

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RUN-TIME: 61 84 12 SECONDS
RUN-TIME RATIO: 527/158=3.3
CORE USED: 33K (65 PAGES)