

PDP11/04

CPU TEST
MD-11-DGKAA-A

EP-DGKAA-A-DL-A
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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 100, \$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, SENVM, WHICH IS LOCATED IN THE APT MAILBOX. SETTING SENVM TO 40(8) WILL

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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 WILL

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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 FAULT WAS DETECTED.
\$TESTN IS USED IN CONJUNCTION WITH \$FATAL TO DISTINGUISH
BETWEEN SEQUENCE AND FUNCTIONAL 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 DEVELOPED 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

000500

000240
000007
000006
177776
177564
177566

000400

```

%
.TITLE MAINDEC-11-DGKAA 11/04 CPU TEST
.ENABLE ABS
STBOT=500
.NLIST CND,MC,MD
.LIST ME
SCOPE=NOP
R7=%7
R6=%6
PS=177776
TPS=177564
TPB=177566
.MCALL .SAPTHDR, .SAPTBL, .SACT11
.SBTTL ACT11 HOOKS
;*****
;HOOKS REQUIRED BY ACT11
$SVPC=. ;SAVE PC

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415
416 000046
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418 000052
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425 000300
426 000300 000000
427 000302 000000
428 000304 000000
429 000306 000000
430 000310 000000
431 000312 000000
432 000314 000000
433 000316 000000
434 000320
435 000320 000
436 000321 000
437 000322 000000
438 000324 000000
439 000326 000000
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446 000330
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453 000330
454 000024 000024
455 000024 000200
456 000044 000044
457 000044 000330
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463 000330
464 000330 000000
465 000332 000300
466 000334 000002
467 000336 000002
468 000340 000000
469 000342 000014
470 000370

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.=46
$ENDAD ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .SEOP
.=52
.WORD 0 ;;2)SET LOC.52 TO ZERO
.=$$VPC ;; RESTORE PC
.=300
.SBTTL APT MAILBOX-ETABLE

;*****
;EVEN
$MAIL: ;; APT MAILBOX
$MSGTY: .WORD AMSGTY ;; MESSAGE TYPE CODE
$FATAL: .WORD AFATAL ;; FATAL ERROR NUMBER
$TESTN: .WORD ATESTN ;; TEST NUMBER
$PASS: .WORD APASS ;; PASS COUNT
$DEVCT: .WORD ADEVCT ;; DEVICE COUNT
$UNIT: .WORD AUNIT ;; I/O UNIT NUMBER
$MSGAD: .WORD AMSGAD ;; MESSAGE ADDRESS
$MSGLG: .WORD AMSGLG ;; MESSAGE LENGTH
$ETABLE: ;; APT ENVIRONMENT TABLE
$ENV: .BYTE AENV ;; ENVIRONMENT BYTE
$ENVM: .BYTE AENVM ;; ENVIRONMENT MODE BITS
$SWREG: .WORD ASWREG ;; APT SWITCH REGISTER
$USWR: .WORD AUSWR ;; USER SWITCHES
$CPUOP: .WORD ACPUOP ;; CPU TYPE, OPTIONS
;*
;* BIT 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
$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.

$APTHD:
$HIBTS: .WORD 0 ;; TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
$MBADR: .WORD $MAIL ;; ADDRESS OF APT MAILBOX (BITS 0-15)
$STMT: .WORD 2 ;; RUN TIM OF LONGEST TEST
$PASTM: .WORD 2 ;; RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
$UNITM: .WORD 0 ;; ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
.=370 $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)

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471 000370 000000 000000 000000      0,0,0,0,0,0
472 000376 000000 000000 000000
473 000404 000001 000001 177777      1,1,-1
474      000500      =500
475      ;*****
476      ;SET UP STARTING ADDRESS
477      .SX=
478      =200
479 000200 000167 000274      JMP      START
480
481 000204 012706 000500      MOV      #STBOT,R6      ;SET STACK POINTER
482 000210 012702 000304      MOV      #STSTN,R2     ;SET MAILBOX POINTER
483 000214 000137      JMP      @PC+          ;JUMP TO SUBTEST
484 000216 000000      0      ;ADDR. OF SUBTEST GOES HERE
485
486      000500      =.SX
487      000302      $ERROR=$FATAL
488      000304      $STSTNM=$STSTN
489 000500 012737 015426 000024      START:  MOV      #PWRDN,@#24      ;SET UP FOR POWER FAIL
490 000506 012737 000000 000306      MOV      #0,@#SPASS     ;CLEAR PASS COUNT
491 000514 012737 177777 015310      MOV      #-1,@#PASSPT  ;SET PRINT COUNTER
492 000522 012706 000500      RESTRT: MOV      #STBOT,R6  ;INITIALIZE STACK POINTER
493 000526 012702 000304      MOV      #STSTN,R2     ;SET UP POINTER TO MESSAGE TYPE
494 000532 012737 000000 000304      MOV      #0,@#STSTNM   ;CLEAR TEST NUMBER
495 000540 012737 000000 000302      MOV      #0,@#$ERROR   ;CLEAR ERROR NUMBER
496 000546 012737 000000 000300      MOV      #0,@#MSGTY    ;CLEAR MESSAGE TYPE(FOR APT)

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000554 005212
000556 022712 000001
000562 001024
000564 000257
000566 001401
000570 000404

000572 012742 000001
000572 005242
000600 000000
000602 001004
000604 012742 000002
000610 005242
000612 000000
000614 000264
000616 001001
000620 000404

000622 012742 000003
000622 005242
000626 000000
000630 000000
000632 001404

000634 012742 000004
000640 005242
000642 000000

TST1: INC (R2)
CMP #1,(R2)
BNE TST2-10
CCC
BEQ BR1
BR BR2

BR1: MOV #1,-(R2)
INC -(R2)
HALT

BR2: BNE BR3

BR3: SEZ
BNE BR4
BR BR5

BR4: MOV #3,-(R2)
INC -(R2)
HALT

BR5: BEQ TST2

MOV #4,-(R2)
INC -(R2)
HALT

;TEST 1 CHECK BRANCHES ON Z BIT

;UPDATE TEST NUMBER
;SEQUENCE ERROR?
;BR TO ERROR HALT ON SEQ ERROR
;CLEAR ALL CONDITION CODES
;SHOULD BRANCH
;BAD BRANCH OF Z-BIT
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; BRANCH INSTRUCTION AND <====
; REPLACE THE MOVE INSTRUCTION <====
; FOLLOWING W/ 774 <====
;MOVE TO MAILBOX # ***** 1 *****
;SET MSGTYP TO FATAL ERROR
;SHOULD HAVE BRANCHED: Z=0

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 770 <====
;MOVE TO MAILBOX # ***** 2 *****
;SET MSGTYP TO FATAL ERROR
;
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; BRANCH INSTRUCTION AND <====
; REPLACE THE MOVE INSTRUCTION <====
; FOLLOWING W/ 760 <====
;MOVE TO MAILBOX # ***** 3 *****
;SET MSGTYP TO FATAL ERROR
;SHOULD NOT HAVE BRANCHED HERE ON Z=1

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 754 <====
;MOVE TO MAILBOX # ***** 4 *****
;SET MSGTYP TO FATAL ERROR
;SHOULD HAVE BRANCHED ON Z=1
; OR SEQUENCE ERROR

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: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

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TST2:  INC      (R2)          ;UPDATE TEST NUMBER
      CMP      #2,(R2)      ;SEQUENCE ERROR?
      BNE     TST3-10      ;BR TO ERROR HALT ON SEQ ERROR
      MOV     #0,a#0       ;MOVE ZEROES THRU ADDRESS LINES, DATA
                          ;LINES AND INTERNAL PATHS
      TST     a#0          ;SUCCESSFUL?
      BEQ     TST3

      ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
      ;                CONDITIONAL BRANCH INST. AND <====
      ;                REPLACE THE MOVE INSTRUCTION <====
      ;                WHICH FOLLOWS W/ 772 <====
      MOV     #5,-(R2)     ;MOVE TO MAILBOX # ***** 5 *****
      INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
      HALT                    ;DATA INCORRECT
                          ; OR SEQUENCE ERROR
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:TEST 3 TEST OF PATTERN 125252 IN DATA PATH

```
TST3:  INC      (R2)          ;UPDATE TEST NUMBER
      CMP      #3,(R2)      ;SEQUENCE ERROR?
      BNE     TST4-10      ;BR TO ERROR HALT ON SEQ ERROR
      MOV     #125252,a#0   ;MOVE ALTERNATING ONES AND ZEROES
                          ;THRU DATA PATHS
      CMP     #125252,a#0   ;SUCCESSFUL
      BEQ     TST4

      ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
      ;                CONDITIONAL BRANCH INST. AND <====
      ;                REPLACE THE MOVE INSTRUCTION <====
      ;                WHICH FOLLOWS W/ 771 <====
      MOV     #6,-(R2)     ;MOVE TO MAILBOX # ***** 6 *****
      INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
      HALT                    ;DATA INCORRECT
                          ; OR SEQUENCE ERROR
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:TEST 4 TEST OF PATTERN 052525 IN DATA PATH

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600 000736 005212          TST4:  INC      (R2)          ;UPDATE TEST NUMBER
601 000740 022712 000004    CMP      #4,(R2)        ;SEQUENCE ERROR?
602 000744 001007          BNE     TST5-10        ;BR TO ERROR HALT ON SEQ ERROR
603 000746 012737 052525 000000  MOV     #052525,0#0    ;MOVE ALTERNATING ZEROES AND ONES
604                                ;THRU DATA PATH
605 000754 022737 052525 000000  CMP     #052525,0#0    ;SUCCESSFUL?
606 000762 001404          BEQ     TST5
607                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
608                                ;          CONDITIONAL BRANCH INST. AND <====
609                                ;          REPLACE THE MOVE INSTRUCTION <====
610                                ;          WHICH FOLLOWS W/ 771 <====
611 000764 012742 000007    MOV     #7,-(R2)       ;MOVE TO MAILBOX # ***** 7 *****
612 000770 005242          INC     -(R2)         ;SET MSGTYP TO FATAL ERROR
613 000772 000000          HALT                    ;DATA INCORRECT
614                                ; OR SEQUENCE ERROR
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616                                ;*****
617                                ;TEST 5 TEST OF ALL ONES IN DATA PATH
618                                ;*****
619 000774 005212          TST5:  INC      (R2)          ;UPDATE TEST NUMBER
620 000776 022712 000005    CMP     #5,(R2)        ;SEQUENCE ERROR?
621 001002 001007          BNE     TST6-10        ;BR TO ERROR HALT ON SEQ ERROR
622 001004 012737 177777 000000  MOV     #177777,0#0    ;MOVE ONES THRU DATA PATH
623 001012 022737 177777 000000  CMP     #177777,0#0    ;SUCCESSFUL
624 001020 001404          BEQ     TST6
625                                ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
626                                ;          CONDITIONAL BRANCH INST. AND <====
627                                ;          REPLACE THE MOVE INSTRUCTION <====
628                                ;          WHICH FOLLOWS W/ 771 <====
629 001022 012742 000010    MOV     #10,-(R2)      ;MOVE TO MAILBOX # ***** 10 *****
630 001026 005242          INC     -(R2)         ;SET MSGTYP TO FATAL ERROR
631 001030 000000          HALT                    ;DATA INCORRECT
632                                ; OR SEQUENCE ERROR

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: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
: RO 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 RO 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 RO CAN HOLD ALL ZEROES

```
TST6:  INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #6,(R2)     ;SEQUENCE ERROR?
        BNE     TST7-10     ;BR TO ERROR HALT ON SEQ ERROR
        MOV      #0,RO       ;MOVE ZEROES TO RO
        TST     RO          ;SUCCESSFUL?
        BEQ     TST7
        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
        ;          CONDITIONAL BRANCH INST. AND <====
        ;          REPLACE THE MOVE INSTRUCTION <====
        ;          WHICH FOLLOWS W/ 774 <====
        MOV      #11,-(R2)   ;MOVE TO MAILBOX # ***** 11 *****
        INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
        HALT                    ;RO NOT 0
        ; OR SEQUENCE ERROR
```

:TEST 7 TEST IF RO CAN HOLD ONES AND ZEROES

```
TST7:  INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #7,(R2)     ;SEQUENCE ERROR?
        BNE     TST10-10    ;BR TO ERROR HALT ON SEQ ERROR
        MOV      #125252,RO  ;MOVE ALTERNATING ONES AND ZEROES TO RO
        CMP     RO,#125252  ;SUCCESSFUL?
        BEQ     TST10
        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
        ;          CONDITIONAL BRANCH INST. AND <====
        ;          REPLACE THE MOVE INSTRUCTION <====
```

```

689
690 001104 012742 000012      MOV    #12,-(R2)      ; WHICH FOLLOWS W/ 773      <====
691 001110 005242      INC    -(R2)         ; MOVE TO MAILBOX # ***** 12 *****
692 001112 000000      HALT                   ; SET MSGTYP TO FATAL ERROR
693                                     ; RO NOT 125252
694                                     ; OR SEQUENCE ERROR

```

```

;*****
;TEST 10      TEST IF RO CAN HOLD ZEROES AND ONES
;*****

```

```

697
698 001114 005212      TST10: INC    (R2)          ; UPDATE TEST NUMBER
699 001116 022712 000010      CMP    #10,(R2)       ; SEQUENCE ERROR?
700 001122 001005      BNE    TST11-10       ; BR TO ERROR HALT ON SEQ ERROR
701 001124 012700 052525      MOV    #052525,RO     ; MOVE ALTERNATING ZEROES AND ONES TO RO
702 001130 020027 052525      CMP    RO,#052525     ; SUCCESSFUL?
703 001134 001404      BEQ    TST11

```

```

704                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
705                                     ; CONDITIONAL BRANCH INST. AND                <====
706                                     ; REPLACE THE MOVE INSTRUCTION                <====
707                                     ; WHICH FOLLOWS W/ 773                        <====

```

```

708 001136 012742 000013      MOV    #13,-(R2)      ; MOVE TO MAILBOX # ***** 13 *****
709 001142 005242      INC    -(R2)         ; SET MSGTYP TO FATAL ERROR
710 001144 000000      HALT                   ; RO NOT 52525
711                                     ; OR SEQUENCE ERROR

```

```

;*****
;TEST 11      TEST IF RO CAN HOLD ALL ONES
;*****

```

```

714
715
716 001146 005212      TST11: INC    (R2)          ; UPDATE TEST NUMBER
717 001150 022712 000011      CMP    #11,(R2)       ; SEQUENCE ERROR?
718 001154 001005      BNE    TST12-10       ; BR TO ERROR HALT ON SEQ ERROR
719 001156 012700 177777      MOV    #177777,RO     ; MOVE ALL ONES TO RO
720 001162 020027 177777      CMP    RO,#177777     ; SUCCESSFUL?
721 001166 001404      BEQ    TST12

```

```

722                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
723                                     ; CONDITIONAL BRANCH INST. AND                <====
724                                     ; REPLACE THE MOVE INSTRUCTION                <====
725                                     ; WHICH FOLLOWS W/ 773                        <====

```

```

726 001170 012742 000014      MOV    #14,-(R2)      ; MOVE TO MAILBOX # ***** 14 *****
727 001174 005242      INC    -(R2)         ; SET MSGTYP TO FATAL ERROR
728 001176 000000      HALT                   ; RO NOT 177777
729                                     ; OR SEQUENCE ERROR

```

```

;*****
;TEST 12      TEST IF R1 CAN HOLD A ONE IN ALL BITS
;*****

```

```

731
732
733
734 001200 005212      TST12: INC    (R2)          ; UPDATE TEST NUMBER
735 001202 022712 000012      CMP    #12,(R2)       ; SEQUENCE ERROR?
736 001206 001006      BNE    TST13-10       ; BR TO ERROR HALT ON SEQ ERROR
737 001210 012701 000001      MOV    #1,R1          ; SET BIT 0
738 001214 000241      CLC                   ; CLEAR C-BIT
739 001216 006101      REG1: ROL    R1        ; ROTATE 1 POSITION
740 001220 103376      BCC    REG1           ; ALL DONE
741 001222 001404      BEQ    TST13

```

```

742                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
743                                     ; CONDITIONAL BRANCH INST. AND                <====
744                                     ; REPLACE THE MOVE INSTRUCTION                <====

```



```

745
746 001224 012742 000015      MOV    #15,-(R2)      ; WHICH FOLLOWS W/ 772      <====
747 001230 005242              INC    -(R2)          ; MOVE TO MAILBOX # ***** 15 *****
748 001232 000000              HALT                   ; SET MSGTYP TO FATAL ERROR
749                                     ; FAILURE WITH R1
750                                     ; OR SEQUENCE ERROR
751
752 ;*****
753 ;TEST 13      TEST IF R2 CAN HOLD A ONE IN ALL BITS
754 ;*****
754 001234 005212              TST13: INC    (R2)          ; UPDATE TEST NUMBER
755 001236 022712 000013      CMP    #13,(R2)       ; SEQUENCE ERROR?
756 001242 001006              BNE   REG2A-14        ; BR TO ERROR HALT ON SEQ ERROR
757 001244 012702 000001      MOV    #1,R2          ; SET BIT 0
758 001250 000241              CLC                   ; CLEAR C-BIT
759 001252 006102              REG2: ROL    R2        ; ROTATE 1 POSITION
760 001254 103376              BCC   REG2            ; ALL DONE
761 001256 001406              BEQ   REG2A
762
763 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
764 ; BRANCH INSTRUCTION AND                      <====
765 ; REPLACE THE MOVE INSTRUCTION                <====
766 ; FOLLOWING W/ 771                            <====
766 001260 012702 000304      MOV    #$TESTN,R2     ; RESTORE POINTER
767 001264 012742 000016      MOV    #16,-(R2)      ; MOVE TO MAILBOX # ***** 16 *****
768 001270 005242              INC    -(R2)          ; SET MSGTYP TO FATAL ERROR
769 001272 000000              HALT                   ; FAILURE WITH R2
770 001274 012702 000304      REG2A: MOV   #$TESTN,R2 ; RESTORE POINTER
771 ;*****
772 ;TEST 14      TEST IF R3 CAN HOLD A ONE IN ALL BITS
773 ;*****
774 001300 005212              TST14: INC    (R2)          ; UPDATE TEST NUMBER
775 001302 022712 000014      CMP    #14,(R2)       ; SEQUENCE ERROR?
776 001306 001006              BNE   TST15-10        ; BR TO ERROR HALT ON SEQ ERROR
777 001310 012703 000001      MOV    #1,R3          ; SET BIT 0
778 001314 000241              CLC                   ; CLEAR C-BIT
779 001316 006103              REG3: ROL    R3        ; ROTATE 1 POSITION
780 001320 103376              BCC   REG3            ; ALL DONE
781 001322 001404              BEQ   TST15
782
783 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
784 ; CONDITIONAL BRANCH INST. AND                <====
785 ; REPLACE THE MOVE INSTRUCTION                <====
786 ; WHICH FOLLOWS W/ 772                        <====
786 001324 012742 000017      MOV    #17,-(R2)      ; MOVE TO MAILBOX # ***** 17 *****
787 001330 005242              INC    -(R2)          ; SET MSGTYP TO FATAL ERROR
788 001332 000000              HALT                   ; FAILURE WITH R3
789                                     ; OR SEQUENCE ERROR
790
791 ;*****
792 ;TEST 15      TEST IF R4 CAN HOLD A ONE IN ALL BITS
793 ;*****
794 001334 005212              TST15: INC    (R2)          ; UPDATE TEST NUMBER
795 001336 022712 000015      CMP    #15,(R2)       ; SEQUENCE ERROR?
796 001342 001006              BNE   TST16-10        ; BR TO ERROR HALT ON SEQ ERROR
797 001344 012704 000001      MOV    #1,R4          ; SET BIT 0
798 001350 000241              CLC                   ; CLEAR C-BIT
799 001352 006104              REG4: ROL    R4        ; ROTATE 1 POSITION
800 001354 103376              BCC   REG4            ; ALL DONE

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 :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
 :*****

```
TST20: INC      (R2)           ;UPDATE TEST NUMBER
        CMP      #20,(R2)    ;SEQUENCE ERROR?
        BNE     TST21-10    ;BR TO ERROR HALT ON SEQ ERROR
        MOV     #STBOT,R6
        MOV     #0,#PS      ;SET PSW TO ZERO
        TST     #PS         ;SUCCESSFUL
        BEQ     TST21
        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
        ;           CONDITIONAL BRANCH INST. AND <====
        ;           REPLACE THE MOVE INSTRUCTION <====
        ;           WHICH FOLLOWS W/ 770 <====
        MOV     #23,-(R2)    ;MOVE TO MAILBOX # ***** 23 *****
        INC     -(R2)        ;SET MSGTYP TO FATAL ERROR
        HALT                ;PSW NOT 0
        ; OR SEQUENCE ERROR
```

 :TEST 21 TEST IF PSW WILL HOLD ONES AND ZEROES
 :*****

```
TST21: INC      (R2)           ;UPDATE TEST NUMBER
        CMP      #21,(R2)    ;SEQUENCE ERROR?
        BNE     TST22-10    ;BR TO ERROR HALT ON SEQ ERROR
        MOV     #252,#PS     ;MOVE ALT. ONES AND ZEROES TO PSW
        CMP     #PS,#252    ;SUCCESSFUL?
        BEQ     TST22
        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
        ;           CONDITIONAL BRANCH INST. AND <====
        ;           REPLACE THE MOVE INSTRUCTION <====
        ;           WHICH FOLLOWS W/ 771 <====
        MOV     #24,-(R2)    ;MOVE TO MAILBOX # ***** 24 *****
        INC     -(R2)        ;SET MSGTYP TO FATAL ERROR
        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     #105,2#PS     ;MOVE ALT. ONES AND ZEROES TO PSW
911 001574 023727 177776 000105 CMP     2#PS,#105     ;SUCCESSFUL?
912 001602 001404          BEQ     TST23
913
914 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
915 ;          CONDITIONAL BRANCH INST. AND <====
916 ;          REPLACE THE MOVE INSTRUCTION <====
917 ;          WHICH FOLLOWS W/ 771 <====
918 001604 012742 000025          MOV     #25,-(R2)     ;MOVE TO MAILBOX # ***** 25 *****
919 001610 005242          INC     -(R2)        ;SET MSGTYP TO FATAL ERROR
920 001612 000000          HALT                    ;PSW NOT 105
921 ; OR SEQUENCE ERROR

```

```

;*****
;TEST 23          TEST IF PSW (EXCEPT T-BIT) WILL HOLD ALL ONES
;*****

```

```

922
923
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     #357,2#PS     ;MOVE ONES TO PSW
929 001632 023727 177776 000357 CMP     2#PS,#357     ;SUCCESSFUL
930 001640 001404          BEQ     TST24
931
932 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
933 ;          CONDITIONAL BRANCH INST. AND <====
934 ;          REPLACE THE MOVE INSTRUCTION <====
935 ;          WHICH FOLLOWS W/ 771 <====
936 001642 012742 000026          MOV     #26,-(R2)     ;MOVE TO MAILBOX # ***** 26 *****
937 001646 005242          INC     -(R2)        ;SET MSGTYP TO FATAL ERROR
938 001650 000000          HALT                    ;PSW NOT 357
; OR SEQUENCE ERROR

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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

```

TST24: INC      (R2)           ;UPDATE TEST NUMBER
        CMP      #24,(R2)     ;SEQUENCE ERROR?
        BNE      TST25-10    ;BR TO ERROR HALT ON SEQ ERROR
        CLC                     ;CLEAR CARRY BIT
        MOV      #1,0#0      ;LOAD A 1
        ROL      0#0         ;SHIFT LEFT
        CMP      #2,0#0      ;SUCCESSFUL
        BEQ      TST25

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 766 <====
        MOV      #27,-(R2)    ;MOVE TO MAILBOX # ***** 27 *****
        INC      -(R2)        ;SET MSGTYP TO FATAL ERROR
        HALT                  ;BIT 1 NOT SET
; OR SEQUENCE ERROR

```

TEST 25 SHIFT CARRY INTO BIT 0

```

TST25: INC      (R2)           ;UPDATE TEST NUMBER
        CMP      #25,(R2)     ;SEQUENCE ERROR?
        BNE      TST26-10    ;BR TO ERROR HALT ON SEQ ERROR
        MOV      #0,0#0      ;CLEAR LOCATION
        SEC                     ;SET CARRY
        ROL      0#0         ;ROTATE CARRY BIT TO BIT 0
        BCC      TST26

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 771 <====
        MOV      #30,-(R2)    ;MOVE TO MAILBOX # ***** 30 *****
        INC      -(R2)        ;SET MSGTYP TO FATAL ERROR
        HALT                  ;CARRY CLEAR
; OR SEQUENCE ERROR
        CMP      #1,0#0      ;BIT 0 SET
        BEQ      TST26

```

```

995
996
997
998
999 001764 012742 000031      MOV    #31,-(R2)      ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
1000 001770 005242      INC    -(R2)         ; CONDITIONAL BRANCH INST. AND
1001 001772 000000      HALT                ; REPLACE THE MOVE INSTRUCTION
                                ; WHICH FOLLOWS W/ 761
                                ; MOVE TO MAILBOX # ***** 31 *****
                                ; SET MSGTYP TO FATAL ERROR
                                ; BIT 0 NOT SET
                                ; OR SEQUENCE ERROR

```

```

1002
1003
1004
1005 ;*****
1006 ;TEST 26 LEFT SHIFT FROM BIT 0 TO C-BIT
1007 ;*****

```

```

1007 001774 005212      TST26: INC    (R2)          ; UPDATE TEST NUMBER
1008 001776 022712 000026      CMP    #26,(R2)       ; SEQUENCE ERROR?
1009 002002 001010      BNE    TST27-10       ; BR TO ERROR HALT ON SEQ ERROR
1010 002004 012737 000001 000000      MOV    #1,#0          ; SET BIT 0
1011 002012 000241      CLC                    ; CLEAR C-BIT
1012 002014 006137 000000      SHL:  ROL    #0        ; SHIFT LEFT ONE POSITION
1013 002020 103375      BCC    SHL             ; BRANCH IF C-BIT NOT SET
1014 002022 001404      BEQ    TST27

```

```

1015
1016 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
1017 ; CONDITIONAL BRANCH INST. AND
1018 ; REPLACE THE MOVE INSTRUCTION
1019 ; WHICH FOLLOWS W/ 770
1019 002024 012742 000032      MOV    #32,-(R2)      ; MOVE TO MAILBOX # ***** 32 *****
1020 002030 005242      INC    -(R2)         ; SET MSGTYP TO FATAL ERROR
1021 002032 000000      HALT                ; LEFT SHIFTING LOGIC FAILED
                                ; OR SEQUENCE ERROR

```

```

1022
1023 ;*****
1024 ;TEST 27 SHIFT BIT 15 TO BIT 14
1025 ;*****

```

```

1026
1027 002034 005212      TST27: INC    (R2)          ; UPDATE TEST NUMBER
1028 002036 022712 000027      CMP    #27,(R2)       ; SEQUENCE ERROR?
1029 002042 001012      BNE    TST30-10       ; BR TO ERROR HALT ON SEQ ERROR
1030 002044 012737 100000 000000      MOV    #100000,#0     ; SET BIT 15
1031 002052 000241      CLC                    ; CLEAR CARRY
1032 002054 006037 000000      ROR    #0             ; SHIFT BIT 15 TO BIT 14
1033 002060 022737 040000 000000      CMP    #40000,#0      ; SUCCESSFUL
1034 002066 001404      BEQ    TST30

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```

1035
1036 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
1037 ; CONDITIONAL BRANCH INST. AND
1038 ; REPLACE THE MOVE INSTRUCTION
1039 ; WHICH FOLLOWS W/ 766
1039 002070 012742 000033      MOV    #33,-(R2)      ; MOVE TO MAILBOX # ***** 33 *****
1040 002074 005242      INC    -(R2)         ; SET MSGTYP TO FATAL ERROR
1041 002076 000000      HALT                ; BIT 14 NOT SET
                                ; OR SEQUENCE ERROR

```

```

1042
1043 ;*****
1044 ;TEST 30 RIGHT SHIFT FROM BIT 15 TO C-BIT
1045 ;*****

```

```

1046
1047 002100 005212      TST30: INC    (R2)          ; UPDATE TEST NUMBER
1048 002102 022712 000030      CMP    #30,(R2)       ; SEQUENCE ERROR?
1049 002106 001010      BNE    TST31-10       ; BR TO ERROR HALT ON SEQ ERROR
1050 002110 012737 100000 000000      MOV    #100000,#0     ; SET BIT 15

```


1051	002116	000241	
1052	002120	006037	000000
1053	002124	103375	
1054	002126	001404	
1055			
1056			
1057			
1058			
1059	002130	012742	000034
1060	002134	005242	
1061	002136	000000	
1062			

SHR: CLC
ROR
BCC
BEQ

J#0
SHR
TST31

```

;CLEAR C-BIT
;ROTATE RIGHT ONE POSITION
;BRANCH IF C-BIT CLEAR

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
;                CONDITIONAL BRANCH INST. AND
;                REPLACE THE MOVE INSTRUCTION
;                WHICH FOLLOWS W/ 770
;MOVE TO MAILBOX # ***** 34 *****
;SET MSGTYP TO FATAL ERROR
;RIGHT SHIFT LOGIC FAILED
; OR SEQUENCE ERROR

```

.SBTTL CONDITION CODE TEST

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1100
1101
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1110

002140 005212
002142 022712 000031
002146 001014

002150 000257
002152 000264
002154 001001
002156 001404

002160
002160 012742 000035
002164 005242
002166 000000

002170 000277
002172 000244
002174 001401
002176 001004

002200
002200 012742 000036
002204 005242
002206 000000

: 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

TST31: INC (R2) ;UPDATE TEST NUMBER
CMP #31,(R2) ;SEQUENCE ERROR?
BNE TST32-10 ;BR TO ERROR HALT ON SEQ ERROR
;FIRST WITH Z-BIT ON
CCC ;CC=0100: JUST Z-BIT
SEZ
BNE BRZ1 ;CHECK OPPOSITE CONDITION
BEQ BRZ2
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 774 <====
BRZ1: MOV #35,-(R2) ;MOVE TO MAILBOX # ***** 35 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;IMPROPER BR W/ Z=1
;CHECK WITH Z-BIT OFF
BRZ2: SCC ;CC=1011: ALL BUT Z-BIT
CLZ
BEQ BRZ3
BNE TST32
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 764 <====
BRZ3: MOV #36,-(R2) ;MOVE TO MAILBOX # ***** 36 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;IMPROPER BR W/ Z=0
; OR SEQUENCE ERROR


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1128 002210 005212
1129 002212 022712 000032
1130 002216 001014
1131
1132 002220 000257
1133 002222 000270
1134 002224 100001
1135 002226 100404
1136
1137
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1139
1140 002230
1141 002230 012742 000037
1142 002234 005242
1143 002236 000000
1144
1145 002240 000277
1146 002242 000250
1147 002244 100401
1148 002246 100004
1149
1150
1151
1152
1153 002250
1154 002250 012742 000040
1155 002254 005242
1156 002256 000000
1157

```

```

:*****
:
:   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
:*****
TST32:  INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #32,(R2)    ;SEQUENCE ERROR?
        BNE     TST33-10    ;BR TO ERROR HALT ON SEQ ERROR
        ;FIRST WITH N-BIT ON
        CCC
        SEN
        BPL     BRN1        ;CHECK OPPOSITE CONDITION
        BMI     BRN2
        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
        ;          CONDITIONAL BRANCH INST. AND <====
        ;          REPLACE THE MOVE INSTRUCTION <====
        ;          WHICH FOLLOWS W/ 774 <====
BRN1:  MOV      #37,-(R2)    ;MOVE TO MAILBOX # ***** 37 *****
        INC      -(R2)      ;SET MSGTYP TO FATAL ERROR
        HALT
        ;CHECK WITH N-BIT OFF
        ;IMPROPER BR W/ N=1
BRN2:  SCC
        CLN
        BMI     BRN3        ;CHECK OPPOSITE CONDITION
        BPL     TST33
        ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
        ;          CONDITIONAL BRANCH INST. AND <====
        ;          REPLACE THE MOVE INSTRUCTION <====
        ;          WHICH FOLLOWS W/ 764 <====
BRN3:  MOV      #40,-(R2)    ;MOVE TO MAILBOX # ***** 40 *****
        INC      -(R2)      ;SET MSGTYP TO FATAL ERROR
        HALT
        ;IMPROPER BR W/ N=0
        ; OR SEQUENCE ERROR

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002260 005212
002262 022712 000033
002266 001014
002270 000257
002272 000262
002274 102001
002276 102404
002300
002300 012742 000041
002304 005242
002306 000000
002310 000277
002312 000242
002314 102401
002316 102004
002320
002320 012742 000042
002324 005242
002326 000000

```
*****
THIS TEST CHECKS THE CONDITIONAL BRANCHES INVOLVING THE V-BIT.
THE V-BIT IS SET WITH ALL OTHER CC BITS ZERO AND BOTH CONDITIONS
BVS AND BVC ARE TESTED FOR PROPER EXECUTION. THEN THE V-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 33 TEST BRANCHES AROUND V-BIT
*****
TST33: INC (R2) ;UPDATE TEST NUMBER
CMP #33,(R2) ;SEQUENCE ERROR?
BNE TST34-10 ;BR TO ERROR HALT ON SEQ ERROR
;FIRST WITH V-BIT ON
CCC ;CC=0010: JUST V-BIT
SEV
BVC BRV1 ;CHECK OPPOSITE CONDITION
BVS BRV2
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 774 <====
BRV1: MOV #41,-(R2) ;MOVE TO MAILBOX # ***** 41 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;IMPROPER BR W/ V=1
;CHECK WITH V-BIT OFF
BRV2: SCC ;CC=1101: ALL BVT V-BIT
CLV
BVS BRV3 ;CHECK OPPOSITE CONDITION
BVC TST34
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 764 <====
BRV3: MOV #42,-(R2) ;MOVE TO MAILBOX # ***** 42 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;IMPROPER BR W/ V=0
; OR SEQUENCE ERROR
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002330 005212
002332 022712 000034
002336 001014
002340 000257
002342 000261
002344 103001
002346 103404
002350
002350 012742 000043
002354 005242
002356 000000
002360 000277
002362 000242
002364 102401
002366 100404
002370
002370 012742 000044
002374 005242
002376 000000

```
*****
: THIS TEST CHECKS THE CONDITIONAL BRANCHES INVOLVING THE C-BIT.
: THE C-BIT IS SET WITH ALL OTHER CC BITS ZERO AND BOTH CONDITIONS
: BCS AND BCC ARE TESTED FOR PROPER EXECUTION. THEN THE C-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 34 TEST BRANCHES AROUND C-BIT
*****
TST34: INC (R2) ;UPDATE TEST NUMBER
CMP #34,(R2) ;SEQUENCE ERROR?
BNE TST35-10 ;BR TO ERROR HALT ON SEQ ERROR
;FIRST WITH C-BIT ON
CCC ;CC=0001: JUST C-BIT
SEC
BCC BRC1 ;CHECK OPPOSITE CONDITION
BCS BRC2
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 774 <====
BRC1: MOV #43,-(R2) ;MOVE TO MAILBOX # ***** 43 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;IMPROPER BR W/ C=1
;CHECK WITH V-BIT OFF
BRC2: SCC ;CC=1110
CLV
BVS BRC3 ;CHECK OPPOSITE CONDITION
BMI TST35
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 764 <====
BRC3: MOV #44,-(R2) ;MOVE TO MAILBOX # ***** 44 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;IMPROPER BR W/ C=0
; OR SEQUENCE ERROR
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*****  
;SBTTL MICROCODE TESTS  
;  
; THE MICROCODE TESTS ARE USED TO VERIFY THE MICROPROGRAMM  
;FLOW. THE GOAL OF THESE TESTS IS TO EXERCISE EVERY POSSIBLE  
;BRANCH IN THE MICROPROGRAM FLOW.  
; THE TEST EXERCISES EVERY BRANCH IN THE MICROCODE BY  
;TESTING AT LEAST ONE INSTRUCTION FROM EVERY CLASS OF INSTRUCTION IN  
;ALL POSSIBLE MODES. FOR EXAMPLE, TO TEST THE SINGLE OPERAND INSTRUCTIONS,  
;AT LEAST ONE SINGLE OPERAND INSTRUCTION IS VERIFIED IN ALL UNIQUE  
;ADDRESSING MODES. BYTE MODES ARE ALSO TESTED. AS EACH NEW  
;MODE IS INTRODUCED THE SAME INSTRUCTION IS TRIED AND TESTED IN  
;A SMALL LOOP CONVENIENT FOR SCOPING. THE TEST IS SET UP USING  
;ONLY INSTRUCTIONS AND ADDRESSING MODES WHICH HAVE BEEN PREVIOUSLY  
;VERIFIED.  
; IF THESE TESTS FAIL, CHECK THE RESULTS FOR A CLUE TO THE  
;FAULT.  
*****
```

```
*****  
; THE CLR INSTRUCTION IS USED TO INTRODUCE EACH ADDRESSING  
;MODE WITH THE SINGLE OPERAND INSTRUCTION. FOLLOWING THE SEQUENCE CHECK,  
;THE CLR INSTRUCTION IS EXECUTED AND A BRANCH TEST IS EXECUTED WHICH  
;CHECKS THAT THE Z-BIT WAS PROPERLY SET. THIS SMALL TEST IS SELF-SUFFICIENT  
;AND CAN BE SCOPED TO TROUBLE SHOOT ALL OF THE IR DECODE LOGIC AND  
;MICROCODE FOR SOP INSTRUCTIONS WITH MODE 0. FOLLOWING THIS TEST  
;SEVERAL OTHER SOP INSTRUCTIONS ARE INTRODUCED WITH MODE 0. THESE  
;INSTRUCTIONS MAINPULATE DATA AND SERVE TO CHECK THE DATA RESULTS  
;OF THE SOP INSTRUCTIONS IN THIS TEST. THE DATA IN THIS TEST IS  
;OPERATED ON BY EACH INSTRUCTION WITHOUT REINITIALIZING.  
*****  
;TEST 35 TEST MODE 0 USING SOP INST.  
*****
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1291 002400 005212
1292 002402 022712 000035
1293 002406 001017
1294 002410 005000
1295 002412 001404
1296
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1300 002414 012742 000045
1301 002420 005242
1302 002422 000000
1303 002424 005200
1304 002426 005400
1305 002430 100404
1306
1307

```
TST35: INC (R2) ;UPDATE TEST NUMBER  
;SEQUENCE ERROR?  
CMP #35,(R2) ;BR TO ERROR HALT ON SEQ ERROR  
BNE TST36-10 ;TRY THE CLEAR INST.  
CLR R0  
BEQ SOP0A  
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====  
; CONDITIONAL BRANCH INST. AND <====  
; REPLACE THE MOVE INSTRUCTION <====  
; WHICH FOLLOWS W/ 776 <====  
;MOVE TO MAILBOX # ***** 45 *****  
;SET MSGTYP TO FATAL ERROR  
;CLR DID NOT SET Z-BIT  
SOP0A: INC R0 ;TRY THE INCREMENT INST.  
NEG R0 ;TRY THE NEGATE INST.  
BMI SOP0B  
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====  
; CONDITIONAL BRANCH INST. AND <====
```



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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                       SOPOB: 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

```

```

*****
: THIS TEST INTRODUCES THE REMAINING SOP INSTRUCTIONS AND TESTS
: THEM IN MODE 0. THE PURPOSE IS TO PROVIDE A BASELINE OF
: INSTRUCTIONS FOR USE IN THE SUBSEQUENT TESTS. SINCE THE MICROCODE FOR
: THESE INSTRUCTIONS IS IDENTICAL TO THAT ALREADY TESTED, ANY TROUBLE
: SHOOTING EFFORTS SHOULD BE AIMED AT THE ACTUAL IR DECODE AND ALU
: FUNCTIONING.
*****

```

```

*****
: TEST 36 TEST REMAINDER OF SOP INSTS IN MODE 0
*****
1337 002456 005212 000036                TST36: INC (R2) ; UPDATE TEST NUMBER
1338 002460 022712                       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 SOPDC

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: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: 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                       SOPOC: SEC R0 ; INITIALIZE CARRY
1351 002506 005500                       ADC R0 ; TRY ADD CARRY INST
1352 002510 001006                       BNE SOPDC

```

```

: INITIALIZE CARRY
: TRY SUBTRACT-CARRY INST
1353 002512 000261                       SEC R0
1354 002514 005600                       SBC R0
1355 002516 100003                       BPL SOPDC
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 <====

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1363 002526                               SOPOD:

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1364 002526 012742 000051
1365 002532 005242
1366 002534 000000
1367

MOV #51, -(R2)
INC -(R2)
HALT

; MOVE TO MAILBOX # ***** 51 *****
; SET MSGTYP TO FATAL ERROR
; CUMMULATIVE RESULT OF ADC, SBC, NEG AND DEC INSTS. FAILE
; OR SEQUENCE ERROR


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1378 002536 005212
1379 002540 022712 000037
1380 002544 001012
1381 002546 105000
1382 002550 001404
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1387 002552 012742 000052
1388 002556 005242
1389 002560 000000
1390 002562 105100
1391 002564 100002
1392 002566 105200
1393 002570 001404
1394
1395
1396
1397
1398 002572
1399 002572 012742 000053
1400 002576 005242
1401 002600 000000
1402

```

```

:*****
:
:   THIS TEST INTRODUCES THE BYTE CONTROL LOGIC OF THE PROCESSOR.
: THE MODE 0 BYTE MICROCODE IS TESTED.  THE METHOD AND SEQUENCE
: OF TESTING IS THE SAME AS THAT USED IN THE SOP MODE 0 TESTS.
:
:*****
: TEST 37      TEST MODE 0 EVEN BYTE USING SOP INST
:*****
TST37:  INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #37,(R2)     ;SEQUENCE ERROR?
        BNE     TST40-10     ;BR TO ERROR HALT ON SEQ ERROR
        CLRB    R0           ;TRY CLEARING EVEN BYTE OF REGISTER
        BEQ     SOPB0A
:
:   TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
:               CONDITIONAL BRANCH INST. AND <====
:               REPLACE THE MOVE INSTRUCTION <====
:               WHICH FOLLOWS W/ 776 <====
:
:   MOV      #52,-(R2)        ;MOVE TO MAILBOX # ***** 52 *****
:   INC      -(R2)           ;SET MSGTYP TO FATAL ERROR
:   HALT
SOPB0A: COMB    R0           ;CLRB DID NOT SET Z-BIT
        BPL     SOPB0B      ;TRY SETTING EVEN BYTE OF REGISTER
        INCB   R0           ;TRY INCREMENTING EVEN BYTE OF REGISTER>>
        BEQ     TST40
:
:   TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
:               CONDITIONAL BRANCH INST. AND <====
:               REPLACE THE MOVE INSTRUCTION <====
:               WHICH FOLLOWS W/ 766 <====
:
SOPB0B: MOV      #53,-(R2)        ;MOVE TO MAILBOX # ***** 53 *****
        INC      -(R2)        ;SET MSGTYP TO FATAL ERROR
        HALT                 ;TEST CUMMULATIVE RESULT OF ABOVE BYTE INST.
:                               ; OR SEQUENCE ERROR

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1497 002730 005212
1498 002732 022712 000042
1499 002736 001021
1500 002740 005000
1501 002742 005010
1502 002744 005110
1503 002746 005200
1504 002750 105010
1505 002752 001404
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1510 002754 012742 000060
1511 002760 005242
1512 002762 000000
1513 002764 005300
1514 002766 005210
1515 002770 005200
1516 002772 105410
1517 002774 100002
1518 002776 105210
1519 003000 001404
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1524 003002
1525 003002 012742 000061
1526 003006 005242
1527 003010 000000
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*****
: 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
*****
TST42: INC (R2) ;UPDATE TEST NUMBER
CMP #42,(R2) ;SEQUENCE ERROR?
BNE TST43-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR RO ;INITIALIZE RO
CLR (RO) ;INITIALIZE LOC. 0
COM (RO)
INC RO ;RO=ODD BYTE
CLRB (RO) ;TRY TO CLEAR BYTE 1
BEQ SOPB1C
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 772 <====
MOV #60,-(R2) ;MOVE TO MAILBOX # ***** 60 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CLRB DID NOT SET Z-BIT
SOPB1C: DEC RO ;RO=WORD ADDR.
INC (RO) ;INCREMENT TO TEST WORD
INC RO ;RO=ODD BYTE
NEGB (RO) ;TRY TO NEGATE BYTE 1
BPL SOPB1D
INCB (RO) ;TRY TO INCREMENT BYTE 1
BEQ TST43
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 757 <====
SOPB1D: MOV #61,-(R2) ;MOVE TO MAILBOX # ***** 61 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;TEST CUMMULATIVE RESULT OF ABOVE INST.
; OR SEQUENCE ERROR

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1543 003012 005212
1544 003014 022712 000043
1545 003020 001023
1546 003022 005000
1547 003024 105100
1548 003026 005200
1549 003030 005010
1550 003032 005110
1551 003034 005020
1552 003036 001404
1553
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1557 003040 012742 000062
1558 003044 005242
1559 003046 000000
1560 003050 005300
1561 003052 005300
1562 003054 005120
1563 003056 100004
1564 003060 005300
1565 003062 005300
1566 003064 005220
1567 003066 001404
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1572 003070
1573 003070 012742 000063
1574 003074 005242
1575 003076 000000
1576

: 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.

TST43: INC (R2) ;UPDATE TEST NUMBER
CMP #43,(R2) ;SEQUENCE ERROR?
BNE TST44-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR R0 ;SET R0=400
COMB R0
INC R0
CLR (R0) ;CLEAR 400
COM (R0) ;INITIALIZE: 400=-1
CLR (R0)+ ;TRY CLEARING WITH MODE 2
BEQ SOPZA

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 771 <====

MOV #62,-(R2) ;MOVE TO MAILBOX # ***** 62 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CLR INST DID NOT SET Z-BIT
SOPZA: DEC R0 ;RESET R0
DEC R0
COM (R0)+ ;TRY COMPLEMENTING WITH MODE 2
BPL SOP2B
DEC R0 ;RESET R0
DEC R0
INC (R0)+ ;TRY INCREMENTING WITH MODE 2
BEQ TST44

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 755 <====

SOP2B: MOV #63,-(R2) ;MOVE TO MAILBOX # ***** 63 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CHECK CUMMULATIVE RESULT OF ABOVE INST
; OR SEQUENCE ERROR

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003100 005212
003102 022712 000044
003106 001022
003110 005000
003112 105100
003114 005200
003116 005010
003120 005110
003122 105020
003124 001404

003126 012742 000064
003132 005242
003134 000000
003136 005300
003140 005210
003142 105420
003144 100003
003146 005300
003150 105220
003152 001404

003154 012742 000065
003154 005242
003162 000000

```
*****
THIS TEST VERIFIES MODE 2 SINGLE OPERAND INSTRUCTIONS WHICH
ADDRESS EVEN BYTES.  RO IS SET TO 400 AND USED TO INITIALIZE LOCATION
400 TO -1.  CLRB INSTRUCTION IS THEN EXECUTED ON BYTE 400 WITH
MODE 2.
RO IS THEN DECREMENTED BEFORE EACH OF SEVERAL MODE 2 INSTRUCTIONS
WHICH ARE USED TO VERIFY THE DATA RESULTS OF THE TEST.  THIS PROCEDURE ALSO
VERIFIES THE PROPER INCREMENTING OF THE REGISTER.
*****
TEST 44          TEST MODE 2 EVEN BYTE USING SOP INST.
*****
TST44:  INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #44,(R2)     ;SEQUENCE ERROR?
        BNE     TST45-10     ;BR TO ERROR HALT ON SEQ ERROR
        CLR     RO           ;SET RO=400
        COMB    RO
        INC     RO
        CLR     (RO)         ;CLEAR 400
        COM     (RO)         ;INITIALIZE: 400=-1
        CLRB   (RO)+        ;TRY TO CLEAT 400 W/MODE 2
        BEQ    SOPB2A
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
;          CONDITIONAL BRANCH INST. AND <====
;          REPLACE THE MOVE INSTRUCTION <====
;          WHICH FOLLOWS W/ 771 <====
        MOV     #64, -(R2)    ;MOVE TO MAILBOX # ***** 64 *****
        INC     -(R2)
        HALT
SOPB2A: DEC     RO           ;SET MSGTYP TO FATAL ERROR
        INC     (RO)         ;CLR DID NOT SET Z-BIT
        NEGB   (RO)+        ;RESULT RO=400
        BPL    SOPB2B       ;INC 400 TO TEST WORD
        BEQ    TST45        ;TRY TO NEGATE EVEN BYTE
; RESET RO=400
; TRY INCREMENT OF EVEN BYTE
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
;          CONDITIONAL BRANCH INST. AND <====
;          REPLACE THE MOVE INSTRUCTION <====
;          WHICH FOLLOWS W/ 756 <====
SOPB2B: MOV     #65, -(R2)    ;MOVE TO MAILBOX # ***** 65 *****
        INC     -(R2)
        HALT
; SET MSGTYP TO FATAL ERROR
; TEST CUMMULATIVE RESULT OF ABOVE INST.
; OR SEQUENCE ERROR
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003164 005212
003166 022712 000045
003172 001025
003174 005000
003176 105100
003200 005200
003202 005010
003204 005110
003206 005200
003210 105020
003212 001404

003214 012742 000066
003220 005242
003222 000000
003224 005300
003226 005300
003230 005220
003232 005300
003234 105420
003236 100003
003240 005300
003242 105220
003244 001404

003246 012742 000067
003246 005242
003254 000000

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:*****
: 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.
:*****
†ST45:  INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #45,(R2)     ;SEQUENCE ERROR?
        BNE     TST46-10     ;BR TO ERROR HALT ON SEQ ERROR
        CLR     RO           ;SET RO=400
        COMB    RO
        INC     RO
        CLR     (RO)         ;CLEAR LOC 400
        COM     (RO)         ;INITIALIZE: 400=-1
        INC     RO           ;RO=ODD BYTE
        CLRB    (RO)+        ;TRY TO CLEAR ODD BYTE
        BEQ     SOPB2C
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
;          CONDITIONAL BRANCH INST. AND <====
;          REPLACE THE MOVE INSTRUCTION <====
;          WHICH FOLLOWS W/ 770 <====
        MOV     #66,-(R2)    ;MOVE TO MAILBOX # ***** 66 *****
        INC     -(R2)
        HALT
SOPB2C: DEC     RO
        DEC     RO
        INC     (RO)+
        DEC     RO          ;INCREMENT WORD
        NEGB    (RO)+      ;POINT TO ODD BYTE
        BPL     SOPB2D     ;TRY TO NEGATE ODD BYTE
        DEC     RO
        INCB    (RO)+
        BEQ     TST46      ;RESET RO TO ODD BYTE
;          TRY TO INCREMENT ODD BYTE
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
;          CONDITIONAL BRANCH INST. AND <====
;          REPLACE THE MOVE INSTRUCTION <====
;          WHICH FOLLOWS W/ 753 <====
SOPB2D: MOV     #67,-(R2)    ;MOVE TO MAILBOX # ***** 67 *****
        INC     -(R2)
        HALT
;          SET MSGTYP TO FATAL ERROR
;          TEST CUMMULATIVE RESULT OF ABOVE INST.
;          OR SEQUENCE ERROR

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1687 003256 005212
1688 003260 022712 000046
1689 003264 001020
1690 003266 005000
1691 003270 105100
1692 003272 005200
1693 003274 005010
1694 003276 005030
1695 003300 001404
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1700 003302 012742 000070
1701 003306 005242
1702 003310 000000
1703 003312 005300
1704 003314 005300
1705 003316 005130
1706 003320 100002
1707 003322 005230
1708 003324 001404
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1711
1712
1713 003326
1714 003326 012742 000071
1715 003332 005242
1716 003334 000000
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*****
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.
RO IS SET TO 400, THE START OF THE ADDRESS TABLE, AND A CLR
INSTRUCTION IS EXECUTED WITH MODE 3 TO CLEAR LOC. 0. THEN RO
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.
*****
TST46: INC (R2) ;UPDATE TEST NUMBER
CMP #46,(R2) ;SEQUENCE ERROR?
BNE TST47-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR RO ;SET RO=400
COMB RO
INC RO
CLR (RO) ;CLEAR LOC 400
CLR @ (RO)+ ;TRY TO CLEAR LOC 0 USING MODE 3
BEQ SOP3A
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 772 ***** <====
; MOVE TO MAILBOX # ***** 70 *****
; SET MSGTYP TO FATAL ERROR
; CLR DID NOT SET Z-BIT
; RESET RO=400
SOP3A: DEC RO
DEC RO
COM @ (RO)+ ;TRY TO COMPLEMENT LOC 0 OF MODE 3
BPL SOP3B
INC @ (RO)+ ;TRY TO INCREMENT LOC 0 W/MODE 3
BEQ TST47
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 760 <====
SOP3B: MOV #71,-(R2) ;MOVE TO MAILBOX # ***** 71 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CUMMULATIVE RESULT OF ABOVE INST FAILED
; OR SEQUENCE ERROR

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003336 005212
003340 022712 000047
003344 001026
003346 005004
003350 105104
003352 005204
003354 005000
003356 005010
003360 005110
003362 105034
003364 001404

003366 012742 000072
003372 005242
003374 000000
003376 005304
003400 005304
003402 005234
003404 100006
003406 105434
003410 100004
003412 005304
003414 005304
003416 105234
003420 001404

003422 012742 000073
003426 005242
003430 000000

```
*****  
: THIS TEST VERIFIES MODE 3 SINGLE OPERAND BYTE INSTRUCTIONS  
: WHICH ADDRESS EVEN BYTES. AGAIN, THE TARGET LOCATION 0 IS USED  
: AND THE SAME TABLE AT 400 IS EMPLOYED.  
: AFTER POINTING R4 TO THE TABLE (400) AND SETTING LOCATION  
: 0 TO -1, A CLRB INSTRUCTION IS USED TO CLEAR BYTE 0.  
: SEVERAL OTHER MODE 3 INSTRUCTIONS ARE THEN USED WITH THE TABLE  
: TO VERIFY THE DATA RESULTS AND THE PROPER INCREMENTING OF THE REGISTER.  
: IF A FAILURE IS DETECTED, BE SURE THAT THE TABLE (LOCATION 400-402) HAS  
: THE PROPER VALUES (0).  
*****  
: TEST 47 TEST MODE 3 EVEN BYTE USING SOP INST.  
*****  
TST47: INC (R2) ;UPDATE TEST NUMBER  
CMP #47,(R2) ;SEQUENCE ERROR?  
BNE TST50-10 ;BR TO ERROR HALT ON SEQ ERROR  
CLR R4 ;SET R4=400  
COMB R4  
INC R4  
CLR R0 ;INITIALIZE LOC. 0=-1  
CLR (R0)  
COM (R0)  
CLRB @R4+ ;TRY TO CLEAR EVEN BYTE  
BEQ SOPB3A  
: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====  
: CONDITIONAL BRANCH INST. AND <====  
: REPLACE THE MOVE INSTRUCTION <====  
: WHICH FOLLOWS W/ 770 <====  
MOV #72,-(R2) ;MOVE TO MAILBOX # ***** 72 *****  
INC -(R2) ;SET MSGTYP TO FATAL ERROR  
HALT ;CLRB DID NOT SET Z-BIT  
SOPB3A: DEC R4 ;RESET POINTER  
DEC R4  
INC @R4+ ;TRY INCREMENTING WORD  
BPL SOPB3B ;TRY TO NEGATE EVEN BYTE  
NEGB @R4+  
BPL SOPB3B  
DEC R4  
DEC R4  
INCB @R4+ ;TRY TO INCREMENT EVEN BYTE  
BEQ TST50  
: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====  
: CONDITIONAL BRANCH INST. AND <====  
: REPLACE THE MOVE INSTRUCTION <====  
: WHICH FOLLOWS W/ 752 <====  
SOPB3B: MOV #73,-(R2) ;MOVE TO MAILBOX # ***** 73 *****  
INC -(R2) ;SET MSGTYP TO FATAL ERROR  
HALT ;CUMMULATIVE RESULT OF ABOVE INST FAILED  
: OR SEQUENCE ERROR
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1788 003432 005212 000050
1789 003434 022712
1790 003440 001024
1791 003442 005000
1792 003444 105100
1793 003446 005200
1794 003450 005030
1795 003452 005130
1796 003454 105030
1797 003456 001404
1798
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1800
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1802 003460 012742 000074
1803 003464 005242
1804 003466 000000
1805 003470 005300
1806 003472 005300
1807 003474 005300
1808 003476 005300
1809 003500 005230
1810 003502 105430
1811 003504 100002
1812 003506 105230
1813 003510 001404
1814
1815
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1818 003512
1819 003512 012742 000075
1820 003516 005242
1821 003520 000000
1822

```
*****
;
; 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.
;*****
TST50: INC (R2) ;UPDATE TEST NUMBER
; SEQUENCE ERROR?
CMP #50,(R2) ;BR TO ERROR HALT ON SEQ ERROR
BNE TST51-10 ;SET R0=400
CLR R0
COMB R0
INC R0
CLR @ (R0)+ ;INITIALIZE
COM @ (R0)+ ;LOC 0=-1 R0=404
CLRB @ (R0)+ ;TRY TO CLEAR ODD BYTE
BEQ SOPB3C
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 771 <====
MOV #74,-(R2) ;MOVE TO MAILBOX # ***** 74 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CLRB DID NOT SET Z-BIT
SOPB3C: DEC R0 ;RESET R0
DEC R0
DEC R0 ;POINT TO EVEN BYTE ADDR.
DEC R0
INC @ (R0)+ ;INCREMENT WORD
NEGB @ (R0)+ ;TRY TO NEGATE ODD BYTE
BPL SOPB3D
INCB @ (R0)+ ;TRY TO INCREMENT ODD BYTE
BEQ TST51
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 754 <====
SOPB3D: MOV #75,-(R2) ;MOVE TO MAILBOX # ***** 75 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CUMMULATIVE RESULT OF ABOVE INSTS FAILED
; OR SEQUENCE ERROR
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1827 003522 005212
1828 003524 022712 000051
1829 003530 001021
1830 003532 005000
1831 003534 105100
1832 003536 005200
1833 003540 005040
1834 003542 001404
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1839 003544 012742 000076
1840 003550 005242
1841 003552 000000
1842 003554 005200
1843 003556 005200
1844 003560 005140
1845 003562 100004
1846 003564 005200
1847 003566 005200
1848 003570 005240
1849 003572 001404
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1854 003574
1855 003574 012742 000077
1856 003600 005242
1857 003602 000000
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;*****
;TEST 51 TEST MODE 4 USING SOP INSTS
;*****
TST51: INC (R2) ;UPDATE TEST NUMBER
        CMP #51,(R2) ;SEQUENCE ERROR?
        BNE TST52-10 ;BR TO ERROR HALT ON SEQ ERROR
        CLR RO ;SET RO=400
        COMB RO
        INC RO
        CLR -(RO) ;TRY TO CLEAR USING MODE 4
        BEQ SOP4A
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 773 <====
        MOV #76,-(R2) ;MOVE TO MAILBOX # ***** 76 *****
        INC -(R2) ;SET MSGTYP TO FATAL ERROR
        HALT ;CLR DID NOT SET Z-BIT
SOP4A: INC RO ;RESET RO
        INC RO
        COM -(RO) ;TRY TO COMPLEMENT USING MODE 4
        BPL SOP4B
        INC RO ;MOVE POINTER
        INC -(RO)
        BEQ TST52
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 757 <====
SOP4B: MOV #77,-(R2) ;MOVE TO MAILBOX # ***** 77 *****
        INC -(R2) ;SET MSGTYP TO FATAL ERROR
        HALT ;CHECK CUMMULATIVE RESULT OF ABOVE INST.
; OR SEQUENCE ERROR

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003604 005212
003606 022712 000052
003612 001017
003614 005000
003616 005020
003620 105400
003622 005050
003624 001404

003626 012742 000100
003632 005242
003634 000000
003636 005200
003640 005200
003642 005150
003644 100002
003646 005250
003650 001404

003652
003652 012742 000101
003656 005242
003660 000000

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.
RO 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 RO 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

TST52: INC (R2) ;UPDATE TEST NUMBER
CMP #52,(R2) ;SEQUENCE ERROR?
BNE TST53-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR RO ;SET RO=376
CLR (RO)+
NEGB RO
CLR 2-(RO) ;TRY TO CLEAR LOC 0 W/MODE 5
BEQ SOP5A

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 773 <====
; MOVE TO MAILBOX # ***** 100 *****
; SET MSGTYP TO FATAL ERROR
; CLR DID NOT SET Z-BIT
; RESET RO

SOP5A: INC RO
INC RO
COM 2-(RO) ;TRY TO COMPLEMENT LOC. 0 W/MODE 5
BPL SOP5B
INC 2-(RO) ;TRY TO INCREMENT LOC. 0 W/MODE 5
BEQ TST53

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 761 <====

SOP5B: MOV #101, -(R2) ;MOVE TO MAILBOX # ***** 101 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;TEST CUMMULATIVE RESULT OF ABOVE INSTS
; OR SEQUENCE ERROR


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1920 003662 005212
1921 003664 022712 000053
1922 003670 001020
1923 003672 005000
1924 003674 105100
1925 003676 005200
1926 003700 005060 177400
1927 003704 001404
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1932 003706 012742 000102
1933 003712 005242
1934 003714 000000
1935 003716 005160 177400
1936 003722 100003
1937 003724 005260 177400
1938 003730 001404
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1943 003732
1944 003732 012742 000103
1945 003736 005242
1946 003740 000000
1947

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*****
:
:   THIS TEST VERIFIES MODE 6 SINGLE OPERAND INSTRUCTIONS.  IT
:   USES LOCATION 0 AS ITS TARGET DATA.  RO IS SET TO 400 USING
:   PREVIOUSLY TESTED INSTRUCTIONS AND A MODE 6 CLR INSTRUCTION IS
:   EXECUTED ON LOC. 0 USING RO AND A -400 OFFSET.  COM AND INC
:   INSTRUCTIONS ARE THEN USED TO VERIFY THE DATA.
:
:*****
:TEST 53          TEST MODE 6 USING SOP INSTS
:*****
TST53:  INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #53,(R2)     ;SEQUENCE ERROR?
        BNE     TST54-10     ;BR TO ERROR HALT ON SEQ ERROR
        CLR     RO           ;SET RO=400
        COMB    RO
        INC     RO
        CLR     -400(RO)     ;TRY TO CLEAR LOCATION 0 W/MODE 6
        BEQ     SOP6A
:
:   TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
:   CONDITIONAL BRANCH INST. AND <====
:   REPLACE THE MOVE INSTRUCTION <====
:   WHICH FOLLOWS W/ 772 <====
:
:   MOVE TO MAILBOX # ***** 102 *****
:   SET MSGTYP TO FATAL ERROR
:   CLR DID NOT SET Z-BIT
SOP6A:  COM     -400(RO)     ;TRY TO COMPLEMENT LOCATION 0 W/MODE 6
        BPL     SOP6B
        INC     -400(RO)     ;TRY TO INCREMENT LOCATION 0 W/MODE 6
        BEQ     TST54
:
:   TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
:   CONDITIONAL BRANCH INST. AND <====
:   REPLACE THE MOVE INSTRUCTION <====
:   WHICH FOLLOWS W/ 760 <====
:
SOP6B:  MOV     #103,-(R2)   ;MOVE TO MAILBOX # ***** 103 *****
        INC     -(R2)       ;SET MSGTYP TO FATAL ERROR
        HALT                    ;TEST CUMMULATIVE RESULT OF ABOVE INSTS
:                               ; OR SEQUENCE ERROR

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003742 005212
003744 022712 000054
003750 001020
003752 005000
003754 105100
003756 005200
003760 005070 000002
003764 001404

012742 000104
003772 005242
003774 000000
003776 005170 000002
004002 100003
004004 005270 000002
004010 001404

004012 012742 000105
004016 005242
004020 000000

THIS TEST VERIFIES MODE 7 SINGLE OPERAND INSTRUCTIONS. IT USES
THE POINTER TO LOC. 0 WHICH IS STORED AT LOC. 402.
RO 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.

TST54: INC (R2) ;UPDATE TEST NUMBER
CMP #54,(R2) ;SEQUENCE ERROR?
BNE TST55-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR RO ;SET RO=400
COMB RO
INC RO
CLR @2(RO) ;TRY TO CLEAR LOC. 0 W/MODE 7
BEQ SOP7A ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
 ; CONDITIONAL BRANCH INST. AND <====
 ; REPLACE THE MOVE INSTRUCTION <====
 ; WHICH FOLLOWS W/ 772 <====
MOV #104,-(R2) ;MOVE TO MAILBOX # ***** 104 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CLR DID NOT SET Z-BIT
SOP7A: COM @2(RO) ;TRY TO COMPLEMENT LOC. 0 W/MODE 7
BPL SOP7B
INC @2(RO) ;TRY TO INCREMENT LOC. 0 W/MODE 7
BEQ TST55 ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
 ; CONDITIONAL BRANCH INST. AND <====
 ; REPLACE THE MOVE INSTRUCTION <====
 ; WHICH FOLLOWS W/ 760 <====
SOP7B: MOV #105,-(R2) ;MOVE TO MAILBOX # ***** 105 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;TEST CUMMULATIVE RESULT OF ABOVE INSTS.
 ; OR SEQUENCE ERROR

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004022 005212
 004024 022712 000055
 004030 001017
 004032 005027
 004034 177777
 004036 001404
 004040 012742 000106
 004044 005242
 004046 000000
 004050 005237 004034
 004054 005467 177754
 004060 100003
 004062 005277 000012
 004066 001405
 004070
 004070 012742 000107
 004074 005242
 004076 000000
 004100 004034

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*****
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
*****
TST55: INC (R2) ;UPDATE TEST NUMBER
CMP #55,(R2) ;SEQUENCE ERROR?
BNE SOPB ;BR TO ERROR HALT ON SEQ ERROR
CLR (R7)+ ;CLEAR NEXT LOCATION: (SOPX)
SOPX: -1 ;USE MODE 27
BEQ SOPA
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 775 <====
MOV #106,-(R2) ;MOVE TO MAILBOX # ***** 106 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CLR DID NOT SET Z-BIT
SOPA: INC @SOPX ;INC SOPX W/MODE 37
NEG SOPX ;NEGATE SOPX W/MODE 67
BPL SOPB
INC @SOPXAD ;INC SOPX W/MODE 77
BEQ TST56
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 761 <====
SOPB: MOV #107,-(R2) ;MOVE TO MAILBOX # ***** 107 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;INC DID NOT SET Z-BIT
; OR SEQUENCE ERROR
SOPXAD: SOPX ;INDIRECT ADDRESS OF SOPX
  
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004102 005212
004104 022712 000056
004110 001010
004112 005000
004114 000277
004116 000244
004120 005700
004122 102403
004124 100402
004126 103401
004130 001404

004132 012742 000110
004132 005242
004136 000000

```
*****
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
*****
TST56:  INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #56,(R2)     ;SEQUENCE ERROR?
        BNE     TST57-10     ;BR TO ERROR HALT ON SEQ ERROR
        CLR     R0           ;INITIALIZE R0=0
        SCC     ;            ;SET CC=1011
        CLZ     ;
        TST     R0           ;TRY TST W/ MODE 0
        BVS     SNMOA        ;CHECK THAT CC=0100
        BMI     SNMOA
        BCS     SNMOA
        BEQ     TST57
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 770 <====
SNMOA:  MOV      #110,-(R2)   ;MOVE TO MAILBOX # ***** 110 *****
        INC     -(R2)        ;SET MSGTYP TO FATAL ERROR
        HALT    ;CONDITION CODES NOT SET PROPERLY
        ; OR SEQUENCE ERROR
*****
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004142 005212
004144 022712 000057
004150 001010
004152 005000
004154 105100
004156 000277
004160 000250
004152 105700
004164 102402
004166 101401
004170 100404

004172 012742 000111
004172 005242
004200 000000

```

*****
: THIS TEST VERIFIES SINGLE OPERAND NON-MODIFYING BYTE INSTRUCTIONS WITH MODE 0.
: RO IS SET TO 377 AND COMPLEMENT OF THE EXPECTED CONDITION CODES
: IS LOADED IN PSW. A TSTB INSTRUCTION IS EXECUTED AND THE RESULTS
: ARE CHECKED WITH SEVERAL CONDITIONAL BRANCH INSTRUCTIONS.
: THIS VERIFIES THAT THE PROPER BYTE WAS TESTED.
*****
: TEST 57 TEST MODE 0 EVEN BYTE W/ SOP NON-MODIFYING
*****
TST57: INC (R2) ;UPDATE TEST NUMBER
      CMP #57,(R2) ;SEQUENCE ERROR?
      BNE TST60-10 ;BR TO ERROR HALT ON SEQ ERROR
      CLR RO ;INITIALIZE
      COMB RO ;RO=377
      SCC ;SET CC=0111
      CLN
      TSTB RO ;TRY TST EVEN BYTE
      BVS SNMBOA ;CHECK CC=1000
      BLOS SNMBOA
      BMI TST60
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 770 <====
SNMBOA: MOV #111,-(R2) ;MOVE TO MAILBOX # ***** 111 *****
      INC -(R2) ;SET MSGTYP TO FATAL ERROR
      HALT ;CONDITION CODES NOT SET PROPERLY
; OR SEQUENCE ERROR
  
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2110
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2112
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2114
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2119
2120
2121
2122
2123
2124
2125

004202 005212
004204 022712 000060
004210 001011
004212 005000
004214 005010
004216 000277
004220 000244
004222 005710
004224 102403
004226 103402
004230 100401
004232 001404

004234
004234 012742 000112
004240 005242
004242 000000

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 RO AND CONDITIONAL BRANCHES TEST
THE RESULTS.

TEST 60 TEST MODE 1 SOP NON-MODIFYING

TST60: INC (R2) ;UPDATE TEST NUMBER
CMP #60,(R2) ;SEQUENCE ERROR?
BNE TST61-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR RO ;POINT TO LOC 0
CLR (RO) ;CLEAR LOC 0
SCC ;INITIALIZE
CLZ ;CC=1011
TST (RO) ;TRY TST W/ MODE 1
BVS SNM1A ;CHECK CC=0100
BCS SNM1A
BMI SNM1A
BEQ TST61

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 767 <====

SNM1A: MOV #112,-(R2) ;MOVE TO MAILBOX # ***** 112 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CC'S NOT SET PROPERLY
; OR SEQUENCE ERROR

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2161
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2168
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2170
2171
2172
2173
2174

004244 005212
004246 022712 000061
004252 001026
004254 005000
004256 005010
004260 105110
004262 000277
004264 000250
004266 105710
004270 102402
004272 101401
004274 100404

004276 012742 000113
004276 005242
004302 000000
004304 005000
004306 005200
004310 000277
004312 000244
004314 105710
004316 102403
004320 103402
004322 100401
004324 001404
004326

004330 012742 000114
004330 005242
004334 000000
004336

```
*****
: 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
*****
TST61: INC (R2) ; UPDATE TEST NUMBER
      CMP #61,(R2) ; SEQUENCE ERROR?
      BNE TST62-10 ; BR TO ERROR HALT ON SEQ ERROR
      CLR R0 ; POINT TO LOC 0
      CLR (R0) ; CLEAR LOC 0
      COMB (R0) ; COMPLEMENT BYTE 0
      SCC ; SET CC=0111
      CLN
      TSTB (R0) ; TRY TST ON EVEN BYTE
      BVS SNMB1A
      BLOS SNMB1A
      BMI SNMB1B

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 767 <====

SNMB1A: MOV #113,-(R2) ; MOVE TO MAILBOX # ***** 113 *****
        INC -(R2) ; SET MSGTYP TO FATAL ERROR
        HALT ; CC'S NOT CORRECT

SNMB1B: CLR R0
        INC R0
        SCC ; SET CC=1011
        CLZ
        TSTB (R0) ; TRY TO TST AN ODD BYTE
        BVS SNMB1C ; CHECK CC=0100
        BCS SNMB1C
        BMI SNMB1C
        BEQ TST62

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 752 <====

SNMB1C: MOV #114,-(R2) ; MOVE TO MAILBOX # ***** 114 *****
        INC -(R2) ; SET MSGTYP TO FATAL ERROR
        HALT ; CC'S NOT CORRECT
        OR SEQUENCE ERROR
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004340 005212
004342 022712 000062
004346 001020
004350 005000
004352 005010
004354 000277
004356 000244
004360 005720
004362 102403
004364 103402
004366 100401
004370 001404

004372 012742 000115
004376 005242
004400 000000
004402 005300
004404 005300
004406 001404

004410 012742 000116
004414 005242
004416 000000

```
*****
: 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
*****
TST62: INC (R2) ;UPDATE TEST NUMBER
CMP #62,(R2) ;SEQUENCE ERROR?
BNE TST63-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR RO ;INITIALIZE RO=0
CLR (RO) ;CLEAR LOC 0
SCC ;SET CC=1011
CLZ
TST (RO)+ ;TRY TST W/ MODE 2
BVS SNM2A ;CHECK CC=0100
BCS SNM2A
BMI SNM2A
BEQ SNM2B

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 767 <====

SNM2A: MOV #115,-(R2) ;MOVE TO MAILBOX # ***** 115 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CC'S NOT CORRECT
SNM2B: DEC RO ;RESET RO
DEC RO
BEQ TST63

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 760 <====

MOV #116,-(R2) ;MOVE TO MAILBOX # ***** 116 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;MODE 2 DID NOT INC REG CORRECTLY
; OR SEQUENCE ERROR
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2250
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2255
2256
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2272

004420 005212
004422 022712 000063
004426 001042
004430 005000
004432 005010
004434 105110
004436 000277
004440 000250
004442 105720
004444 102402
004446 101401
004450 100404

004452 012742 000117
004456 005242
004460 000000
004462 005300
004464 001404

004466 012742 000120
004472 005242
004474 000000
004476 005200
004500 000277
004502 000244
004504 105720
004506 102403
004510 103402
004512 100401
004514 001404

004516 012742 000121
004522 005242

```
*****  
: 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  
*****  
TST63: INC (R2) ; UPDATE TEST NUMBER  
CMP #63,(R2) ; SEQUENCE ERROR?  
BNE TST64-10 ; BR TO ERROR HALT ON SEQ ERROR  
CLR R0 ; CLEAR R0  
CLR (R0) ; CLEAR LOC 0  
COMB (R0) ; SET LOC 0=377  
SCC ; SET CC=0111  
CLN ;  
TSTB (R0)+ ; TRY TST OF EVEN BYTE  
BVS SNMB2A  
BLOS SNMB2A  
BMI SNMB2B  
  
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====  
; CONDITIONAL BRANCH INST. AND <====  
; REPLACE THE MOVE INSTRUCTION <====  
; WHICH FOLLOWS W/ 767 <====  
  
SNMB2A: MOV #117,-(R2) ; MOVE TO MAILBOX # ***** 117 *****  
INC -(R2) ; SET MSGTYP TO FATAL ERROR  
HALT ; CC'S NOT SET CORRECTLY  
SNMB2B: DEC R0 ; DECREMENT R0  
BEQ SNMB2C  
  
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====  
; CONDITIONAL BRANCH INST. AND <====  
; REPLACE THE MOVE INSTRUCTION <====  
; WHICH FOLLOWS W/ 761 <====  
  
SNMB2C: MOV #120,-(R2) ; MOVE TO MAILBOX # ***** 120 *****  
INC -(R2) ; SET MSGTYP TO FATAL ERROR  
HALT ; MODE 2 DID NOT INC REG CORRECTLY  
SNMB2C: INC R0 ; POINT TO ODD BYTE  
SCC ; SET CC=1011  
CLZ  
TSTB (R0)+ ; TRY TST OF ODD BYTE  
BVS SNMB2D  
BCS SNMB2D  
BMI SNMB2D  
BEQ SNMB2E  
  
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====  
; CONDITIONAL BRANCH INST. AND <====  
; REPLACE THE MOVE INSTRUCTION <====  
; WHICH FOLLOWS W/ 745 <====  
  
SNMB2D: MOV #121,-(R2) ; MOVE TO MAILBOX # ***** 121 *****  
INC -(R2) ; SET MSGTYP TO FATAL ERROR
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2328

004544 005212
004546 022712 000064
004552 001022
004554 005000
004556 005010
004560 105100
004562 005300
004564 000277
004566 000244
004570 005730
004572 102403
004574 103402
004576 100401
004600 001404

004602 012742 000123
004606 005242
004610 000000
004612 005300
004614 105100
004616 001404

004620 012742 000124
004624 005242
004626 000000

```
*****
: THIS TEST VERIFIES MODE 3 SINGLE OPERAND NON-MODIFYING INSTRUCTIONS.
: A POINTER IN A TABLE AT LOC. 376 IS USED TO TEST LOCATION 0.
: THE CC'S AND THE REGISTER ARE CHECKED FOLLOWING THE
: TST MODE 3 INSTRUCTION.
*****
: TEST 64 TEST MODE 3 W/ SOP NON-MODIFYING INSTS
*****
TST64: INC (R2) ; UPDATE TEST NUMBER
      CMP #64,(R2) ; SEQUENCE ERROR?
      BNE TST65-10 ; BR TO ERROR HALT ON SEQ ERROR
      CLR RO ; RO=0
      CLR (RO) ; CLEAR LOC 0
      COMB RO ; RO=376
      DEC RO
      SCC ; SET CC=1011
      CLZ
      TST 2(RO)+ ; TRY TST W/ MODE 3
      BVS SNM3A ; CHECK CC=0100
      BCS SNM3A
      BMI SNM3A
      BEQ SNM3B
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 765 <====
SNM3A: MOV #123, -(R2) ; MOVE TO MAILBOX # ***** 123 *****
      INC -(R2) ; SET MSGTYP TO FATAL ERROR
      HALT ; CC'S NOT CORRECT
SNM3B: DEC RO ; RO=377
      COMB RO ; RO=0
      BEQ TST65
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 756 <====
      MOV #124, -(R2) ; MOVE TO MAILBOX # ***** 124 *****
      INC -(R2) ; SET MSGTYP TO FATAL ERROR
      HALT ; MODE 3 DID NOT INC REG CORRECTLY
; OR SEQUENCE ERROR
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004630 005212
004632 022712 000065
004636 001036
004640 005000
004642 005010
004644 105110
004646 105100
004650 005200
004652 005720
004654 000277
004656 000250
004660 105730
004662 102402
004664 101401
004666 100404

004670
004670 012742 000125
004674 005242
004676 000000
004700 000277
004702 000244
004704 105730
004706 102403
004710 103402
004712 100401
004714 001404

004716
004716 012742 000126
004722 005242
004724 000000
004726 005720
004730 005710
004732 100404

```
*****
;
; 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.
*****
TST65: INC (R2) ; UPDATE TEST NUMBER
; CMP #65, (R2) ; SEQUENCE ERROR?
; BNE TST66-10 ; BR TO ERROR HALT ON SEQ ERROR
; CLR RO ; RO=0
; CLR (RO) ; CLEAR LOC 0
; COMB (RO) ; LOC. 0 =377
; COMB RO
; INC RO
; TST (RO)+ ; RO=402
; SCC ; CC=0111
; CLN
; TSTB @ (RO)+ ; TRY TST OF EVEN BYTE
; BVS SNMB3A ; CHECK CC=1000
; BLOS SNMB3A
; BMI SNMB3B
;
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 764 <====
;
SNMB3A: MOV #125, -(R2) ; MOVE TO MAILBOX # ***** 125 *****
; INC -(R2) ; SET MSGTYP TO FATAL ERROR
; HALT ; CC'S NOT CORRECT
SNMB3B: SCC ; SET CC=1011
; CLZ
; TSTB @ (RO)+ ; TRY TST OF ODD BYTE
; BVS SNMB3C ; CHECK CC=0100
; BCS SNMB3C
; BMI SNMB3C
; BEQ SNMB3D
;
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 751 <====
;
SNMB3C: MOV #126, -(R2) ; MOVE TO MAILBOX # ***** 126 *****
; INC -(R2) ; SET MSGTYP TO FATAL ERROR
; HALT ; CC'S NOT CORRECT
SNMB3D: TST (RO)+ ; RO=410
; TST (RO)
; BMI TST66
;
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
```


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2475

005022 005212
005024 022712 000067
005030 001022
005032 005000
005034 005010
005036 005110
005040 105100
005042 005200
005044 000277
005046 000250
005050 005750
005052 102402
005054 101401
005056 100404

005060
005060 012742 000132
005064 005242
005066 000000
005070 005200
005072 105100
005074 001404

005076 012742 000133
005102 005242
005104 000000

```
*****  
; THIS TEST VERIFIES MODE 5 SOP NON-MODIFYING INSTRUCTIONS.  
; IT USES A POINTER AT LOC. 376 TO TEST LOC. 0. RO IS SET  
; TO 400, A TST MODE 5 INSTRUCTION IS EXECUTED AND THE CC'S CHECKED.  
; RO IS CHECKED TO INSURE PROPER DECREMENTING.  
*****  
; TEST 67 TEST MODE 5 W/ SOP NON-MODIFYING INSTS  
*****  
TST67: INC (R2) ; UPDATE TEST NUMBER  
CMP #67,(R2) ; SEQUENCE ERROR?  
BNE TST70-10 ; BR TO ERROR HALT ON SEQ ERROR  
CLR RO ; RO=0  
CLR (RO) ; LOC 0=0  
COM (RO) ; LOC 0=-1  
COMB RO ; RO=377  
INC RO ; RO=400  
SCC ; SET CC=0111  
CLN  
TST @-(RO) ; TRY TST W/ MODE 5  
BVS SNM5A ; CHECK CC=1000  
BLOS SNM5A  
BMI SNM5B  
  
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====  
; CONDITIONAL BRANCH INST. AND <====  
; REPLACE THE MOVE INSTRUCTION <====  
; WHICH FOLLOWS W/ 765 <====  
  
SNM5A: MOV #132,-(R2) ; MOVE TO MAILBOX # ***** 132 *****  
INC -(R2) ; SET MSGTYP TO FATAL ERROR  
HALT ; CC'S NOT SET PROPERLY  
SNM5B: INC RO ; RO=377  
COMB RO ; RO=0  
BEQ TST70  
  
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====  
; CONDITIONAL BRANCH INST. AND <====  
; REPLACE THE MOVE INSTRUCTION <====  
; WHICH FOLLOWS W/ 756 <====  
  
MOV #133,-(R2) ; MOVE TO MAILBOX # ***** 133 *****  
INC -(R2) ; SET MSGTYP TO FATAL ERROR  
HALT ; MODE 5 DID NOT DEC RO CORRECTLY  
; OR SEQUENCE ERROR
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005106 005212
005110 022712 000070
005114 001021
005116 005000
005120 005010
005122 005110
005124 105100
005126 000277
005128 000250
005132 005760 177401
005136 102402
005140 101401
005142 100404

005144
005144 012742 000134
005150 005242
005152 000000
005154 105100
005156 001404

005160 012742 000135
005164 005242
005166 000000
  
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:*****
:      THIS TEST VERIFIES MODE 6 SOP NON-MODIFYING INSTRUCTIONS.
:RD IS SET TO 377 AND A MODE 6 TST INSTRUCTION IS EXECUTED
:USING RD AND AN OFFSET OF -377. THE CC'S ARE CHECKED AS WELL
:AS RD TO INSURE IT WAS NOT ALTERED.
:*****
:TEST 70          TEST MODE 6 W/ SOP NON-MODIFYING INSTS
:*****
TST70:  INC      (R2)           ; UPDATE TEST NUMBER
        CMP      #70,(R2)     ; SEQUENCE ERROR?
        BNE     TST71-10     ; BR TO ERROR HALT ON SEQ ERROR
        CLR     RD           ; RD=0
        CLR     (RD)         ; LOC 0=0
        COM     (RD)         ; LOC 0=-1
        COMB    RD           ; RD=377
        SCC     ; SET CC=0111
        CLN
        TST     -377(RD)     ; TRY TST W/ MODE 6
        BVS     SNM6A        ; CHECK CC=1000
        BLOS    SNM6A
        BMI     SNM6B
:
: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <=====
: CONDITIONAL BRANCH INST. AND           <=====
: REPLACE THE MOVE INSTRUCTION           <=====
: WHICH FOLLOWS W/ 765                   <=====
:
SNM6A:  MOV      #134,-(R2)   ; MOVE TO MAILBOX # ***** 134 *****
        INC      -(R2)
        HALT
SNM6B:  COMB    RD           ; SET MSGTYP TO FATAL ERROR
        BEG     TST71       ; CC'S INCORRECT
:
: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS   <=====
: CONDITIONAL BRANCH INST. AND           <=====
: REPLACE THE MOVE INSTRUCTION           <=====
: WHICH FOLLOWS W/ 757                   <=====
:
        MOV     #135,-(R2)   ; MOVE TO MAILBOX # ***** 135 *****
        INC     -(R2)
        HALT                 ; SET MSGTYP TO FATAL ERROR
:                               ; TST MODE 6 INCORRECTLY CHANGED RC
:                               ; OR SEQUENCE ERROR
  
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00555
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00558
00559

005170 005212
005172 022712 000071
005176 001021
005200 005000
005202 005010
005204 005110
005206 105100
005210 000277
005212 000250
005214 005770 000001
005220 102402
005222 101401
005224 100404

005226 012742 000136
005226 005242
005232 000000
005234 105100
005236 001404

005242 012742 000137
005246 005242
005250 000000

```
*****
THIS TEST VERIFIES MODE 7 SOP NON-MODIFYING INSTRUCTIONS.
IT USES A POINTER TO LOC. 0 STORED AT LOC. 400 TO TST LOC. 0.
RO IS SET TO 377 AND LOC. 0 IS TESTED THRU THE POINTER AT 400 USING
RO AND AN OFFSET OF 1.
*****
TEST 71 TEST MODE 7 W/ SOP NON-MODIFYING INSTS.
*****
TST71: INC (R2) ;UPDATE TEST NUMBER
CMP #71,(R2) ;SEQUENCE ERROR?
BNE TST72-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR RO ;RO=0
CLR (RO) ;LOC 0=0
COM (RO) ;LOC 0=-1
COMB RO ;RO=377
SCC ;CC=0111
CLN
TST #1(RO) ;TRY TST W/ MODE 7
BVS SNM7A ;CHECK CC=1000
BLOS SNM7A
BMI SNM7B

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 765 <====

SNM7A: MOV #136,-(R2) ;MOVE TO MAILBOX # ***** 136 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;CC'S NOT CORRECT
BEG RO ;RO=0
TST72

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 757 <====

SNM7B: MOV #137,-(R2) ;MOVE TO MAILBOX # ***** 137 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;TST MODE 7 INCORRECTLY CHANGED RC
; OR SEQUENCE ERROR
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2570 005252 005212
2571 005254 022712 000072
2572 005260 001006
2573 005262 005000
2574 005264 005100
2575 005266 005004
2576 005270 060004
2577 005272 005204
2578 005274 001404
2579
2580
2581
2582
2583 005276 012742 000140
2584 005302 005242
2585 005304 000000
2586
2587
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2594
2595
2596
2597 005306 005212
2598 005310 022712 000073
2599 005314 001006
2600 005316 005000
2601 005320 005004
2602 005322 005100
2603 005324 010004
2604 005326 005204
2605 005330 001404
2606
2607
2608
2609
2610 005332 012742 000141
2611 005336 005242
2612 005340 000000
2613

 : THIS TEST VERIFIES MODE 0 DOUBLE OPERAND INSTRUCTIONS. IT SETS
 : DATA IN R0 AND R4 AND USES THE ADD INSTRUCTION TO TEST THE DOP
 : MICROCODE.
 :*****

TEST 72 TEST MODE 0 DOUBLE-OPERAND (DOP) INSTS.
 :*****

TST72: INC (R2) ; UPDATE TEST NUMBER
 CMP #72,(R2) ; SEQUENCE ERROR?
 BNE TST73-10 ; BR TO ERROR HALT ON SEQ ERROR
 CLR R0 ; R0=0
 COM R0 ; R0=-1
 CLR R4 ; R4=0
 ADD R0,R4 ; TRY ADD: R4=-1
 INC R4 ; R4=0
 BEQ TST73

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
 ; CONDITIONAL BRANCH INST. AND <====
 ; REPLACE THE MOVE INSTRUCTION <====
 ; WHICH FOLLOWS W/ 772 <====
 ; MOVE TO MAILBOX # ***** 140 *****
 ; SET MSGTYP TO FATAL ERROR
 ; ADD INST. FAILED W/ MODE 0
 ; OR SEQUENCE ERROR

 : THIS TEST VERIFIES THE MOVE INSTRUCTION WITH MODE 0 TO MODE 0.
 : THIS TEST IS NECESSARY BECAUSE THIS PARTICULAR INSTRUCTION UTILIZES UNIQUE
 : MICROCODE.
 :*****

TEST 73 MOV MODE 0 TO MODE 0
 :*****

TST73: INC (R2) ; UPDATE TEST NUMBER
 CMP #73,(R2) ; SEQUENCE ERROR?
 BNE TST74-10 ; BR TO ERROR HALT ON SEQ ERROR
 CLR R0 ; R0=0
 CLR R4 ; R4=0
 COM R0 ; R0=-1
 MOV R0,R4 ; TRY MOVE -1 TO R4
 INC R4 ; INC R4
 BEQ TST74

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
 ; CONDITIONAL BRANCH INST. AND <====
 ; REPLACE THE MOVE INSTRUCTION <====
 ; WHICH FOLLOWS W/ 772 <====
 ; MOVE TO MAILBOX # ***** 141 *****
 ; SET MSGTYP TO FATAL ERROR
 ; MOVE FAILED MODE 0 TO MODE 0
 ; OR SEQUENCE ERROR

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2626 005342 005212
2627 005344 022712 000074
2628 005350 001051
2629 005352 005000
2630 005354 010004
2631 005356 001404
2632
2633
2634
2635
2636 005360 012742 000142
2637 005364 005242
2638 005366 000000
2639 005370 005200
2640 005372 005100
2641 005374 005104
2642 005376 040004
2643 005400 005304
2644 005402 001404
2645
2646
2647
2648
2649 005404 012742 000143
2650 005410 005242
2651 005412 000000
2652 005414 050004
2653 005416 005204
2654 005420 005204
2655 005422 001404
2656
2657
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2659
2660 005424 012742 000144
2661 005430 005242
2662 005432 000000
2663 005434 005000
2664 005436 105100
2665 005440 005004
2666 005442 005104
2667 005444 040004
2668 005446 060004
2669 005450 005204

```

```

*****
THIS TEST QUICKLY VERIFIES THE REMAINING DOP MODIFYING INSTRUCTIONS
WITH MODE 0 TO PROVIDE A BASELINE FOR SUBSEQUENT TESTS.
SINGLE OPERAND INSTRUCTIONS ARE USED TO SET UP DATA IN R0 AND R4
BEFORE EACH OF THE SEVERAL DOP MODIFYING INSTRUCTIONS ARE USED AND
VERIFIED.
*****
TEST 74 TEST ALL THE DOP INSTRUCTIONS W/ SOURCE MODE 0
*****
†ST74: INC (R2) ;UPDATE TEST NUMBER
CMP #74,(R2) ;SEQUENCE ERROR?
BNE TST75-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR R0 ;R0=0
MOV R0,R4 ;TRY MOVE MODE 0,0
BEQ DOP0A
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 775 <====
; MOVE TO MAILBOX # ***** 142 *****
; SET MSGTYP TO FATAL ERROR
; Z-BIT NOT SET
; R0=1
; R0=177776
; R4=177777
; TRY BIC: R4=1
; R4=0
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 763 <====
; MOVE TO MAILBOX # ***** 143 *****
; SET MSGTYP TO FATAL ERROR
; BIC CLEAR RESULT INCORRECT
; TRY BIS: R4=177777
; R4=0
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 753 <====
; MOVE TO MAILBOX # ***** 144 *****
; SET MSGTYP TO FATAL ERROR
; RESULT OF BIS INCORRECT
; R0=0
; R0=377
; R4=0
; R4=177777
; R4=177400
; TRY ADD: R4=177777
; R4=0

```

2670	005452	001404		BEQ	DOP0D				
2671									
2672									
2673									
2674									
2675	005454	012742	000145	MOV	#145, -(R2)				
2676	005460	005242		INC	-(R2)				
2677	005462	000000		HALT					
2678	005464	160004		DOP0D: SUB	R0, R4				
2679	005466	105404		NEGB	R4				
2680	005470	005204		INC	R4				
2681	005472	001404		BEQ	TST75				
2682									
2683									
2684									
2685									
2686	005474	012742	000146	MOV	#146, -(R2)				
2687	005500	005242		INC	-(R2)				
2688	005502	000000		HALT					
2689									


```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 737 <====
; MOVE TO MAILBOX # ***** 145 *****
; SET MSGTYP TO FATAL ERROR
; RESULT OF ADD INCORRECT
; 177401=R4
; R4=177777
; RD=0
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 727 <====
; MOVE TO MAILBOX # ***** 146 *****
; SET MSGTYP TO FATAL ERROR
; RESULT OF SUB INCORRECT
; OR SEQUENCE ERROR

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2700 005504 005212
2701 005506 022712 000075
2702 005512 001042
2703 005514 005000
2704 005516 005004
2705 005520 005204
2706 005522 020400
2707 005524 003004
2708
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2712 005526 012742 000147
2713 005532 005242
2714 005534 000000
2715 005536 020004
2716 005540 002404
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2721 005542 012742 000150
2722 005546 005242
2723 005550 000000
2724 005552 005200
2725 005554 020400
2726 005556 001404
2727
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2730
2731 005560 012742 000151
2732 005564 005242
2733 005566 000000
2734 005570 005000
2735 005572 005100
2736 005574 005004
2737 005576 030004
2738 005600 001404
2739
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2743 005602 012742 000152
2744 005606 005242
2745 005610 000000

```

```

*****
THIS TEST VERIFIES MODE 0 DOP NON-MODIFYING INSTRUCTIONS.
RO AND R4 ARE PRESET TO 0 AND 1 RESPECTIVELY. COMPARE INSTRUCTIONS ARE
THEN EXECUTED AND CHECKED. FIRST R4 IS COMPARED TO RO THEN RO TO R4.
*****
TEST 75 TEST DOP NON-MODIFYING INST. W/ SOURCE MODE 0
*****
TST75: INC (R2) ;UPDATE TEST NUMBER
CMP #75,(R2) ;SEQUENCE ERROR?
BNE TST76-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR RO ;RO=0
CLR R4 ;R4=0
INC R4 ;R4=1
CMP R4,RO ;TRY COMPARE R4 TO RO
BGT DNM1
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 773 <====
; MOVE TO MAILBOX # ***** 147 *****
; SET MSGTYP TO FATAL ERROR
; CC'S NOT CORRECT FOR CMP
; TRY COMPARE RO TO R4
DNM1: MOV #147,-(R2)
INC -(R2)
HALT
CMP RO,R4
BLT DNM2
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 765 <====
; MOVE TO MAILBOX # ***** 150 *****
; SET MSGTYP TO FATAL ERROR
; CC'S NOT CORRECT FOR CMP
; R4=0
; TRY COMPARE R4=1 TO RO=1
DNM2: MOV #150,-(R2)
INC -(R2)
HALT
INC RO
CMP R4,RO
BEQ DNM3
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 756 <====
; MOVE TO MAILBOX # ***** 151 *****
; SET MSGTYP TO FATAL ERROR
; CC'S NOT CORRECT (Z=1) FOR CMP
; RO=0
; RO=177777
; R4=0
; TRY BIT RO TO R4
DNM3: MOV #151,-(R2)
INC -(R2)
HALT
CLR RO
COM RO
CLR R4
BIT RO,R4
BEQ DNM4
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 745 <====
; MOVE TO MAILBOX # ***** 152 *****
; SET MSGTYP TO FATAL ERROR
; CC'S NOT CORRECT FOR BIT

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```

2746 005612 005304          DNM4:  DEC  R4          :R4=177777
2747 005614 030004          BIT  R0,R4       :TRY BIT AGAIN
2748 005616 100404          BMI  TST76
2749
2750
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2752
2753 005620 012742 000153      MOV  #153,-(R2)   ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
2754 005624 005242          INC  -(R2)        ; CONDITIONAL BRANCH INST. AND <====
2755 005626 000000          HALT              ; REPLACE THE MOVE INSTRUCTION <====
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```

:*****
: THIS TEST VERIFIES MODE 1 DOP INSTRUCTIONS.  R0 IS SET TO -1
: AND LOC 0 TO 1.  R4 IS THEN CLEARED AND USED TO POINT TO LOC 0.
: IN THE ADD MODE 1 INSTRUCTION, LOC 0 IS ADDED TO R0 AND THE
: RESULTS VERIFIED.
:*****

```

```

:TEST 76          TEST MODE 1 W/ DOP INST.
:*****

```

```

TST76:  INC  (R2)          ;UPDATE TEST NUMBER
        CMP  #76,(R2)    ;SEQUENCE ERROR?
        BNE  TST77-10   ;BR TO ERROR HALT ON SEQ ERROR
        CLR  R0          ;R0=0
        COM  R0          ;R0=177777
        CLR  R4          ;R4=0
        CLR  (R4)        ;LOC 0=0
        INC  (R4)        ;LOC 0=1
        ADD  (R4),R0     ;TRY ADD SOURCE MODE 1
        BEQ  TST77

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2778
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2782 005656 012742 000154      MOV  #154,-(R2)   ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
2783 005662 005242          INC  -(R2)        ; CONDITIONAL BRANCH INST. AND <====
2784 005664 000000          HALT              ; REPLACE THE MOVE INSTRUCTION <====
2785
                ; WHICH FOLLOWS W/ 771 <====
                ; MOVE TO MAILBOX # ***** 154 *****
                ; SET MSGTYP TO FATAL ERROR
                ; RESULT OF ADD INCORRECT
                ; OR SEQUENCE ERROR

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2811
2812
2813

005666 005212
005670 022712 000077
005674 001007
005676 005000
005700 005010
005702 005110
005704 005004
005706 151004
005710 105104
005712 001404

005714 012742 000155
005720 005242
005722 000000

```
*****
:
:   THIS TEST VERIFIES MODE 1 DOP BYTE INSTRUCTIONS WHICH ADDRESS
:   EVEN BYTES.  LOC. 0 IS SET TO -1 AND R4 IS CLEARED.  THEN R4 IS
:   SET TO -1 USING A BISB THRU R0 WITH MODE 1.
:
:*****
:TEST 77      TEST MODE 1 - EVEN BYTE W/ DOP INSTS.
:*****
TST77:  INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #77,(R2)     ;SEQUENCE ERROR?
        BNE     TST100-10    ;BR TO ERROR HALT ON SEQ ERROR
        CLR     R0           ;R0=0
        CLR     (R0)         ;LOC. 0=0
        COM     (R0)         ;LOC. 0=177777
        CLR     R4           ;R4=0
        BISB   (R0),R4      ;TRY MODE 1- EVEN BYTE W/ DOP
        COMB   R4           ;R4=0
        BEQ    TST100
:
:   TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
:   CONDITIONAL BRANCH INST. AND <====
:   REPLACE THE MOVE INSTRUCTION <====
:   WHICH FOLLOWS W/ 771 <====
:MOVE TO MAILBOX # ***** 155 *****
:SET MSGTYP TO FATAL ERROR
:RESULT OF BISB IS INCORRECT
: OR SEQUENCE ERROR
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2825 005724 005212
2826 005726 022712 000100
2827 005732 001007
2828 005734 005000
2829 005736 005010
2830 005740 005110
2831 005742 005004
2832 005744 105104
2833 005746 121004
2834 005750 001404
2835
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2839 005752 012742 000156
2840 005756 005242
2841 005760 000000
2842

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```

;*****
; THIS TEST VERIFIES MODE 1 DOP NON-MODIFYING INSTRUCTIONS
; WHICH ADDRESS EVEN BYTES. LOC 0 IS SET TO -1 AND R0 IS CLEARED
; AND USED AS THE ADDRESSING REGISTER. R4 IS SET TO 377 AND A
; MODE 1,0 CMPB INSTRUCTION IS USED THE RESULTS VERIFIED.
;*****
;TEST 100 TEST MODE 1 - EVEN BYTE W/ DOP NON-MODIFYING INST.
;*****
TST100: INC (R2) ;UPDATE TEST NUMBER
CMP #100,(R2) ;SEQUENCE ERROR?
BNE TST101-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR R0 ;R0=0
CLR (R0) ;LOC 0=0
COM (R0) ;LOC 0=177777
CLR R4 ;R4=0
COMB R4 ;R4=377
CMPB (R0),R4 ;TRY MODE 1 - EVEN BYTE W/ DOP NON-MODIFYING
BEQ TST101
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 771 <====
;MOVE TO MAILBOX # ***** 156 *****
;SET MSGTYP TO FATAL ERROR
;RESULT OF CMPB INCORRECT
; OR SEQUENCE ERROR

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2887

005762 005212
005764 022712 000101
005770 001020
005772 005000
005774 005010
005776 105110
006000 005110
006002 005004
006004 005104
006006 111004
006010 005704
006012 001404

006014 012742 000157
006020 005242
006022 000000
006024 005110
006026 111004
006030 100404

006032 012742 000160
006036 005242
006040 000000

```
*****
: THIS TEST VERIFIES MODE 1,0 MOV B INSTRUCTIONS
: WHICH ADDRESS EVEN BYTES. LOC. 0 IS SET TO 177400, R0 IS CLEARED AND
: R4 IS SET TO -1. MOV B ARE USED TO MOVE BYTE 0 TO R4. THIS
: VERIFIES THAT THE PROPER BYTE WAS SELECTED AND THAT THE SIGN-X-TEND
: FUNCTION WITH MODE 0.
: THEN LOC. 0 IS COMPLEMENTED AND THE SAME PROCEDURE EXERCISES
: THE LOGIC FOR COMPLEMENTARY DATA.
: THIS TEST EXERCISES UNIQUE MICROCODE.
*****
: TEST 101 TEST MOV INSTRUCTION MODE 1,0 EVEN BYTE
*****
TST101: INC (R2) ;UPDATE TEST NUMBER
CMP #101,(R2) ;SEQUENCE ERROR?
BNE TST102-10 ;BR TO ERROR HALT ON SEQ ERROR
CLR R0 ;R0=0
CLR (R0) ;LOC 0=0
COMB (R0) ;LOC 0=177400
COM (R0)
CLR R4 ;R4=0
COM R4 ;R4=177777
MOVB (R0),R4 ;R4=0
TST R4 ;CHECK SIGN OF WORD
BEQ DOP1

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 767 <====
; MOVE TO MAILBOX # ***** 157 *****
; SET MSGTYP TO FATAL ERROR
; MOV B SHOULD SIGN X-TEND
; LOC 0=177777
; DO MOV B W/ EVEN BYTE

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 760 <====
; MOVE TO MAILBOX # ***** 160 *****
; SET MSGTYP TO FATAL ERROR
; MOV B SHOULD SIGN X-TEND
; OR SEQUENCE ERROR
```

```
TST101: INC (R2)
CMP #101,(R2)
BNE TST102-10
CLR R0
CLR (R0)
COMB (R0)
COM (R0)
CLR R4
COM R4
MOVB (R0),R4
TST R4
BEQ DOP1

DOP1: COM (R0)
MOVB (R0),R4
BMI TST102
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006042 005212
006044 022712 000102
006050 001010
006052 005000
006054 005010
006056 005004
006060 005204
006062 105114
006064 151410
006066 005210
006070 001404

006072 012742 000161
006076 005242
006100 000000

```
*****
: 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.
*****
TST102: INC (R2) ; UPDATE TEST NUMBER
; CMP #102,(R2) ; SEQUENCE ERROR?
; BNE TST103-10 ; BR TO ERROR HALT ON SEQ ERROR
; CLR R0 ; R0=0
; CLR (R0) ; LOC. 0=0
; CLR R4 ; R4=0
; INC R4 ; R4=1
; COMB (R4) ; LOC. 0=177400
; BISB (R4),(R0) ; TRY TO BIS LOW ORDER BITS W/ MODE 1
; INC (R0) ; CHECK RESULT
; BEQ TST103
;
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 770 <====
; MOVE TO MAILBOX # ***** 161 *****
; SET MSGTYP TO FATAL ERROR
; RESULT OF BISB INCORRECT
; OR SEQUENCE ERROR
```

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2929 006102 005212
2930 006104 022712 000103
2931 006110 001015
2932 006112 005000
2933 006114 005010
2934 006116 005110
2935 006120 012004
2936 006122 005204
2937 006124 001404
2938
2939
2940
2941
2942 006126 012742 000162
2943 006132 005242
2944 006134 000000
2945 006136 005300
2946 006140 005300
2947 006142 001404
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2952 006144 012742 000163
2953 006150 005242
2954 006152 000000
2955

```

```

;*****
;
; THIS TEST VERIFIES MODE 2 DOP INSTRUCTIONS. LOC. 0 IS SET TO -1.
; R0 IS CLEARED AND USED AS THE MODE 2 ADDRESSING REGISTER TO MOVE LOC. 0
; TO R7. THE DATA RESULTS ARE VERIFIED AND THE INCREMENTING OF THE REGISTER
; IS CHECKED.
;*****
; TEST 103 TEST MODE 2 W/ DOP INSTS.
;*****
TST103: INC (R2) ; UPDATE TEST NUMBER
; SEQUENCE ERROR?
CMP #103,(R2) ; BR TO ERROR HALT ON SEQ ERROR
BNE TST104-10 ; R0=0
CLR R0 ; LOC. 0=0
CLR (R0) ; LOC. 0=177777
COM (R0) ; TRY MOVE MODE 2,0
MOV (R0)+,R4 ; CHECK R4
INC R4
BEQ DOP2
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 772 <====
MOV #162,-(R2) ; MOVE TO MAILBOX # ***** 162 *****
INC -(R2) ; SET MSGTYP TO FATAL ERROR
HALT ; RESULT OF MOV INST INCORRECT
DOP2: DEC R0 ; TEST R0 AFTER MODE 2
DEC R0
BEQ TST104
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 763 <====
MOV #163,-(R2) ; MOVE TO MAILBOX # ***** 163 *****
INC -(R2) ; SET MSGTYP TO FATAL ERROR
HALT ; REGISTER NOT INCREMENTED IN MODE 2
; OR SEQUENCE ERROR

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2990
2991
2992
2993
2994

006154 005212
006156 022712 000104
006162 001016
006164 005000
006166 010010
006170 005110
006172 142010
006174 105737 000001
006200 001404

006202 012742 000164
006206 005242
006210 000000
006212 105137 000000
006216 001404

006220 012742 000165
006224 005242
006226 000000

```
*****
;
; 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.
;*****
TST104: INC (R2) ; UPDATE TEST NUMBER
; CMP #104,(R2) ; SEQUENCE ERROR?
; BNE TST105-10 ; BR TO ERROR HALT ON SEQ ERROR
; CLR R0 ; R0=0
; MOV R0,(R0) ; LOC. 0=0
; COM (R0) ; LOC. 0=177777
; BICB (R0)+,(R0) ; TRY TO CLEAR BYTE 1 FROM BYTE 0 W/ BICB
; TSTB @#1 ; CHECK RESULT
; BEQ DOPB2A
;
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 771 <====
; MOVE TO MAILBOX # ***** 164 *****
; SET MSGTYP TO FATAL ERROR
; BICB DESTINATION INCORRECT
; CHECK BICB SOURCE
;
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 762 <====
; MOVE TO MAILBOX # ***** 165 *****
; SET MSGTYP TO FATAL ERROR
; BICB SOURCE INCORRECTLY CHANGED
; OR SEQUENCE ERROR
```

```
TST104: INC (R2)
; CMP #104,(R2)
; BNE TST105-10
; CLR R0
; MOV R0,(R0)
; COM (R0)
; BICB (R0)+,(R0)
; TSTB @#1
; BEQ DOPB2A

DOPB2A: COMB @#0
; BEQ TST105

; MOV #164,-(R2)
; INC -(R2)
; HALT

; MOV #165,-(R2)
; INC -(R2)
; HALT
```



```

2995
2996
2997
2998
2999
3000
3001
3002
3003
3004
3005 006230 005212
3006 006232 022712 000105
3007 006236 001017
3008 006240 005000
3009 006242 005004
3010 006244 005010
3011 006246 005110
3012 006250 105120
3013 006252 112004
3014 006254 005204
3015 006256 001404
3016
3017
3018
3019
3020 006260 012742 000166
3021 006264 005242
3022 006266 000000
3023 006270 005740
3024 006272 005700
3025 006274 001404
3026
3027
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3030 006276 012742 000167
3031 006302 005242
3032 006304 000000
3033

```

```

:*****
:
:   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 MOV B 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.
:*****
TST105: INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #105,(R2)   ;SEQUENCE ERROR?
        BNE     TST106-10   ;BR TO ERROR HALT ON SEQ ERROR
        CLR     R0           ;R0=0
        CLR     R4           ;R4=0
        CLR     (R0)        ;LOC. 0=0
        COM     (R0)        ;LOC. 0=177777
        COMB    (R0)+       ;LOC 0=177400; R0=1
        MOV B   (R0)+,R4    ;TRY DOP MODE 2 W/ ODD BYTE
        INC     R4          ;CHECK RESULT OF MOV B
        BEQ     DOPB2B
:
:   TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
:   CONDITIONAL BRANCH INST. AND               <====
:   REPLACE THE MOVE INSTRUCTION              <====
:   WHICH FOLLOWS W/ 770                       <====
:
:   MOVE TO MAILBOX # ***** 166 *****
:   SET MSGTYP TO FATAL ERROR
:   RESULT OF MOV B INCORRECT
:   BUMP R0 DOWN BY 2
:   CHECK R0
:
:   TO SCOPE: CLEAR THE RIGHT BYTE OF THIS      <====
:   CONDITIONAL BRANCH INST. AND               <====
:   REPLACE THE MOVE INSTRUCTION              <====
:   WHICH FOLLOWS W/ 761                       <====
:
:   MOVE TO MAILBOX # ***** 167 *****
:   SET MSGTYP TO FATAL ERROR
:   MODE 2 BYTE DID NOT INCREMENT REG. CORRECTLY
:   OR SEQUENCE ERROR

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3046 006306 005212
3047 006310 022712 000106
3048 006314 001011
3049 006316 012737 052525 000000
3050 006324 012700 125252
3051 006330 053700 000000
3052 006334 005200
3053 006336 001404
3054
3055
3056
3057
3058 006340 012742 000170
3059 006344 005242
3060 006346 000000
3061
3062
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3069
3070
3071
3072
3073 006350 005212
3074 006352 022712 000107
3075 006356 001011
3076 006360 012737 052652 000000
3077 006366 005000
3078 006370 153700 000000
3079 006374 022700 000252
3080 006400 001404
3081
3082
3083
3084
3085 006402 012742 000171
3086 006406 005242
3087 006410 000000
3088

```

```

*****
:
: THIS TEST VERIFIES MODE 3 DOUBLE-OPERAND INSTRUCTIONS.
: LOC. 0 IS LOADED WITH ALTERNATING ZEROES AND ONES; AND RO IS LOADED
: WITH ALTERNATING ONES AND ZEROES. A MODE 3 BIS IS USED TO SET RO
: TO -1 BY USING LOC. 0 AS THE SOURCE TO BIS THE ZEROES IN RO. THE
: RESULT IS TESTED BY INCREMENTING RO AND CHECKING FOR ZERO.
:
: *****
: TEST 106 TEST MODE 3 W/ DOP INSTS.
: *****
TST106: INC (R2) ;UPDATE TEST NUMBER
: CMP #106,(R2) ;SEQUENCE ERROR?
: BNE TST107-10 ;BR TO ERROR HALT ON SEQ ERROR
: MOV #052525,R#0 ;MOVE 52525 TO LOC. 0
: MOV #125252,RO ;SET ALT. ONE AND ZERO IN RO
: BIS #0,RO ;TRY TO SET ALL OTHER BITS W/ MODE 3
: INC RO ;TEST RESULT
: BEQ TST107
:
: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 767 <====
: MOVE TO MAILBOX # ***** 170 *****
: SET MSGTYP TO FATAL ERROR
: BIS W/ MODE 3 INCORRECT RESULT
: OR SEQUENCE ERROR

```

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*****
:
: 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. RO IS CLEARED AND A BISB IS USED TO
: SET THE LOW BYTE OF RO TO 252.
:
: *****
: TEST 107 TEST MODE 3 - EVEN BYTE W/ DOP INSTS.
: *****
TST107: INC (R2) ;UPDATE TEST NUMBER
: CMP #107,(R2) ;SEQUENCE ERROR?
: BNE TST110-10 ;BR TO ERROR HALT ON SEQ ERROR
: MOV #52652,R#0 ;MOVE 1'S AND 0' PATTERN TO LOC. 0
: CLR RO ;RO=0
: BISB #0,RO ;TRY RO=252 W/ MODE 3 - EVEN BYTE
: CMP #252,RO ;BISB W/ EVEN BYTE SUCCESSFUL?
: BEQ TST110
:
: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 767 <====
: MOVE TO MAILBOX # ***** 171 *****
: SET MSGTYP TO FATAL ERROR
: BISB W/ MODE 3 - EVEN BYTE FAILED
: OR SEQUENCE ERROR

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3006
3005
3004
3003
3002
3001
3000

006412 005212
006414 022712 000110
006420 001011
006422 012737 052652 000000
006430 005000
006432 153700 000001
006436 022700 000125
006442 001404

006444 012742 000172
006450 005242
006452 000000

006454 005212
006456 022712 000111
006462 001015
006464 012700 006536
006470 014037 006536
006474 064037 006536
006500 144037 006536
006504 154037 006537
006510 024037 006536
006514 001411

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: RO = 125.

TEST 110 TEST MODE 3 - ODD BYTE W/ DOP INSTS.

TST110: INC (R2) ; UPDATE TEST NUMBER
CMP #110, (R2) ; SEQUENCE ERROR?
BNE TST111-10 ; BR TO ERROR HALT ON SEQ ERROR
MOV #52652, @#0 ; MOVE 1'S AND 0'S PATTERN TO LOC 0
CLR RO ; RO=0
BISB @#1, RO ; TRY RO=152 W/ MODE 3 - ODD BYTE
CMP #125, RO ; RO=125?
BEQ TST111

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS (====
; CONDITIONAL BRANCH INST. AND (====
; REPLACE THE MOVE INSTRUCTION (====
; WHICH FOLLOWS W/ 767 (====
MOV #172, -(R2) ; MOVE TO MAILBOX # ***** 172 *****
INC -(R2) ; SET MSGTYP TO FATAL ERROR
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.

TST111: INC (R2) ; UPDATE TEST NUMBER
CMP #111, (R2) ; SEQUENCE ERROR?
BNE DOP4 ; BR TO ERROR HALT ON SEQ ERROR
MOV #TBL1, RO ; INITIALIZE RO
MOV -(RO), @#TBL1 ; TBL1=125252
ADD -(RO), @#TBL1 ; TBL1=000377
BICB -(RO), @#TBL1 ; TBL1=000252
BISB -(RO), @#TBL1+1 ; TBL1=125252
CMP -(RO), @#TBL1 ; CHECK RESULT
BEQ TST112

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS (====
; CONDITIONAL BRANCH INST. AND (====
; REPLACE THE MOVE INSTRUCTION (====


```

3145
3146 006516
3147 006516 012742 000173
3148 006522 005242
3149 006524 000000
3150
3151
3152 006526 125252
3153 006530 052652
3154 006532 053125
3155 006534 125252
3156 006536 000000
3157
3158
3159
3160
3161
3162
3163
3164
3165
3166
3167
3168
3169
3170 006540 005212
3171 006542 022712 000112
3172 006546 001015
3173 006550 012700 006624
3174 006554 015037 006536
3175 006560 065037 006536
3176 006564 145037 006536
3177 006570 155037 006537
3178 006574 025037 006536
3179 006600 001411
3180
3181
3182
3183
3184 006602
3185 006602 012742 000174
3186 006606 005242
3187 006610 000000
3188
3189 006612 006526
3190 006614 006530
3191 006616 006531
3192 006620 006532
3193 006622 006534

```

```

DOP4:
MOV #173, -(R2) ; MOVE TO MAILBOX # ***** 173 *****
INC -(R2) ; SET MSGTYP TO FATAL ERROR
HALT ; RESULT OF MODE 4 INSTS. INCORRECT
; OR SEQUENCE ERROR

```

```

125252
52652
53125
125252
TBL1: 0

```

```

*****
: THIS TEST VERIFIES MODE 5 DOUBLE OPERAND INSTRUCTIONS.
: THE TEST USES AN ADDRESS TABLE STORED FOLLOWING THE TEST CODE.
: THIS TABLE IS SIMPLY A TABLE OF ADDRESS POINTERS WHICH ADDRESS
: THE DATA TABLE USED IN THE PREVIOUS TEST. THE TEST IS IDENTICAL TO
: THE PREVIOUS TEST EXCEPT THE DATA IS REFERENCED USING THIS ADDRESS
: TABLE AND MODE 5 ADDRESSING. (SEE PREVIOUS TEST).
*****

```

```

*****
: TEST 112 TEST MODE 5 W/ DOP INSTS.
*****

```

```

TST112: INC (R2) ; UPDATE TEST NUMBER
CMP #112, (R2) ; SEQUENCE ERROR?
BNE DOP5 ; BR TO ERROR HALT ON SEQ ERROR
MOV #TBL2+2, R0 ; INITIALIZE R0
MOV @-(R0), @#TBL1 ; TBL1=125252
ADD @-(R0), @#TBL1 ; TBL1=000377
BICB @-(R0), @#TBL1 ; TBL1=000252
BISB @-(R0), @#TBL1+1 ; TBL1=125252
CMP @-(R0), @#TBL1 ; CHECK RESULT
BEQ TST113

```

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
; CONDITIONAL BRANCH INST. AND
; REPLACE THE MOVE INSTRUCTION
; WHICH FOLLOWS W/ 763

```

```

DOP5:
MOV #174, -(R2) ; MOVE TO MAILBOX # ***** 174 *****
INC -(R2) ; SET MSGTYP TO FATAL ERROR
HALT ; RESULT OF MODE 5 INSTS. INCORRECT
; OR SEQUENCE ERROR

TBL1-10
TBL1-6
TBL1-5
TBL1-4
TBL2: TBL1-2

```

3194
3195
3196
3197
3198
3199
3200
3201
3202
3203
3204
3205
3206
3207
3208 006624 005212
3209 006626 022712 000113
3210 006632 001022
3211 006634 012700 006532
3212 006640 016037 000002 006536
3213 006646 066037 000000 006536
3214 006654 146037 177777 006536
3215 006662 156037 177776 006537
3216 006670 026037 177774 006536
3217 006676 001404

```

:*****
:
:   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.  RO 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.
:*****

```

```

TST113: INC      (R2)           ;UPDATE TEST NUMBER
        CMP      #113,(R2)     ;SEQUENCE ERROR?
        BNE     TST114-10     ;BR TO ERROR HALT ON SEQ ERROR
        MOV     #TBL1-4,RO     ;INITIALIZE RO
        MOV     2(RO),@#TBL1  ;TBL1=125252
        ADD     0(RO),@#TBL1  ;TBL1=000377
        BICB   -1(RO),@#TBL1  ;TBL1=000252
        BISB   -2(RO),@#TBL1+1;TBL1=125252
        CMP     -4(RO),@#TBL1 ;CHECK RESULT
        BEQ     TST114

```

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 756 <====
; MOVE TO MAILBOX # ***** 175 *****
; SET MSGTYP TO FATAL ERROR
; RESULT OF MODE 6 INSTS. INCORRECT
; OR SEQUENCE ERROR

```

3218
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3222 006700 012742 000175
3223 006704 005242
3224 006706 000000
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:*****
:
:   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.
: RO 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.
:*****

```

```

TST114: INC      (R2)           ;UPDATE TEST NUMBER
        CMP      #114,(R2)     ;SEQUENCE ERROR?
        BNE     TST115-10     ;BR TO ERROR HALT ON SEQ ERROR
        MOV     #TBL2-4,RO     ;INITIALIZE RO
        MOV     @4(RO),@#TBL1  ;TBL1=125252
        ADD     @2(RO),@#TBL1  ;TBL1=000377
        BICB   @0(RO),@#TBL1  ;TBL1=000252
        BISB   @-2(RO),@#TBL1+1;TBL1=125252
        CMP     @-4(RO),@#TBL1 ;CHECK RESULT
        BEQ     TST115

```

3240 006710 005212
3241 006712 022712 000114
3242 006716 001022
3243 006720 012700 006616
3244 006724 017037 000004 006536
3245 006732 067037 000002 006536
3246 006740 147037 000000 006536
3247 006746 157037 177776 006537
3248 006754 027037 177774 006536
3249 006762 001404


```

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

```

```

: THIS TEST VERIFIES THE ROTATE MODE 0 INSTRUCTIONS.
: R0 IS LOADED WITH A DATA PATTERN, THE C-BIT IS LOADED, AND
: AN ROL INSTRUCTION IS EXECUTED WITH MODE 0. THE OPERATION IS CHECKED
: BY TESTING THE RESULTING DATA AND THE STATE OF THE C AND V BITS.
: NEXT, THE SAME PROCEDURE IS EXECUTED TO TEST MODE 0 BYTE INSTRUCTIONS.

```

TEST 115 TEST ROTATE INSTRUCTIONS OF MODE 0

```

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 ROTQA ; CC=0011
3277 007016 103003      BCC ROTQA
3279 007020 022700 052525  CMP #052525,R0 ; CHECK DATA
3279 007024 001404      BEQ ROTQB

```

```

3280      ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
3281      ;          CONDITIONAL BRANCH INST. AND <====
3282      ;          REPLACE THE MOVE INSTRUCTION <====
3283      ;          WHICH FOLLOWS W/ 767 <====

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```

3284 007026      ROTQA: MOV #177,-(R2) ; MOVE TO MAILBOX # ***** 177 *****
3285 007026 012742 000177  INC -(R2) ; SET MSGTYP TO FATAL ERROR
3286 007032 005242      HALT ; ROL MODE 0 FAILED
3287 007034 000000      ROTQB: MOV #125252,R0 ; INITIALIZE DATA
3288 007036 012700 125252  SEC ; SET C-BIT
3289 007042 000261      ROLB R0 ; TRY ROL W/ MODE 0 EVEN BYTE
3290 007044 106100      BVC ROTQC ; CC=0011
3291 007046 102004      BCC ROTQC
3292 007050 103003      CMP #125125,R0 ; CHECK DATA
3293 007052 022700 125125  BEQ TST116

```

```

3294 007056 001404      ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
3295      ;          CONDITIONAL BRANCH INST. AND <====
3296      ;          REPLACE THE MOVE INSTRUCTION <====
3297      ;          WHICH FOLLOWS W/ 752 <====

```

```

3298      ROTOC: MOV #200,-(R2) ; MOVE TO MAILBOX # ***** 200 *****
3299 007060 012742 000200  INC -(R2) ; SET MSGTYP TO FATAL ERROR
3300 007060 005242      HALT ; ROLB MODE 0 FAILED
3301 007064 000000      ; OR SEQUENCE ERROR
3302 007066
3303

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007070 005212
007072 022712 000116
007076 001051
007100 005000
007102 012710 052525
007106 000241
007110 006110
007112 102005
007114 103404
007116 023727 000000 125252
007124 001404

007126
007126 012742 000201
007132 005242
007134 000000
007136 000261
007140 012710 125252
007144 106110
007146 102005
007150 103004
007152 022737 125125 000000
007160 001404

007162
007162 012742 000202
007166 005242
007170 000000
007172 012710 125252
007176 005000
007200 005200
007202 000261
007204 106110
007206 102005
007210 103004
007212 022737 052652 000000
007220 001404

```
*****
: 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
*****
TST116: INC (R2) ;UPDATE TEST NUMBER
: CMP #116,(R2) ;SEQUENCE ERROR?
: BNE TST117-10 ;BR TO ERROR HALT ON SEQ ERROR
: CLR R0 ;POINT TO LOC. 0
: MOV #52525,(R0) ;INITIALIZE DATA
: CLC ;CLEAR C-BIT
: ROL (R0) ;TRY ROL W/ MODE 1
: BVC ROT1A ;CC=1010
: BCS ROT1A
: CMP #0,#125252 ;CHECK RESULT
: BEQ ROT1B
: ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: ; CONDITIONAL BRANCH INST. AND <====
: ; REPLACE THE MOVE INSTRUCTION <====
: ; WHICH FOLLOWS W/ 765 <====
:
ROT1A: MOV #201,-(R2) ;MOVE TO MAILBOX # ***** 201 *****
: INC -(R2) ;SET MSGTYP TO FATAL ERROR
: HALT ;ROL MODE 1 FAILED
:
ROT1B: SEC
: MOV #125252,(R0) ;INITIALIZE DATA
: ROLB (R0) ;TRY ROLB W/ MODE 1 EVEN BYTE
: BVC ROT1C ;CC=1011
: BCC ROT1C
: CMP #125125,#0 ;TEST RESULT
: BEQ ROT1D
: ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: ; CONDITIONAL BRANCH INST. AND <====
: ; REPLACE THE MOVE INSTRUCTION <====
: ; WHICH FOLLOWS W/ 747 <====
:
ROT1C: MOV #202,-(R2) ;MOVE TO MAILBOX # ***** 202 *****
: INC -(R2) ;SET MSGTYP TO FATAL ERROR
: HALT ;ROLB W/ MODE 1 EVEN BYTE FAILED
:
ROT1D: MOV #125252,(R0)
: CLR R0 ;POINT TO ODD BYTE
: INC R0
: SEC ;SET C-BIT
: ROLB (R0) ;TRY ROLB W/ MODE 1 ODD BYTE
: BVC ROT1E ;CC=0011
: BCC ROT1E
: CMP #052652,#0 ;CHECK DATA
: BEQ TST117
```

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3360                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
3361                                     ; CONDITIONAL BRANCH INST. AND <====
3362                                     ; REPLACE THE MOVE INSTRUCTION <====
3363                                     ; WHICH FOLLOWS W/ 727 <====
3364 007222          ROT1E:
3365 007222          012742 000203      MOV      #203,-(R2)      ;MOVE TO MAILBOX # ***** 203 *****
3366 007226          005242          INC      -(R2)        ;SET MSGTYP TO FATAL ERROR
3367 007230          000000          HALT                    ;ROLB W/ MODE 1 ODD BYTE FAILED
3368                                     ; OR SEQUENCE ERROR
3369
3370
3371
3372
3373                                     ;*****
3374                                     ; THIS TEST VERIFIES MODE 2 ROTATE INSTRUCTIONS.
3375                                     ; THE SAME PROCEDURE AS IN THE OTHER ROTATE TESTS ARE USED.  RO
3376                                     ; IS USED AS THE ADDRESSING REGISTER AND IS CHECKED FOR PROPER
3377                                     ; INCREMENTING.  BYTE INSTRUCTIONS ARE ALSO CHECKED.
3378                                     ;*****
3379 TEST 117          TEST ROTATE INSTRUCTIONS W/ MODE 2
3380 007232          005212          TST117: INC      (R2)          ;UPDATE TEST NUMBER
3381 007234          022712 000117      CMP      #117,(R2)      ;SEQUENCE ERROR?
3382 007240          001057          BNE     TST120-10      ;BR TO ERROR HALT ON SEQ ERROR
3383 007242          005000          CLR     RO            ;POINT TO LOC 0
3384 007244          012710 173737      MOV     #173737,(RO)   ;INITIALIZE DATA
3385 007250          000241          CLC                    ;CLEAR C-BIT
3386 007252          006120          ROL     (RO)+         ;TRY ROL W/ MODE 2
3387 007254          103007          BCC    ROT2A         ;CHECK C-BIT
3388 007256          022737 167676 000000  CMP     #167676,#0    ;CHECK DATA
3389 007264          001003          BNE    ROT2A         ;BRANCH IF RESULT INCORRECT
3390 007266          005300          DEC     RO            ;TEST RO
3391 007270          005300          DEC     RO
3392 007272          001404          BEQ    ROT2B
3393
3394                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
3395                                     ; CONDITIONAL BRANCH INST. AND <====
3396                                     ; REPLACE THE MOVE INSTRUCTION <====
3397                                     ; WHICH FOLLOWS W/ 763 <====
3398 007274          ROT2A:
3399 007274          012742 000204      MOV     #204,-(R2)    ;MOVE TO MAILBOX # ***** 204 *****
3400 007300          005242          INC     -(R2)        ;SET MSGTYP TO FATAL ERROR
3401 007302          000000          HALT                    ;ROL W/ MODE 2 FAILED
3402 007304          005000          ROT2B: CLR     RO            ;POINT TO LOC 0
3403 007306          012710 004040      MOV     #4040,(RO)   ;INITIALIZE DATA
3404 007312          000241          CLC                    ;CLEAR C-BIT
3405 007314          106120          ROLB   (RO)+         ;TRY ROLB W/ MODE 2 EVEN BYTE
3406 007316          103406          BCS    ROT2C         ;CHECK C-BIT
3407 007320          022737 004100 000000  CMP     #4100,#0    ;CHECK DATA
3408 007326          001002          BNE    ROT2C         ;BRANCH IF DATA INCORRECT
3409 007330          005300          DEC     RO            ;CHECK RO
3410 007332          001404          BEQ    ROT2D
3411
3412                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
3413                                     ; CONDITIONAL BRANCH INST. AND <====
3414                                     ; REPLACE THE MOVE INSTRUCTION <====
3415                                     ; WHICH FOLLOWS W/ 743 <====
3416 007334          ROT2C:
3417 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      RO      ;POINT TO LOC 0
3419 007346 012710 004040  MOV      #4040,(RO) ;INITIALIZE DATA
3420 007352 005200      INC      RO      ;POINT TO ODD BYTE OF DATA
3421 007354 000261      SEC               ;SET C-BIT
3422 007356 106120      ROLB      (RO)+    ;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      RO      ;CHECK RO
3427 007374 005300      DEC      RO
3428 007376 001404      SEQ      TST120
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3433 007400      ROT2E:  MOV      #206, -(R2) ; MOVE TO MAILBOX # ***** 206 *****
3434 007400 012742 000206  INC      -(R2)    ; SET MSGTYP TO FATAL ERROR
3435 007404 005242      HALT               ; ROLB W/ MODE 2 ODD BYTE FAILED
3436 007406 000000
3437

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 721 <====

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007410 005212
007412 022712 000120
007416 001051
007420 012737 052525 000000
007426 000261
007430 006137 000000
007434 103404
007436 022737 125253 000000
007444 001404

007446
007446 012742 000207
007452 005242
007454 000000
007456 012737 125252 000000
007464 000241
007466 006137 000000
007472 103004
007474 023727 000000 125124 45:
007502 001404

007504
007504 012742 000210
007510 005242
007512 000000
007514 012737 125252 000000
007522 000261
007524 106137 000001
007530 103004
007532 022737 052652 000000
007540 001404

007542
007542 012742 000211
007546 005242
007550 000000

```
*****
:
: 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
: *****
TST120: INC (R2) ; UPDATE TEST NUMBER
: CMP #120,(R2) ; SEQUENCE ERROR?
: BNE TST121-10 ; BR TO ERROR HALT ON SEQ ERROR
: MOV #52525,a#0 ; INITIALIZE DATA IN LOC 0
: SEC ; SET C-BIT
: ROL a#0 ; TRO ROL W/ MODE 3
: BCS ROT3A ; CHECK C-BIT
: CMP #125253,a#0 ; CHECK DATA
: BEQ ROT3B
:
: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 765 <====
:
ROT3A: MOV #207,-(R2) ; MOVE TO MAILBOX # ***** 207 *****
: INC -(R2) ; SET MSGTYP TO FATAL ERROR
: HALT ; ROL W/ MODE 3 FAILED
: ROT3B: MOV #125252,a#0 ; INITIALIZE DATA
: CLC ; CLEAR C-BIT
: ROLB a#0 ; TRY ROL W/ MODE 3 EVEN BYTE
: BCC ROT3C ; CHECK C-BIT
: 45: CMP a#0,#125124 ; CHECK DATA
: BEQ ROT3D
:
: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 746 <====
:
ROT3C: MOV #210,-(R2) ; MOVE TO MAILBOX # ***** 210 *****
: INC -(R2) ; SET MSGTYP TO FATAL ERROR
: HALT ; ROL W/ MODE 3 EVEN BYTE FAILED
: ROT3D: MOV #125252,a#0 ; INITIALIZE DATA IN LOC. 0
: SEC ; SET C-BIT
: ROLB a#1 ; TRY ROL W/ MODE 3 ODD BYTE
: BCC ROT3E ; CHECK C-BIT
: CMP #052652,a#0 ; CHECK DATA
: BEQ TST121
:
: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 727 <====
:
ROT3E: MOV #211,-(R2) ; MOVE TO MAILBOX # ***** 211 *****
: INC -(R2) ; SET MSGTYP TO FATAL ERROR
: HALT ; ROL W/ MODE 3 ODD BYTE FAILED
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L06

3494

; OR SEQUENCE ERROR

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3507 007552 005212
3508 007554 022712 000121
3509 007560 001016
3510 007562 012737 070707 000000
3511 007570 012700 000002
3512 007574 000261
3513 007576 006140
3514 007600 103406
3515 007602 022737 161617 000000
3516 007610 001002
3517 007612 005700
3518 007614 001404
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3523 007616
3524 007616 012742 000212
3525 007622 005242
3526 007624 000000
3527
3528
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3536
3537
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3541
3542 007626 005212
3543 007630 022712 000122
3544 007634 001021
3545 007636 012737 007710 000000
3546 007644 012700 000002
3547 007650 012767 107070 000032
3548 007656 000241
3549 007660 006150
3550 007662 103006

```

```

;*****
;
; THIS TEST VERIFIES MODE 4 ROTATE INSTRUCTIONS. THE DATA IS
; STORED IN LOC. 0. RO IS SET TO 2 AND THE CARRY IS SET. AN ROL MODE 4
; IS USED TO ROTATE LOCATION 0 USING RO. THE DATA IS CHECKED
; AND THE C AND V BITS ARE TESTED. THE PROPER DECREMENTING OF
; RO IS VERIFIED.
;*****

```

```

;*****
; TEST 121 TEST MODE 4 W/ ROTATE INSTRUCTIONS
;*****

```

```

TST121: INC (R2) ; UPDATE TEST NUMBER
; SEQUENCE ERROR?
CMP #121,(R2) ; BR TO ERROR HALT ON SEQ ERROR
BNE TST122-10 ; INITIALIZE DATA IN LOC. 0
MOV #070707,R#0 ; INITIALIZE RO AS POINTER
MOV #2,RO ; SET C-BIT
SEC ; TRY ROL W/ MODE 4
ROL -(RO) ; CHECK C-BIT
BCS ROT4 ; CHECK DATA
CMP #161617,R#0 ; BRANCH IF DATA INCORRECT
BNE ROT4 ; CHECK MODE 4 REGISTER
TST RO
BEQ TST122

```

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 762 <====

```

```

ROT4: MOV #212,-(R2) ; MOVE TO MAILBOX # ***** 212 *****
; SET MSGTYP TO FATAL ERROR
INC -(R2) ; ROL MODE 4 FAILED
HALT ; OR SEQUENCE ERROR

```

```

;*****
; THIS TEST VERIFIES MODE 5 ROTATE INSTRUCTIONS.
; THE DATA IS STORED IN A WORK LOCATION (ROTX) AT THE END OF THE
; TEST CODE. LOC. 0 IS LOADED WITH THE ADDRESS OF THE DATA (ROTX).
; RO IS SET TO 2. THE CARRY IS CLEARED AND A MODE 5 ROL
; IS EXECUTED USING RO AS AN ADDRESSING REGISTER. THE DATA IS
; CHECKED, THE C AND V BITS TESTED, AND RO CHECKED FOR PROPER
; DECREMENTING.
;*****

```

```

;*****
; TEST 122 TEST MODE 5 W/ ROTATE INSTRUCTIONS
;*****

```

```

TST122: INC (R2) ; UPDATE TEST NUMBER
; SEQUENCE ERROR?
CMP #122,(R2) ; BR TO ERROR HALT ON SEQ ERROR
BNE ROT5 ; MOVE POINTER TO LOC. 0
MOV #ROTX,R#0 ; SET MODE 5 REG. TO LOC. 0
MOV #2,RO ; INITIALIZE DATA
MOV #107070,ROTX ; CLEAR C-BIT
CLC ; TRY ROL W/ MODE 5
ROL #-(RO) ; CHECK C-BIT
BCC ROT5

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007760 005212
007762 022712 000124
007766 001016
007770 012737 052525 007710
007776 012737 007710 010034
010004 000241
010006 006177 000022
010012 103404
010014 023727 007710 125252
010022 001405

010024
010024 012742 000215
010030 005242
010032 000000

010034 000000

010036 005212
010040 022712 000125
010044 001013
010046 012700 177400
010052 000300
010054 100404

010056 012742 000216
010062 005242
010064 000000

: 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

TST124: INC (R2) ; UPDATE TEST NUMBER
CMP #124,(R2) ; SEQUENCE ERROR?
BNE ROT7 ; BR TO ERROR HALT ON SEQ ERROR
MOV #52525,2#ROTX ; INITIALIZE DATA
MOV #ROTX,2#ROTXAD ; INITIALIZE ADDRESS POINTER
CLC ; CLEAR C-BIT
ROL 2ROTXAD ; TRY ROL W/ MODE 7
BCS ROT7 ; CHECK C-BIT
CMP 2#ROTX,#125252 ; CHECK DATA
BEQ TST125

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 762 <====

ROT7: MOV #215,-(R2) ; MOVE TO MAILBOX # ***** 215 *****
INC -(R2) ; SET MSGTYP TO FATAL ERROR
HALT ; ROL W/ MODE 7 FAILED
; OR SEQUENCE ERROR

ROTXAD: 0

: THIS TEST VERIFIES MODE 0 SWAB INSTRUCTION. RD 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.

TST125: INC (R2) ; UPDATE TEST NUMBER
CMP #125,(R2) ; SEQUENCE ERROR?
BNE TST126-10 ; BR TO ERROR HALT ON SEQ ERROR
MOV #177400,R0 ; MOVE TEST PATTERN TO R0
SWAB R0 ; TRY SWAB MODE 0
BMI 580

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 774 <====

MOV #216,-(R2) ; MOVE TO MAILBOX # ***** 216 *****
INC -(R2) ; SET MSGTYP TO FATAL ERROR
HALT ; SWAB DID NOT SET CC'S CORRECT

3650	010066	022700	000377	SBO:	CMP	#377, RD	;CHECK RESULT	
3651	010072	001404			BEO	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 0 FAILED	
3659							: OR SEQUENCE ERROR	


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3671 010104 005212
3672 010106 022712 000126
3673 010112 001011
3674 010114 012737 125652 000000
3675 010122 005000
3676 010124 000310
3677 010126 022737 125253 000000
3678 010134 001404
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3683 010136 012742 000220
3684 010142 005242
3685 010144 000000
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3699 010146 005212
3700 010150 022712 000127
3701 010154 001020
3702 010156 012737 125152 000000
3703 010164 005000
3704 010166 000320
3705 010170 022737 065252 000000
3706 010176 001404
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3711 010200 012742 000221
3712 010204 005242
3713 010206 000000
3714 010210 162700 000002
3715 010214 001404

```

```

*****
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
*****

```

```

TST126: INC (R2) ;UPDATE TEST NUMBER
CMP #126,(R2) ;SEQUENCE ERROR?
BNE TST127-10 ;BR TO ERROR HALT ON SEQ ERROR
MOV #125652,R#0 ;MOVE TEST PATTERN TO LOC. 0
CLR R0 ;R0=0
SWAB (R0) ;TRY SWAB MODE 1
CMP #125253,R#0 ;CHECK RESULT
BEQ TST127

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS (=====
; CONDITIONAL BRANCH INST. AND (=====
; REPLACE THE MOVE INSTRUCTION (=====
; WHICH FOLLOWS W/ 767 (=====
; MOVE TO MAILBOX # ***** 220 *****
; SET MSGTYP TO FATAL ERROR
; 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
*****

```

```

TST127: INC (R2) ;UPDATE TEST NUMBER
CMP #127,(R2) ;SEQUENCE ERROR?
BNE TST130-10 ;BR TO ERROR HALT ON SEQ ERROR
MOV #125152,R#0 ;MOVE TEST PATTERN TO LOC. 0
CLR R0 ;R0=0
SWAB (R0)+ ;TRY SWAB MODE 2
CMP #65252,R#0 ;CHECK RESULT
BEQ SB2

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS (=====
; CONDITIONAL BRANCH INST. AND (=====
; REPLACE THE MOVE INSTRUCTION (=====
; WHICH FOLLOWS W/ 767 (=====
; MOVE TO MAILBOX # ***** 221 *****
; SET MSGTYP TO FATAL ERROR
; RESULT OF SWAB MODE 0 FAILED
; CHECK EFFECT OF REG.

SB2: SUB #2,R0
BEQ TST130

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3716
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3720 010216 012742 000222          MOV    #222, -(R2)
3721 010222 005242          INC    -(R2)
3722 010224 000000          HALT
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3736 010226 005212          TST130: INC    (R2)
3737 010230 022712 000130        CMP    #130, (R2)
3738 010234 001011          BNE   TST131-10
3739 010236 012737 000377 000000    MOV    #377, @#0
3740 010244 000337 000000          SWAB  @#0
3741 010250 022737 177400 000000    CMP    #177400, @#0
3742 010256 001404          BEQ   TST131
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3747 010260 012742 000223          MOV    #223, -(R2)
3748 010264 005242          INC    -(R2)
3749 010266 000000          HALT
3750

```

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 760 <====
; MOVE TO MAILBOX # ***** 222 *****
; SET MSGTYP TO FATAL ERROR
; REGISTER VALUE INCORRECT
; OR SEQUENCE ERROR

```

```

*****
; THIS TEST VERIFIES MODE 3 SWAB INSTRUCTION. THE TEST
; PATTERN IS MOVED TO LOC 0. A MODE 3 SWAB INSTRUCTION IS EXECUTED
; USING R7 AS THE ADDRESSING REGISTER. A COMPARE VERIFIES THE
; DATA RESULTS.

```

```

*****
; TEST 130 TEST MODE 3 W/SWAB INST.
*****

```

```

; UPDATE TEST NUMBER
; SEQUENCE ERROR?
; BR TO ERROR HALT ON SEQ ERROR
; MOVE TEST PATTERN TO LOC. 0
; TRY SWAB W/ MODE 3
; CHECK RESULT

```

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 767 <====
; MOVE TO MAILBOX # ***** 223 *****
; SET MSGTYP TO FATAL ERROR
; RESULT OF SWAB INCORRECT
; OR SEQUENCE ERROR

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010270 005212
010272 022712 000131
010276 001020
010300 012737 125652 000000
010306 012700 000002
010312 000340
010314 022737 125253 000000
010322 001404

010324 012742 000224
010330 005242
010332 000000
010334 005700
010336 001404

010340 012742 000225
010344 005242
010346 000000

```
*****
      THIS TEST VERIFIES MODE 4 SWAB INSTRUCTIONS.  THE DATA
      IS MOVED TO LOC 0.  R0 IS SET TO 2 AND USED AS THE MODE 4 ADDRESSING
      REGISTER.  THE DATA IS CHECKED WITH A COMPARE AND R0 IS CHECKED
      FOR PROPER DECREMENTING.
*****
TEST 131      TEST MODE 4 W/ SWAB INST
*****
TST131:  INC      (R2)          ;UPDATE TEST NUMBER
          CMP      #131,(R2)    ;SEQUENCE ERROR?
          BNE     TST132-10    ;BR TO ERROR HALT ON SEQ ERROR
          MOV     #125652,R#0   ;MOVE TEST PATTERN TO LOC. 0
          MOV     #2,R0        ;SET UP REGISTER POINTER
          SWAB   -(R0)         ;TRY SWAB MODE 4
          CMP    #125253,R#0   ;CHECK RESULT
          BEQ    SB4
          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
          ;          CONDITIONAL BRANCH INST. AND <====
          ;          REPLACE THE MOVE INSTRUCTION <====
          ;          WHICH FOLLOWS W/ 766 <====
          ; MOVE TO MAILBOX # ***** 224 *****
          ; SET MSGTYP TO FATAL ERROR
          ; RESULT OF SWAB INCORRECT
          ; CHECK EFFECT ON REG.
          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
          ;          CONDITIONAL BRANCH INST. AND <====
          ;          REPLACE THE MOVE INSTRUCTION <====
          ;          WHICH FOLLOWS W/ 760 <====
          ; MOVE TO MAILBOX # ***** 225 *****
          ; SET MSGTYP TO FATAL ERROR
          ; REGISTER VALUE INCORRECT
          ; OR SEQUENCE ERROR

          MOV     #224,-(R2)
          INC     -(R2)
          HALT
SB4:      TST     R0
          BEQ    TST132
          MOV     #225,-(R2)
          INC     -(R2)
          HALT
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010350 005212
010352 022712 000132
010356 001021
010360 012700 010436
010364 012767 125125 000040
010372 000350
010374 022767 052652 000030
010402 001404

010404 012742 000226
010410 005242
010412 000000
010414 020027 010434
010420 001406

010422
010422 012742 000227
010426 005242
010430 000000

010432 000000
010434 010432

TST132: INC (R2)
CMP #132,(R2)
BNE SB5
MOV #SB5XAD+2,R0
MOV #125125,SB5X
SWAB @-(R0)
CMP #52652,SB5X
BEQ SB5A

MOV #226,-(R2)
INC -(R2)
HALT
SBSA: CMP R0,#SB5XAD
BEQ TST133

SBS: MOV #227,-(R2)
INC -(R2)
HALT

SBSX: 0
SB5XAD: SB5X

: 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.

: UPDATE TEST NUMBER
: SEQUENCE ERROR?
: BR TO ERROR HALT ON SEQ ERROR
: SET UP POINTER TO WORK LOCATION
: MOVE PATTERN TO WORK LOCATION
: TRY SWAB MODE 5
: CHECK RESULT

: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 766 <====
: MOVE TO MAILBOX # ***** 226 *****
: SET MSGTYP TO FATAL ERROR
: RESULT OF SWAB INCORRECT
: CHECK RESULT OF REG.

: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 757 <====
: MOVE TO MAILBOX # ***** 227 *****
: SET MSGTYP TO FATAL ERROR
: REGISTER VALUE INCORRECT
: OR SEQUENCE ERROR
: WORK LOCATION

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010436	005212		
010440	022712	000133	
010444	001013		
010446	012767	125125	000030
010454	012700	010476	
010460	000360	000006	
010464	022760	052652	000006
010472	001405		
010474			
010474	012742	000230	
010500	005242		
010502	000000		
010504	000000		

```

*****
THIS TEST VERIFIES MODE 6 SWAB INSTRUCTION. THIS TEST
USES A WORK LOCATION (SB6X) FOLLOWING THE TEST CODE. TEST DATA
IS LOADED INTO THE WORK LOCATION. R0, THE ADDRESSING REGISTER
IS LOADED WITH 6 LESS THEN THE ADDRESS OF THE WORK LOCATION.
THE MODE 6 SWAB IS EXECUTED WITH A +6 OFFSET. THE DATA IS
VERIFIED WITH A COMPARE.
*****
TEST 133 TEST MODE 6 W/ SWAB INST.
*****
TST133: INC (R2) ;UPDATE TEST NUMBER
          CMP #133,(R2) ;SEQUENCE ERROR?
          BNE SB6 ;BR TO ERROR HALT ON SEQ ERROR
          MOV #125125,SB6X ;MOVE PATTERN TO WORK LOCATION
          MOV #SB6X-6,R0 ;MOVE OFFSET POINTER TO R0
          SWAB 6(R0) ;TRY SWAB W/ MODE 6
          CMP #52652,6(R0) ;CHECK RESULT
          BEQ TST134

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 765 <====

SB6: MOV #230,-(R2) ;MOVE TO MAILBOX # ***** 230 *****
      INC -(R2) ;SET MSGTYP TO FATAL ERROR
      HALT ;RESULT OF SWAB INCORRECT
          ; OR SEQUENCE ERROR
          ;WORK LOCATION
SB6X: 0
  
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010506 005212
010510 022712 000134
010514 001013
010516 012767 177400 000030
010524 012700 010464
010530 000370 000072
010534 027027 000072 000377
010542 001406

010544
010544 012742 000231
010550 005242
010552 000000

010554 000000
010556 010554

```
*****
:
:   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.
:*****
TST134: INC      (R2)           ;UPDATE TEST NUMBER
        CMP      #134,(R2)     ;SEQUENCE ERROR?
        BNE     SB7           ;BR TO ERROR HALT ON SEQ ERROR
        MOV     #177400,SB7X   ;MOVE PATTERN TO WORK LOCATION
        MOV     #SB7XAD-72,RO  ;MOVE OFFSET POINTER TO RO
        SWAB    @72(RO)       ;TRY SWAB MODE 7
        CMP     @72(RO),#377   ;CHECK RESULTS
        BEQ     TST135

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
;           CONDITIONAL BRANCH INST. AND <====
;           REPLACE THE MOVE INSTRUCTION <====
;           WHICH FOLLOWS W/ 765 <====

SB7:    MOV     #231,-(R2)     ;MOVE TO MAILBOX # ***** 231 *****
        INC     -(R2)         ;SET MSGTYP TO FATAL ERROR
        HALT                    ;RESULT OF SWAB INCORRECT
;           OR SEQUENCE ERROR
SB7X:   0                     ;WORK LOCATION
SB7XAD: SB7X                  ;POINTER TO WORK LOCATION
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THIS TEST VERIFIES ALL LEGAL MODES OF THE JMP INSTRUCTION.
BECAUSE OF THE NATURE OF THE INSTRUCTION UNDER TEST, THIS TEST
UTILIZES SEVERAL DIFFERENT TECHNIQUES. THE CODE IS NOT EXECUTED
IN A LINEAR FASHION. THE DIFFERENT MODES ARE EXECUTED IN ORDER
FROM 1-7; HOWEVER, THE CODE IS ARRANGED SO THAT CONTROL LEAP
FROGS THRU THE TEST CODE. THE ORDER OF APPEARANCE OF THE CODE
IS:

- JMP MODE 1
- JMP MODE 3
- JMP MODE 2
- JMP MODE 4
- JMP MODE 6
- JMP MODE 5
- JMP MODE 7

AN INTERNAL SEQUENCE TEST (JMPSEQ) IS USED TO INSURE THAT THE
JUMPS ARE OCCURRING IN THE PROGRAMMED SEQUENCE.

THE TEST IS MADE UP OF SEVERAL BLOCKS OF CODE. EACH CODE
BEGINS WITH A LABEL WHICH INDICATES THE MODE BEING EXECUTED IN
THAT BLOCK. A SIMPLE PROCEDURE IS FOLLOWED IN EACH BLOCK. FOR
EXAMPLE THE CODE BEGINNING AT JMP3 WILL FIRST COMPARE THE RESULTS
OF THE PREVIOUS MODE 2 JUMP. (ANY REGISTER CHANGES ARE VERIFIED
AND THE SEQUENCE CHECK IS MADE). THEN THE REGISTERS ARE SETUP
FOR A MODE 3 JUMP TO THE NEXT TEST BLOCK (HERE, JMP4), THE SEQUENCE
CHECKER IS UPDATED AND THE JUMP IS EXECUTED.

IF A FAILURE OCCURS, THE SEQUENCE CHECKER WILL ASSIST IN
DETERMINING JUST WHICH MODE FAILED. IF THE SEQUENCE IS CORRECT
THEN THE ERROR DETECTED WAS A MODE FAILURE (E.G. FAILURE OF THE
REGISTER TO BE INCREMENTED IN MODE 2 JUMP.)

TEST 135 TEST THE JMP INSTRUCTION IN ALL MODES

```

TST135: INC      (R2)          ;UPDATE TEST NUMBER
        CMP      #135, (R2)   ;SEQUENCE ERROR?
        BNE     JMPCK+6       ;BR TO ERROR HALT ON SEQ ERROR
        CLR     JMPSEQ        ;ESTABLISH A SEQUENCE CHECKER
        MOV     #JMP2, R0     ;SET R0=JUMP TARGET
        JMP     (R0)          ;TRY JMP MODE 1
JMP3:   CMP     #.+2, R0      ;CHECK RESULT OF MODE 2 JUMP
        BEQ     JMP3A

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 770 <====

; MOVE TO MAILBOX # ***** 232 *****
; SET MSGTYP TO FATAL ERROR
; REGISTER VALUE AFTER JMP MODE 2 INCORRECT
; MAKE SURE JUMPS ARE IN SEQUENCE: JMPSEQ=1?

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 760 <====

010560	005212		
010562	022712	000135	
010566	001150		
010570	005067	000326	
010574	012700	010654	
010600	000110		
010602	022700	010604	
010606	001404		
010610	012742	000232	
010614	005242		
010616	000000		
010620	026727	000276	000001
010626	001404		

```

JMP3A: MOV     #232, -(R2)
        INC     -(R2)
        HALT
        CMP     JMPSEQ, #1
        BEQ     JMP3B

```

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	#IIMP4, R0	; POINT R0 TO INDIRECT JMP ADDR.
3957	010644	005267	000252		INC	JMPSEQ	; UPDATE SEQUENCE CHECKER
3958	010650	000130			JMP	2(R0)+	; TRY JMP MODE 3
3959	010652	010704		IIMP4:	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	#IIMP4+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
3983	010730	001404			BEQ	JMP4B	; CHECK JUMP SEQUENCE: JMPSEQ=2?
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
3996	010762	001404			BEQ	JMP6A	; CHECK THAT JUMPS ARE IN SEQUENCE: JMPSEQ=4?
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?


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4009 011016 001404          BEQ      JMP5A
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4014 011020 012742 000240      MOV      #240, -(R2)
4015 011024 005242          INC      -(R2)
4016 011026 000000          HALT
4017 011030 012700 011044      JMP5A:  MOV      #IIMP5+2, R0
4018 011034 005267 000062      INC      JMPSEQ
4019 011040 000150          JMP      @-(R0)
4020 011042 010754          IJMP5:  JMP6
4021
4022 011044 022767 000005 000050  JMP7:   CMP      #5, JMPSEQ
4023 011052 001404          BEQ      JMP7A
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4028 011054 012742 000241      MOV      #241, -(R2)
4029 011060 005242          INC      -(R2)
4030 011062 000000          HALT
4031 011064 012700 011110      JMP7A:  MOV      #IIMP+10, R0
4032 011070 005267 000026      INC      JMPSEQ
4033 011074 000170 177770      JMP      @-10(R0)
4034 011100 011102          IJMP:   JMPCK
4035
4036 011102 026727 000014 000006  JMPCK:  CMP      JMPSEQ, #6
4037 011110 001405          BEQ      TST136
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4042 011112 012742 000242      MOV      #242, -(R2)
4043 011116 005242          INC      -(R2)
4044 011120 000000          HALT
4045
4046 011122 000000          JMPSEQ: 0

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; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 664 <====
; MOVE TO MAILBOX # ***** 240 *****
; SET MSGTYP TO FATAL ERROR
; SHOULD ONLY BE HERE FROM MODE 4 JUMP
; SET UP POINTER TO INDIRECT JUMP ADDR.
; UPDATE JUMP SEQUENCE
; TRY JUMP MODE 5 TO "JMP6"
; INDIRECT ADDRESS POINTER
; CHECK JUMPS IN SEQUENCE: JMPSEQ=5?
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 646 <====
; MOVE TO MAILBOX # ***** 241 *****
; SET MSGTYP TO FATAL ERROR
; SHOULD ONLY BE HERE FROM MODE 6 JUMP
; SET UP OFFSET POINTER TO INDIRECT ADDR.
; UPDATE JUMP SEQUENCE
; TRY MODE 7 JUMP
; INDIRECT ADDRESS
; CHECK JUMPS IN SEQUENCE: JMPSEQ
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 627 <====
; MOVE TO MAILBOX # ***** 242 *****
; SET MSGTYP TO FATAL ERROR
; SHOULD ONLY BE HERE FROM MODE 6 JUMP
; OR SEQUENCE ERROR


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4067 011124 005212
4068 011126 022712 000136
4069 011132 001001
4070 011134 000402
4071 011136 000137 011572
4072
4073 011142 012706 000500
4074 011146 012700 011254
4075 011152 005037 011552
4076 011156 005001
4077 011160 005101
4078 011162 004110
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4081 011164
4082 011164 012742 000243
4083 011170 005242
4084 011172 000000
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4086 011174 022737 000001 011552 JSR3:
4087 011202 001014
4088 011204 020127 011336
4089 011210 001011
4090 011212 022706 000476
4091 011216 001006
4092 011220 022716 125252
4093 011224 001003
4094 011226 022700 011176
4095 011232 001404
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4100 011234 JSR3A:
4101 011234 012742 000244
4102 011240 005242

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;*****
; THIS TEST VERIFIES ALL LEGAL MODES OF THE JSR INSTRUCTION.
; THE CONCEPT OF LEAP FROGGING AND SEQUENCE CHECKING (JSRSEQ) IS
; IDENTICAL TO THAT USED IN JMP TEST (SEE PREVIOUS TEST). EACH
; BLOCK OF CODE VERIFIES THE PREVIOUS JSR BY CHECKING THE SEQUENCE,
; CHECKING THAT THE PC WAS SAVED IN THE SPECIFIED REGISTER, CHECKING
; THAT THE SP WAS DECREMENTED, CHECKING THAT THE REGISTER WAS
; SAVED ON THE STACK, AND FINALLY CHECKING THAT ANY MODE ADDRESS
; REGISTER ALTERATIONS (E.G. INCREMENT REGISTER IN MODE 2) WERE
; SUCCESSFUL. R1 IS USED AS THE REGISTER IN ALL JSR INSTRUCTIONS.
; IF A FAILURE OCCURS, THE SEQUENCE CHECKER WILL ASSIST IN
; DETERMINING JUST WHICH MODE FAILED. IF THE SEQUENCE IS CORRECT
; THEN THE ERROR DETECTED WAS A FUNCTIONAL FAILURE (E.G., INCORRECT
; REGISTER SAVED).
;*****
; TEST 136 TEST JSR INSTRUCTION W/ ALL MODES
;*****
TST136: INC (R2) ;UPDATE TEST NUMBER
CMP #136,(R2) ;SEQUENCE ERROR?
BNE JSR0 ;BR TO ERROR HALT ON SEQ ERROR
BR JSR1
JSR0: JMP @#JSRCK1

JSR1: MOV #STBOT,R6 ;SET STACK POINTER
MOV #JSR2,R0 ;SET TARGET ADDRESS
CLR @#JSRSEQ ;INITIALIZE SEQUENCE CHECKER
CLR R1 ;INITIALIZE R1
COM R1
JSR R1,(R0) ;TRY JSR MODE 1
; TO SCOPE: REPLACE THE MOVE INSTRUCTION <====
; FOLLOWING W/ 774 <====

JSR1A: MOV #243,-(R2) ;MOVE TO MAILBOX # ***** 243 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;JSR MODE 1 FAILED

JSR3: CMP #1,@#JSRSEQ ;CHECK SEQUENCE: JSRSEQ=1?
BNE JSR3A ;BRANCH IF OUT OF SEQUENCE
CMP R1,#JSR4 ;PROPER PC SAVED?
BNE JSR3A ;BRANCH IF PC WRONG
CMP #STBOT-2,R6 ;STACK POINTER DECREMENTED?
BNE JSR3A ;BRANCH IF SP WRONG
CMP #125252,(R6) ;REG SAVED ON STACK?
BNE JSR3A ;BRANCH IF REG. NOT SAVED
CMP #JSR3+2,R0 ;MODE 2 INCREMENT CORRECT?
BEQ JSR3B
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 740 <====

JSR3A: MOV #244,-(R2) ;MOVE TO MAILBOX # ***** 244 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR

4103	011242	000000			HALT				;JSR MODE 3 MALFUNCTIONED
4104	011244	005237	011552		JSR3B: INC	2#JSRSEQ			;UPDATE SEQUENCE CHECKER
4105	011250	004137	011336		JSR	R1,2#JSR4			;TRY JSR MODE 4
4106									
4107	011254	005737	011552		JSR2: TST	2#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	2#JSRSEQ			;UPDATE SEQUENCE CHECKER
4126	011330	012700	011174		MOV	#JSR3,R0			;SET TARGET ADDRESS
4127	011334	004120			JSR	R1,(R0)+			;TRY JSR MODE 2
4128									
4129	011336	022737	000002	011552	JSR4: CMP	#2,2#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	2#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 2#JSRSEQ ;UPDATE SEQUENCE CHECKER
4160 011436 004167 00J046 JSR R1,JSR7 ;TRY JSR MODE 6
4161 011442 022767 000003 000102 JSR5: CMP 3#JSRSEQ ;CHECK SEQUENCE: JSRSEQ=3?
4162 011450 001006 BNE JSR5A ;BRANCH IF OUT OF SEQUENCE
4163 011452 022701 011376 CMP 2#JSR6,R1 ;PROPER PC SAVED?
4164 011456 001003 BNE JSR5A ;BRANCH IF PC WRONG
4165 011460 022700 011442 CMP 2#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 2#JSRSEQ ;UPDATE SEQUENCE CHECKER
4176 011502 012700 011550 MOV 2#JSR6AD+2,R0 ;POINT R0 TO TARGET ADDRESS
4177 011506 004150 JSR R1,2-(R0) ;TRY JSR MODE 5
4178
4179 011510 022737 000005 011552 JSR7: CMP 5,2#JSRSEQ ;CHECK SEQUENCE: JSRSEQ=5?
4180 011516 001003 BNE JSR7A ;BRANCH IF OUT OF SEQUENCE
4181 011520 022701 011442 CMP 2#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 2#JSRSEQ ;UPDATE SEQUENCE CHECKER
4192 011542 004177 000002 JSR R1,2JSRCKAD ;TRY JSR MODE 7
4193
4194 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 2#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 ;

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4215 : THIS TEST VERIFIES THE RTS INSTRUCTION. THE STACK POINTER
4216 : IS INITIALIZED AND A TEST PATTERN STORED ON STACK. R0 IS LOADED
4217 : WITH RETURN ADDRESS. AN RTS IS EXECUTED, AND, AT THE TARGET
4218 : ADDRESS, A CHECK IS MADE THAT R0 WAS PROPERLY RESTORED FROM THE
4219 : STACK.
4220 : *****
4221 : TEST 137 TEST RTS INSTRUCTION
4222 : *****
4223 011602 005212 TST137: INC (R2) ;UPDATE TEST NUMBER
4224 011604 022712 000137 CMP #137,(R2) ;SEQUENCE ERROR?
4225 011610 001016 BNE TST140-10 ;BR TO ERROR HALT ON SEQ ERROR
4226 011612 012706 000500 MOV #STBOT,R6 ;INITIALIZE STACK POINTER
4227 011616 012746 052525 MOV #52525,-(R6) ;INITIALIZE TOP OF STACK
4228 011622 012700 011640 MOV #RTS1,R0 ;INITIALIZE RETURN REGISTER
4229 011626 000200 RTS R0 ;TRY RTS THROUGH R0
4230 : TO SCOPE: REPLACE THE MOVE INSTRUCTION <====
4231 : FOLLOWING W/ 770 <====
4232 011630 012742 000253 MOV #253,-(R2) ;MOVE TO MAILBOX # ***** 253 *****
4233 011634 005242 INC -(R2) ;SET MSGTYP TO FATAL ERROR
4234 011636 000000 HALT ;RTS FAILED
4235 011640 022700 052525 RTS1: CMP #52525,R0 ;CHECK THAT R0 RESTORED FROM STACK
4236 011644 001404 BEQ TST140
4237 : TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
4238 : CONDITIONAL BRANCH INST. AND <====
4239 : REPLACE THE MOVE INSTRUCTION <====
4240 : WHICH FOLLOWS W/ 762 <====
4241 011646 012742 000254 MOV #254,-(R2) ;MOVE TO MAILBOX # ***** 254 *****
4242 011652 005242 INC -(R2) ;SET MSGTYP TO FATAL ERROR
4243 011654 000000 HALT ;RTS MALFUNCTIONED
4244 : OR SEQUENCE ERROR
    
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011656 005212
011660 022712 000140
011664 001022
011666 000277
011670 000251
011672 012700 100000
011676 101402
011700 102401
011702 100404

011704
011704 012742 000255
011710 005242
011712 000000

011714 000277
011716 000244
011720 012700 000000
011724 101002
011726 102401
011730 100004

011732
011732 012742 000256
011736 005242
011740 000000

011742 005212

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*****
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
*****
TST140: INC (R2) ;UPDATE TEST NUMBER
CMP #140,(R2) ;SEQUENCE ERROR?
BNE TST141-10 ;BR TO ERROR HALT ON SEQ ERROR
SCC ;CC=0110
+CLN!CLC
MOV #100000,RO ;CC=1000
BLOS MOV1
BVS MOV1
BMI MOV2
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 771 <====
MOV1: MOV #255,-(R2) ;MOVE TO MAILBOX # ***** 255 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;MOV DID NOT SET CC'S CORRECTLY
MOV2: SCC ;CC=1011
CLZ
MOV #0,RO ;CC=0101
BHI MOV3 ;C OR Z = 0?
BVS MOV3 ;V=1?
BPL TST141
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 756 <====
MOV3: MOV #256,-(R2) ;MOVE TO MAILBOX # ***** 256 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT ;MOV DID NOT SET CC'S CORRECTLY
; OR SEQUENCE ERROR
*****
TEST 141 TEST BIT INSTRUCTION
*****
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
4305 011760 000251      +CLN!CLC              ;CC=0110
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
4311
4312
4313
4314 011774
4315 011774 012742 000257      BIT1:  MOV      #257,-(R2) ;MOVE TO MAILBOX # ***** 257 *****
4316 012000 005242      INC      -(R2)         ;SET MSGTYP TO FATAL ERROR
4317 012002 000000      HALT
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
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4329 012022
4330 012022 012742 000260      BIT3:  MOV      #260,-(R2) ;MOVE TO MAILBOX # ***** 260 *****
4331 012026 005242      INC      -(R2)         ;SET MSGTYP TO FATAL ERROR
4332 012030 000000      HALT
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4338 012032 005212      ;*****
4339 012034 022712 000142      ;TEST 142 TEST BIC INSTRUCTION
4340 012040 001024      ;*****
4341 012042 012700 177777      †TST142: INC      (R2)      ;UPDATE TEST NUMBER
4342 012046 000277      CMP      #142,(R2)    ;SEQUENCE ERROR?
4343 012050 000251      BNE      TST143-10    ;BR TO ERROR HALT ON SEQ ERROR
4344 012052 042700 077777      MOV      #177777,R0
4345 012056 101402      SCC              ;CC=0110
4346 012060 102401      +CLN!CLC
4347 012062 100404      BIC      #77777,R0    ;CC=1000
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4351
4352 012064
4353 012064 012742 000261      BIC1:  MOV      #261,-(R2) ;MOVE TO MAILBOX # ***** 261 *****
4354 012070 005242      INC      -(R2)         ;SET MSGTYP TO FATAL ERROR
4355 012072 000000      HALT
4356 012074 000277      BIC2:  SCC              ;CC=1011

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; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
; CONDITIONAL BRANCH INST. AND
; REPLACE THE MOVE INSTRUCTION
; WHICH FOLLOWS W/ 767
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; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
; CONDITIONAL BRANCH INST. AND
; REPLACE THE MOVE INSTRUCTION
; WHICH FOLLOWS W/ 754
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; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
; CONDITIONAL BRANCH INST. AND
; REPLACE THE MOVE INSTRUCTION
; WHICH FOLLOWS W/ 767
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4427 012216 022712 000144
4428 012222 001037
4429 012224 012700 077777
4430 012230 000257
4431 012232 000264
4432 012234 005200
4433 012236 101402
4434 012240 100001
4435 012242 102404
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4440 012244
4441 012244 012742 000265
4442 012250 005242
4443 012252 000000
4444 012254 052700 077777
4445 012260 000261
4446 012262 000244
4447 012264 005200
4448 012266 100403
4449 012270 102402
4450 012272 103001
4451 012274 001404
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4456 012276
4457 012276 012742 000266
4458 012302 005242
4459 012304 000000
4460
4461 012306 000277
4462 012310 000241
4463 012312 005200
4464 012314 101402
4465 012316 100401
4466 012320 100004

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*****
:
: THESE NEXT TWO TESTS VERIFY THE FUNCTIONING OF THE INC AND
: DEC INSTRUCTIONS. THESE INSTRUCTIONS BOTH EFFECT THE C AND V
: BITS THE SAME; THE C-BIT IS LEFT UNCHANGED AND THE V-BIT IS DEPENDENT
: UPON THE DATA RESULTS. THE SAME PROCEDURE IS USED. THE CONDITION
: CODE BITS ARE INITIALIZED, THE INSTRUCTION IS EXECUTED AND THE
: RESULTS ARE VERIFIED WITH A SERIES OF CONDITIONAL BRANCH INSTRUCTIONS.
: THIS PROCEDURE IS REPEATED WITH SEVERAL DATA PATTERNS TO PRODUCE
: DIFFERENT COMBINATIONS OF THE C AND V BITS.
:
*****

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*****
: TEST 144 TEST INC INSTRUCTION
: *****

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TST144: INC (R2) ;UPDATE TEST NUMBER
: CMP #144,(R2) ;SEQUENCE ERROR?
: BNE TST145-10 ;BR TO ERROR HALT ON SEQ ERROR
: MOV #077777,R0 ;RO=077777
: CCC ;CC=0100
: SEZ
: INC R0 ;CC=1010 RO=10000
: BLOS INC1
: BPL INC1
: BVS INC2

```

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 770 <====
:

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INC1: MOV #265,-(R2) ;MOVE TO MAILBOX # ***** 265 *****
: INC -(R2) ;SET MSGTYP TO FATAL ERROR
: HALT ;INC DID NOT SET CC'S CORRECTLY
INC2: BIS #77777,R0 ;RO=177777
: SEC ;CC=1011
: CLZ
: INC R0 ;CC=0101 RO=0
: BMI INC3
: BVS INC3
: BCC INC3
: BEQ INC4

```

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 753 <====
:

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INC3: MOV #266,-(R2) ;MOVE TO MAILBOX # ***** 266 *****
: INC -(R2) ;SET MSGTYP TO FATAL ERROR
: HALT ;INC DID NOT SET CC'S CORRECTLY
INC4: SCC ;CC=1110
: CLC
: INC R0 ;CC=0000 RO=1
: BLOS INC5
: BMI INC5
: BPL TST145

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4467
4468
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4471 012322
4472 012322 012742 000267
4473 012326 005242
4474 012330 000000
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4480 012332 005212
4481 012334 022712 000145
4482 012340 001051
4483 012342 012700 000002
4484 012346 000277
4485 012350 005300
4486 012352 100403
4487 012354 001402
4488 012356 102401
4489 012360 103404
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4491
4492
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4494 012362
4495 012362 012742 000270
4496 012366 005242
4497 012370 000000
4498 012372 000261
4499 012374 000244
4500 012376 005300
4501 012400 101002
4502 012402 100401
4503 012404 102004
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4505
4506
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4508 012406
4509 012406 012742 000271
4510 012412 005242
4511 012414 000000
4512 012416 000277
4513 012420 000251
4514 012422 005300
4515 012424 101402
4516 012426 102401
4517 012430 100404
4518
4519
4520
4521
4522 012432

```

INC5:
MOV #267, -(R2)
INC -(R2)
HALT

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
; CONDITIONAL BRANCH INST. AND
; REPLACE THE MOVE INSTRUCTION
; WHICH FOLLOWS W/ 741

; MOVE TO MAILBOX # ***** 267 *****
; SET MSGTYP TO FATAL ERROR
; INC DID NOT SET CC'S CORRECTLY
; OR SEQUENCE ERROR

;*****
;TEST 145 TEST DEC INSTRUCTION
;*****
†ST145: INC (R2)
CMP #145, (R2)
BNE TST146-10
MOV #2, R0
SCC
DEC R0
BMI DEC1
BEQ DEC1
BVS DEC1
BCS DEC2

; UPDATE TEST NUMBER
; SEQUENCE ERROR?
; BR TO ERROR HALT ON SEQ ERROR
; RO=2
; CC=1111
; CC=0001 RO=1

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
; CONDITIONAL BRANCH INST. AND
; REPLACE THE MOVE INSTRUCTION
; WHICH FOLLOWS W/ 770

DEC1:
MOV #270, -(R2)
INC -(R2)
HALT
DEC2:
SEC
CLZ
DEC R0
BHI DEC3
BMI DEC3
BVC DEC4

; MOVE TO MAILBOX # ***** 270 *****
; SET MSGTYP TO FATAL ERROR
; DEC DID NOT SET CC'S CORRECTLY
; CC=1011
; CC=0101 RO=0

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
; CONDITIONAL BRANCH INST. AND
; REPLACE THE MOVE INSTRUCTION
; WHICH FOLLOWS W/ 756

DEC3:
MOV #271, -(R2)
INC -(R2)
HALT
DEC4:
SCC
+CLN!CLC
DEC R0
BLOS DEC5
BVS DEC5
BMI DEC6

; MOVE TO MAILBOX # ***** 271 *****
; SET MSGTYP TO FATAL ERROR
; DEC DID NOT SET CC'S CORRECTLY
; CC=0110
; CC=1000 RO=17777

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS
; CONDITIONAL BRANCH INST. AND
; REPLACE THE MOVE INSTRUCTION
; WHICH FOLLOWS W/ 744

DEC5:

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			BOS	TST146	

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 727 <====

```

4538	012464	012742	000273	DEC7:	MOV	#273, -(R2)	; MOVE TO MAILBOX # ***** 273 *****
4539	012464	005242			INC	-(R2)	; SET MSGTYP TO FATAL ERROR
4540	012470	000000			HALT		; DEC DID NOT SET CC'S CORRECTLY
4541	012472						; OR SEQUENCE ERROR
4542							
4543							

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4557 012474 005212
4558 012476 022712 000146
4559 012502 001007
4560 012504 000277
4561 012506 000244
4562 012510 005000
4563 012512 100403
4564 012514 102402
4565 012516 103401
4566 012520 001404
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4571 012522
4572 012522 012742 000274
4573 012526 005242
4574 012530 000000
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4580 012532 005212
4581 012534 022712 000147
4582 012540 001022
4583 012542 000277
4584 012544 000244
4585 012546 005700
4586 012550 100403
4587 012552 102402
4588 012554 103401
4589 012556 001404
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4594 012560
4595 012560 012742 000275
4596 012564 005242
4597 012566 000000
4598 012570 005300
4599 012572 000277

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```

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

```

TST146: INC (R2) ;UPDATE TEST NUMBER
        CMP #146,(R2) ;SEQUENCE ERROR?
        BNE TST147-10 ;BR TO ERROR HALT ON SEQ ERROR
        SCC ;CC=1011
        CLZ
        CLR RO ;CC=0100 RO=0
        BMI CLR1
        BVS CLR1
        BCS CLR1
        BEQ TST147

```

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 771 <====

```

```

CLR1: MOV #274,-(R2) ;MOVE TO MAILBOX # ***** 274 *****
      INC -(R2) ;SET MSGTYP TO FATAL ERROR
      HALT ;CLR DID NOT SET CC'S CORRECTLY
           ; OR SEQUENCE ERROR

```

TEST 147 TEST TST INSTRUCTION

```

TST147: INC (R2) ;UPDATE TEST NUMBER
        CMP #147,(R2) ;SEQUENCE ERROR?
        BNE TST150-10 ;BR TO ERROR HALT ON SEQ ERROR
        SCC ;CC=1011
        CLZ
        TST RO ;CC=0100
        BMI TEST1
        BVS TEST1
        BCS TEST1
        BEQ TEST2

```

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 771 <====

```

```

TEST1: MOV #275,-(R2) ;MOVE TO MAILBOX # ***** 275 *****
      INC -(R2) ;SET MSGTYP TO FATAL ERROR
      HALT ;TEST DID NOT SET CC'S CORRECTLY
TEST2: DEC RO ;MAKE RO NEGATIVE
      SCC ;CC=0111

```

```

4600 012574 000250          CLN
4601 012576 005700          TST          RO          ;CC=1000
4602 012600 101402          BLOS        TEST3
4603 012602 102401          BVS        TEST3
4604 012604 100404          BMI        TST150
4605          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
4606          ;          CONDITIONAL BRANCH INST. AND <====
4607          ;          REPLACE THE MOVE INSTRUCTION <====
4608          ;          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
4613          ;          OR SEQUENCE ERROR
4614
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, RO   ;RO=170000
4622 012632 000277          SCC          ;CC=0111
4623 012634 000250          CLN
4624 012636 000300          SWAB       RO          ;CC=1000  RO=360
4625 012640 101402          BLOS       SWB1
4626 012642 102401          BVS       SWB1
4627 012644 100404          BMI       SWB2
4628          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
4629          ;          CONDITIONAL BRANCH INST. AND <====
4630          ;          REPLACE THE MOVE INSTRUCTION <====
4631          ;          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       RO          ;CC=0100  RO=170000
4639 012664 102403          BVS       SWB3
4640 012666 103402          BCS       SWB3
4641 012670 100401          BMI       SWB3
4642 012672 001404          BEQ       TST151
4643          ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
4644          ;          CONDITIONAL BRANCH INST. AND <====
4645          ;          REPLACE THE MOVE INSTRUCTION <====
4646          ;          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
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4706
4707

012704 005212
012706 022712 000151
012712 001062
012714 012700 040000
012720 000277
012722 062700 030000
012726 101402
012730 102401
012732 100004

012734
012734 012742 000301
012740 005242
012742 000000
012744 000264

012746 062700 010000
012752 101402
012754 102001
012756 100404

012760
012760 012742 000302
012764 005242
012766 000000
012770 000257
012772 000270
012774 062700 100000
013000 101002
013002 102001
013004 100004

013006

```
*****
:
: 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. THIS PROCEDURE IS REPEATED SEVERAL TIMES WITH DIFFERENT
: DATA TO PRODUCE EVERY COMBINATION OF C AND V BITS.
:
: *****
: TEST 151 TEST ADD INSTRUCTION
: *****
TST151: INC (R2) ;UPDATE TEST NUMBER
: CMP #151,(R2) ;SEQUENCE ERROR?
: BNE TST152-10 ;BR TO ERROR HALT ON SEQ ERROR
: MOV #40000,R0 ;RO=40000
: SCC ;CC=1111
: ADD #30000,R0 ;CC=0000 RO=70000
: BLOS ADD1
: BVS ADD1
: BPL ADD2
:
: ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <=====
: ; CONDITIONAL BRANCH INST. AND <=====
: ; REPLACE THE MOVE INSTRUCTION <=====
: ; WHICH FOLLOWS W/ 770 <=====
:
ADD1: MOV #301,-(R2) ;MOVE TO MAILBOX # ***** 301 *****
: INC -(R2) ;SET MSGTYP TO FATAL ERROR
: HALT ;ADD DID NOT SET CC'S CORRECTLY
ADD2: SEZ ;CC=0100
:
: ADD #10000,R0 ;CC=1010 40=100000
: BLOS ADD3
: BVC ADD3
: BMI ADD4
:
: ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <=====
: ; CONDITIONAL BRANCH INST. AND <=====
: ; REPLACE THE MOVE INSTRUCTION <=====
: ; WHICH FOLLOWS W/ 756 <=====
:
ADD3: MOV #302,-(R2) ;MOVE TO MAILBOX # ***** 302 *****
: INC -(R2) ;SET MSGTYP TO FATAL ERROR
: HALT ;ADD DID NOT SET CC'S CORRECTLY
ADD4: CCC ;CC=1000
: SEN
: ADD #100000,R0 ;CC=0111 RO=0
: BHI ADD5
: BVC ADD5
: BPL ADD6
:
: ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <=====
: ; CONDITIONAL BRANCH INST. AND <=====
: ; REPLACE THE MOVE INSTRUCTION <=====
: ; WHICH FOLLOWS W/ 743 <=====
:
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  RO=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
4724 013042 000245              +CLC!CLZ              ;CC=1010
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
4748 013106 000252              +CLN!CLV              ;CC=0101
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
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
4769
4770
4771
4772 013150          ADC3:
4773 013150 012742 000307          MOV     #307, -(R2)
4774 013154 005242          INC     -(R2)
4775 013156 000000          HALT
4776 013160 000277          ADC4:  SCC
4777 013162 000245          +CLZ!CLC
4778 013164 005500          ADC     R0          ;CC=0100 ;CC=1010
4779 013166 102403          BVS     ADC5
4780 013170 103402          BCS     ADC5
4781 013172 100401          BMI     ADC5
4782 013174 001404          BEQ     TST153
4783
4784
4785
4786
4787 013176          ADC5:
4788 013176 012742 000310          MOV     #310, -(R2)
4789 013202 005242          INC     -(R2)
4790 013204 000000          HALT
4791

```

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 754 <====
; MOVE TO MAILBOX # ***** 307 *****
; SET MSGTYP TO FATAL ERROR
; ADC DID NOT SET CC'S CORRECTLY
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 741 <====
; MOVE TO MAILBOX # ***** 310 *****
; SET MSGTYP TO FATAL ERROR
; ADC DID NOT SET CC'S CORRECTLY
; OR SEQUENCE ERROR

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4801
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4806 013206 005212
4807 013210 022712 000153
4808 013214 001042
4809 013216 012700 000001
4810 013222 000277
4811 013224 000251
4812 013226 005400
4813 013230 103003
4814 013232 102402
4815 013234 001401
4816 013236 100404
4817
4818
4819
4820
4821 013240
4822 013240 012742 000311
4823 013244 005242
4824 013246 000000
4825 013250 042700 077777
4826 013254 000257
4827 013256 000264
4828 013260 005400
4829 013262 102003
4830 013264 103002
4831 013266 001401
4832 013270 100404
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4837 013272
4838 013272 012742 000312
4839 013276 005242
4840 013300 000000
4841 013302 005000
4842 013304 000277
4843 013306 000244
4844 013310 005400
4845 013312 102403
4846 013314 103402
4847 013316 001001

: 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

↑ST153: INC (R2) ; UPDATE TEST NUMBER
CMP #153,(R2) ; SEQUENCE ERROR?
BNE TST154-10 ; BR TO ERROR HALT ON SEQ ERROR
MOV #1,R0
SCC ; CC=0110
+CLN!CLC
NEG R0 ; CC=1001 RO=177777
BCC NEG1
BVS NEG1
BEQ NEG1
BMI NEG2

: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 767 <====

NEG1: MOV #311,-(R2) ; MOVE TO MAILBOX # ***** 311 *****
INC -(R2) ; SET MSGTYP TO FATAL ERROR
HALT ; NEG DID NOT SET CC'S CORRECTLY

NEG2: BIC #77777,R0
CCC ; CC=0100
SEZ
NEG R0 ; CC=1011 RO=100000
BVC NEG3
BCC NEG3
BEQ NEG3
BMI NEG4

: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 752 <====

NEG3: MOV #312,-(R2) ; MOVE TO MAILBOX # ***** 312 *****
INC -(R2) ; SET MSGTYP TO FATAL ERROR
HALT ; NEG DID NOT SET CC'S CORRECTLY

NEG4: CLR R0
SCC ; CC=1011
CLZ
NEG R0 ; CC=0100 RO=0
BVS NEG5
BCS NEG5
BNE NEG5

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4848 013320 100004          BPL      TST154
4849                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
4850                                     ; CONDITIONAL BRANCH INST. AND <====
4851                                     ; REPLACE THE MOVE INSTRUCTION <====
4852                                     ; WHICH FOLLOWS W/ 736 <====
4853 013322          NEGS:
4854 013322 012742 000313      MOV      #313, -(R2)      ; MOVE TO MAILBOX # ***** 313 *****
4855 013326 005242          INC      -(R2)      ; SET MSGTYP TO FATAL ERROR
4856 013330 000000          HALT
4857                                     ; NEG DID NOT SET CC'S CORRECTLY
4858                                     ; OR SEQUENCE ERROR
4859
4860 ;*****
4861 ;TEST 154      TEST CMP INSTRUCTION
4862 ;*****
4862 013332 005212          TST154: INC      (R2)      ; UPDATE TEST NUMBER
4863 013334 022712 000154      CMP      #154, (R2)      ; SEQUENCE ERROR?
4864 013340 001060          BNE     TST155-10      ; BR TO ERROR HALT ON SEQ ERROR
4865 013342 012700 000005      MOV      #5, R0
4866 013346 000257          CCC
4867 013350 000271          +SEN!SEC      ; CC=1010
4868 013352 022700 000005      CMP      #5, R0      ; CC=0101
4869 013356 101002          BHI     CMP1
4870 013360 102401          BVS     CMP1
4871 013362 100004          BPL     CMP2
4872                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
4873                                     ; CONDITIONAL BRANCH INST. AND <====
4874                                     ; REPLACE THE MOVE INSTRUCTION <====
4875                                     ; WHICH FOLLOWS W/ 767 <====
4876 013364          CMP1:
4877 013364 012742 000314      MOV      #314, -(R2)      ; MOVE TO MAILBOX # ***** 314 *****
4878 013370 005242          INC      -(R2)      ; SET MSGTYP TO FATAL ERROR
4879 013372 000000          HALT
4880 013374 012700 100000      CMP2: MOV      #100000, R0      ; CMP DID NOT SET CC'S CORRECTLY
4881 013400 000277          SCC
4882 013402 000242          CLV      ; CC=1101
4883 013404 020027 077777      CMP      R0, #77777      ; CC=0010
4884 013410 101402          BLOS    CMP3
4885 013412 102001          BVC     CMP3
4886 013414 100004          BPL     CMP4
4887                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
4888                                     ; CONDITIONAL BRANCH INST. AND <====
4889                                     ; REPLACE THE MOVE INSTRUCTION <====
4890                                     ; WHICH FOLLOWS W/ 752 <====
4891 013416          CMP3:
4892 013416 012742 000315      MOV      #315, -(R2)      ; MOVE TO MAILBOX # ***** 315 *****
4893 013422 005242          INC      -(R2)      ; SET MSGTYP TO FATAL ERROR
4894 013424 000000          HALT
4895 013426 052700 040000      CMP4: BIS      #40000, R0      ; CMP DID NOT SET CC'S CORRECTLY
4896 013432 000257          CCC      ; RD=140000
4897 013434 000264          SEZ      ; CC=0100
4898 013436 022700 040000      CMP      #40000, R0      ; CC=1011
4899 013442 102003          BVC     CMP5
4900 013444 103002          BCC     CMP5
4901 013446 001401          BEQ     CMP5
4902 013450 100404          BMI     CMP6
4903                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
    
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4904                                     :          CONDITIONAL BRANCH INST. AND <====
4905                                     :          REPLACE THE MOVE INSTRUCTION <====
4906                                     :          WHICH FOLLOWS W/ 734 <====
4907 013452                                CMP5:  MOV    #316, -(R2)          ; MOVE TO MAILBOX # ***** 316 *****
4908 013452 012742 000316                 :          INC    -(R2)          ; SET MSGTYP TO FATAL ERROR
4909 013456 005242                         :          HALT                   ; CMP DID NOT SET CC'S CORRECTLY
4910 013460 000000                         :                                     :
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:  MOV    #317, -(R2)          ; MOVE TO MAILBOX # ***** 317 *****
4922 013502 012742 000317                 :          INC    -(R2)          ; SET MSGTYP TO FATAL ERROR
4923 013506 005242                         :          HALT                   ; CMP DID NOT SET CC'S CORRECTLY
4924 013510 000000                         :          ; OR SEQUENCE ERROR
4925
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:  MOV    #320, -(R2)          ; MOVE TO MAILBOX # ***** 320 *****
4945 013542 012742 000320                 :          INC    -(R2)          ; SET MSGTYP TO FATAL ERROR
4946 013546 005242                         :          HALT                   ; COM DID NOT SET CC'S CORRECTLY
4947 013550 000000                         :          ; OR SEQUENCE ERROR
4948
4949

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4951
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4955
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4964 013552 005212
4965 013554 022712 000156
4966 013560 001055
4967 013562 012700 125252
4968 013566 000257
4969 013570 000271
4970 013572 162700 125252
4971 013576 101002
4972 013600 102401
4973 013602 100004
4974
4975
4976
4977
4978 013604
4979 013604 012742 000321
4980 013610 005242
4981 013612 000000
4982 013614 052700 100000
4983 013620 000277
4984 013622 000242
4985 013624 162700 077777
4986 013630 101402
4987 013632 102001
4988 013634 100004
4989
4990
4991
4992
4993 013636
4994 013636 012742 000322
4995 013642 005242
4996 013644 000000
4997 013646 005100
4998 013650 000277
4999
5000 013652 162700 100000
5001 013656 101402
5002 013660 102401
5003 013662 100004
5004
5005

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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.
*****

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*****
: TEST 156 TEST SUB INSTRUCTION
*****

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TST156: INC (R2) ;UPDATE TEST NUMBER
        CMP #156,(R2) ;SEQUENCE ERROR?
        BNE TST157-10 ;BR TO ERROR HALT ON SEQ ERROR
        MOV #125252,R0
        CCC ;CC=1010
        +SEN!SEC
        SUB #125252,R0 ;CC=0101 R0=0
        BHI SUB1
        BVS SUB1
        BPL SUB2

```

```

: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 767 <====

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SUB1: MOV #321,-(R2) ;MOVE TO MAILBOX # ***** 321 *****
      INC -(R2) ;SET MSGTYP TO FATAL ERROR
      HALT ;SUB DID NOT SET CC'S CORRECTLY
SUB2: BIS #100000,R0
      SCC ;CC=1101
      CLV
      SUB #77777,R0 ;CC=0010 R0=1
      BLOS SUB3
      BVC SUB3
      BPL SUB4

```

```

: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====
: REPLACE THE MOVE INSTRUCTION <====
: WHICH FOLLOWS W/ 752 <====

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SUB3: MOV #322,-(R2) ;MOVE TO MAILBOX # ***** 322 *****
      INC -(R2) ;SET MSGTYP TO FATAL ERROR
      HALT
SUB4: COM R0 ;R0=177777
      SCC ;CC=11111

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SUB5: SUB #100000,R0 ;CC=0000 R0=77777
      BLOS SUB5
      BVS SUB5
      BPL SUB6

```

```

: TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
: CONDITIONAL BRANCH INST. AND <====

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109

S097
S098
S099
S100
S101
S102
S103
S104
S105
S106
S107
S108
S109
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S113
S114
S115
S116
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S127
S128
S129
S130
S131
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S141
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S143
S144
S145
S146
S147
S148
S149
S150
S151
S152

014072 005212
014074 022712 000160
014100 001053
014102 012700 144000
014106 000257
014110 000266
014112 006100
014114 103003
014116 102402
014120 001401
014122 100404

014124
014124 012742 000331
014130 005242
014132 000000
014134 000277
014136 000243
014140 006100
014142 103003
014144 102002
014146 001401
014150 100004

014152
014152 012742 000332
014156 005242
014160 000000
014162 000277
014164 000250
014166 006100
014170 101402
014172 102401
014174 100004

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

ST160: INC (R2) ;UPDATE TEST NUMBER
CMP #160,(R2) ;SEQUENCE ERROR?
BNE TST161-10 ;BR TO ERROR HALT ON SEQ ERROR
MOV #144000,RO ;RO=144000
CCC ;CC=0110
+SEZ!SEV
ROL RO ;CC=1001 RO=110000
BCC ROL1
BVS ROL1
BEQ ROL1
BMI ROL2

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 767 <====

ROL1: MOV #331,-(R2) ;MOVE TO MAILBOX # ***** 331 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT
ROL2: SCC ;CC=1100
+CLV!CLC
ROL RO ;CC=0011 RO=020000
BCC ROL3
BVC ROL3
BEQ ROL3
BPL ROL4

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 754 <====

ROL3: MOV #332,-(R2) ;MOVE TO MAILBOX # ***** 332 *****
INC -(R2) ;SET MSGTYP TO FATAL ERROR
HALT
ROL4: SCC ;CC=0111
CLN
ROL RO ;CC=0000 RO=040001
BLOS ROL5
BVS ROL5
BPL ROL6

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====

```

5153                                     ; REPLACE THE MOVE INSTRUCTION <====
5154                                     ; WHICH FOLLOWS W/ 742 <====
5155 014176                                ROL5: MOV #333, -(R2) ; MOVE TO MAILBOX # ***** 333 *****
5156 014176 012742 000333                INC -(R2) ; SET MSGTYP TO FATAL ERROR
5157 014202 005242                        HALT ; ROL DID NOT SET CC'S CORRECTLY
5158 014204 000000                        ROL6: CCC ; CC=0101
5159 014206 000257                        +SEZ!SEC ;
5160 014210 000265                        ROL RO ; CC=1010 RO=100003
5161 014212 006100                        BLOS ROL7
5162 014214 101405                        BVC ROL7
5163 014216 102004                        BPL ROL7
5164 014220 100003                        CMP #100003, RO
5165 014222 022700 100003                BEQ TST161
5166 014226 001404
5167                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
5168                                     ; CONDITIONAL BRANCH INST. AND <====
5169                                     ; REPLACE THE MOVE INSTRUCTION <====
5170                                     ; WHICH FOLLOWS W/ 725 <====
5171 014230                                ROL7: MOV #334, -(R2) ; MOVE TO MAILBOX # ***** 334 *****
5172 014230 012742 000334                INC -(R2) ; SET MSGTYP TO FATAL ERROR
5173 014234 005242                        HALT ; ROL MALFUNCTIONED
5174 014236 000000                        ; OR SEQUENCE ERROR
5175
5176
5177 ;*****
5178 ;TEST 161 TEST ROR INSTRUCTION
5179 ;*****
5180 014240 005212                                TST161: INC (R2) ; UPDATE TEST NUMBER
5181 014242 022712 000161                CMP #161, (R2) ; SEQUENCE ERROR?
5182 014246 001051                        BNE TST162-10 ; BR TO ERROR HALT ON SEQ ERROR
5183 014250 012700 000023                MOV #23, RO ; RO=23
5184 014254 000277                        SCC ; CC=0111
5185 014256 000250                        CLN
5186 014260 006000                        ROR RO ; CC=1001 RO=100011
5187 014262 102403                        BVS ROR1
5188 014264 103002                        BCC ROR1
5189 014266 001401                        BEQ ROR1
5190 014270 100404                        BMI ROR2
5191                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
5192                                     ; CONDITIONAL BRANCH INST. AND <====
5193                                     ; REPLACE THE MOVE INSTRUCTION <====
5194                                     ; WHICH FOLLOWS W/ 767 <====
5195 014272                                ROR1: MOV #335, -(R2) ; MOVE TO MAILBOX # ***** 335 *****
5196 014272 012742 000335                INC -(R2) ; SET MSGTYP TO FATAL ERROR
5197 014276 005242                        HALT ; ROR DID NOT SET CC'S CORRECTLY
5198 014300 000000                        ROR2: CCC ; CC=1100
5199 014302 000257                        +SEN!SEZ ;
5200 014304 000274                        ROR RO ; CC=0011 RO=040004
5201 014306 006000                        BVC ROR3
5202 014310 102003                        BCC ROR3
5203 014312 103002                        BEQ ROR3
5204 014314 001401                        BPL ROR4
5205 014316 100004
5206                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
5207                                     ; CONDITIONAL BRANCH INST. AND <====
5208                                     ; REPLACE THE MOVE INSTRUCTION <====

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5209                                     ;          WHICH FOLLOWS W/ 754          <====
5210 014320                                ROR3:                                     ;
5211 014320 012742 000336                MOV      #336, -(R2)                ; MOVE TO MAILBOX # ***** 336 *****
5212 014324 005242                        INC      -(R2)                ; SET MSGTYP TO FATAL ERROR
5213 014326 000000                        HALT                                     ; ROR DID NOT SET CC'S CORRECTLY
5214 014330 000277                                ROR4:                ; CC=1110
5215 014332 000241                        SCC                                     ;
5216 014334 006000                        CLC                                     ;
5217 014336 101403                        ROR      RO                ; CC=0000  RO=020002
5218 014340 102402                        BLOS    ROR5               ;
5219 014342 001401                        BVS     ROR5               ;
5220 014344 100004                        BEQ     ROR5               ;
5221                                     ;                                     ;
5222                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS  <====
5223                                     ; CONDITIONAL BRANCH INST. AND          <====
5224                                     ; REPLACE THE MOVE INSTRUCTION        <====
5225                                     ; WHICH FOLLOWS W/ 741                <====
5226 014346                                ROR5:                                     ;
5227 014346 012742 000337                MOV      #337, -(R2)                ; MOVE TO MAILBOX # ***** 337 *****
5228 014352 005242                        INC      -(R2)                ; SET MSGTYP TO FATAL ERROR
5229 014354 000000                        HALT                                     ; ROR DID NOT SET CC'S CORRECTLY
5230 014356 000257                                ROR6:                ; CC=0101
5231 014360 000265                        CCC                                     ;
5232 014362 006000                        +SEC!SEZ                          ;
5233 014364 101402                        ROR      RO                ; CC=1010  RO=110001
5234 014366 102001                        BLOS    ROR7               ;
5235 014370 100404                        BVC     ROR7               ;
5236                                     ;                                     ;
5237                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS  <====
5238                                     ; CONDITIONAL BRANCH INST. AND          <====
5239                                     ; REPLACE THE MOVE INSTRUCTION        <====
5240                                     ; WHICH FOLLOWS W/ 727                <====
5241 014372                                ROR7:                                     ;
5242 014372 012742 000340                MOV      #340, -(R2)                ; MOVE TO MAILBOX # ***** 340 *****
5243 014376 005242                        INC      -(R2)                ; SET MSGTYP TO FATAL ERROR
5244 014400 000000                        HALT                                     ; ROR DID NOT PRODUCE CORRECT RESULTS
5245                                     ; OR SEQUENCE ERROR
5246                                     ; *****
5247                                     ; TEST 162 TEST ASL INSTRUCTION *****
5248 014402 005212                                TST162: INC      (R2)                ; UPDATE TEST NUMBER
5249 014404 022712 000162                CMP      #162, (R2)                ; SEQUENCE ERROR?
5250 014410 001054                        BNE     TST163-10                ; BR TO ERROR HALT ON SEQ ERROR
5251 014412 012700 144000                MOV      #144000, RO                ; RO=14000
5252 014416 000257                        CCC                                     ; CC=0110
5253 014420 000271                        +SEN!SEC                          ;
5254 014422 006300                        ASL      RO                ; CC=1001  RO=110000
5255 014424 103003                        BCC     ASL1                   ;
5256 014426 102402                        BVS     ASL1                   ;
5257 014430 001401                        BEQ     ASL1                   ;
5258 014432 100404                        BMI     ASL2                   ;
5259                                     ;                                     ;
5260                                     ; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS  <====
5261                                     ; CONDITIONAL BRANCH INST. AND          <====
5262                                     ; REPLACE THE MOVE INSTRUCTION        <====
5263                                     ; WHICH FOLLOWS W/ 767                <====
5264 014434                                ASL1:                                     ;
5265 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
5275
5276
5277
5278 014462
5279 014462 012742 000342          ASL3:  MOV      #342, -(R2) ;MOVE TO MAILBOX # ***** 342 *****
5280 014466 005242          INC      -(R2)          ;SET MSGTYP TO FATAL ERROR
5281 014470 000000          HALT
5282 014472 000277          ASL4:  SCC              ;ASL DID NOT SET CC'S CORRECTLY
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
5289
5290
5291
5292 014506
5293 014506 012742 000343          ASL5:  MOV      #343, -(R2) ;MOVE TO MAILBOX # ***** 343 *****
5294 014512 005242          INC      -(R2)          ;SET MSGTYP TO FATAL ERROR
5295 014514 000000          HALT
5296 014516 000257          ASL6:  CCC              ;ASL DID NOT SET CC'S CORRECTLY
5297 014520 000265          +SEZ!SEC ;CC=0101
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
5306
5307
5308
5309 014542
5310 014542 012742 000344          ASL7:  MOV      #344, -(R2) ;MOVE TO MAILBOX # ***** 344 *****
5311 014546 005242          INC      -(R2)          ;SET MSGTYP TO FATAL ERROR
5312 014550 000000          HALT
5313
5314
5315
5316
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

;*****
;TEST 163 TEST ASR INSTRUCTION
;*****
; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 754 <====

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 742 <====

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 724 <====

```

5321	014562	012700	100023		MOV	#100023,RO	;RO=100023	
5322	014566	000277			SCC		;CC=0110	
5323	014570	000250			CLN			
5324	014572	006200			ASR	RO	;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								
5330								
5331								
5332								
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,RO	;RO=40011	
5338	014620	000277			SCC		;CC=1100	
5339	014622	000243			+CLV!CLC			
5340	014624	006200			ASR	RO	;CC=0011	RO=020004
5341	014626	102003			BVC	ASR3		
5342	014630	103002			BCC	ASR3		
5343	014632	001401			BEQ	ASR3		
5344	014634	100004			BPL	ASR4		
5345								
5346								
5347								
5348								
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	RO	;CC=0000	RO=010002
5356	014652	101403			BLOS	ASR5		
5357	014654	102402			BVS	ASR5		
5358	014656	001401			BEQ	ASR5		
5359	014660	100004			BPL	ASR6		
5360								
5361								
5362								
5363								
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,RO	;RO=110002	
5369	014676	000257			CCC		;CC=0101	
5370	014700	000265			+SEZ!SEC			
5371	014702	006200			ASR	RO	;C=1010	RO=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,RO	;CHECK RESULT OF ASR'S	

5377 014720 001404 BEQ TST164

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014722
014722 012742 000350
014726 005242
014730 000000

ASR7:
MOV #350, -(R2)
INC -(R2)
HALT

; TO SCOPE: CLEAR THE RIGHT BYTE OF THIS <====
; CONDITIONAL BRANCH INST. AND <====
; REPLACE THE MOVE INSTRUCTION <====
; WHICH FOLLOWS W/ 720 <====
; MOVE TO MAILBOX # ***** 350 *****
; SET MSGTYP TO FATAL ERROR
; ASR DID NOT FUNCTION CORRECTLY
; OR SEQUENCE ERROR

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014732 005212
014734 022712 000164
014740 001062
014742 012700 015332
014746 012704 015370
014752 012767 000015 000142
014760 012067 000110
014764 012401
014766 012767 177777 000074
014774 012703 000016
015000 005267 000064
015004 032701 100000
015010 013705 177776
015014 042705 177773
015020 000165 015024
015024 000167 000020
015030 012767 015124 000042
015036 012767 015106 000040
015044 000167 000014
015050 012767 015106 000022
015056 012767 015124 000020
015064 006101
015066 012737
015070 000000
015072 177776
015074 000000
015076 000137
015100 000000

```
*****
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 OUTER 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
*****
TST164: INC (R2) ;UPDATE TEST NUMBER
CMP #164,(R2) ;SEQUENCE ERROR?
BNE ER ;BR TO ERROR HALT ON SEQ ERROR
SETUP: MOV #BRTAB,R0 ;INITIALIZE BRANCH TABLE POINTER
MOV #YNTAB,R4 ;INITIALIZE YES/NO BRANCH MAP POINTER
MOV #15,BRCT ;INITIALIZE BRANCH TABLE COUNT
SETBR: MOV (R0)+,BRH ;GET NEXT BRANCH INST.
MOV (R4)+,R1 ;GET NEXT BRANCH MAP
MOV #-1,CC ;INITIALIZE CONDITION CODE VALUE
MOV #16,R3 ;INITIALIZE CONDITION CODE COUNT
SETCC: INC CC ;SET FOR NEXT CC VALUE
BIT #100000,R1 ;SEE IF SHOULD BR W/ THESE CC'S
MOV @#177776,R5 ;SIMULATE A JNE
BIC #177773,R5 ;
; (JUMP NOT EQUAL)
JMP .+4(R5) ; TO SET2BR
JMP SET2BR
MOV #CONT,NBR ;SET TO CONTINUE IF NO BRANCH
MOV #ER,YBR ;SET TO REPORT ERROR IF BRANCH
JMP AROUND ;GO AROUNDND OPPOSITE CONDITION
SET2BR: MOV #ER,NBR ;SET TO REPORT ERROR IF NO BRANCH
MOV #CONT,YBR ;SET TO CONTINUE IF BRANCH
AROUND: ROL R1 ;UPDATE BIT MAP
CC: MOV (PC)+,@(PC)+ ;SET CONDITION CODE
0 ;NEW CC VALUE GOES HERE
177776
BRH: 0 ;BRANCH INST. GOES HERE
JMP @ (PC)+ ;THIS JUMP IF NO BRANCH
NBR: 0 ;WHERE TO GO IF NO BRANCH OCCURS
```

5445	015102	000137		JMP	@(PC)+	: THIS JUMP IF BRANCH OCCURS
5446	015104	000000		0		: WHERE TO GO IF BRANCH OCCURS
5447	015106	012702	000304	YBR: MOV	#\$TESTN,R2	: RESTORE POINTER
5448	015112	012742	000351	ER: 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		CONT: 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      @SPASS
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,RO      ;GET MSG ADDR.
5476 015240 105737 177564    WAIT:  TSTB    @TPS     ;TTY READY
5477 015244 100375          BPL      WAIT        ;NO WAIT
5478 015246 112037 177566    MOVB    (RO)+,@TPB   ;PRINT CHARACTER
5479 015252 001372          BNE      WAIT        ;NEXT IF NOT DONE.
5480 015254 013700 000042    ACT:   MOV      @42,RO ;CHECK ACT
5481 015260 001405          BEQ      GOAGIN      ;KEEP GOING
5482 015262 000005          RESET
5483 015264 004710          SENDAD: JSR     PC,(RO) ;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
    
```



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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

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5513
5514          000002          .RADIX 2
5515 015370 177777          YNTAB: 1111111111111111
5516 015372 170360          1111000011110000
5517 015374 007417          0000111100001111
5518 015376 146063          1100110000110011
5519 015400 031714          0011001111001100
5520 015402 140060          1100000000110000
5521 015404 037717          0011111111001111
5522
5523 015406 177400          1111111100000000
5524 015410 000377          0000000011111111
5525 015412 120240          1010000010100000
5526 015414 057537          0101111101011111
5527 015416 146314          1100110011001100
5528 015420 031463          0011001100110011
5529 015422 125252          1010101010101010
5530 015424 052525          0101010101010101

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;BR
;BNE: Z=0
;BEQ: Z=1
;BGE: N XOR V =0
;BLT: N XOR V =1
;BGT: Z+(N XOR V) =0
;BLE: Z+(N XOR V) =1

;BPL: N=0
;BMI: N=1
;BHI: C+Z=0
;BLOS: C+Z=1
;BVC: V=0
;BVS: V=1
;BCC: C=0
;BCS: C=1

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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          000001          .END

```

ABASE =	000000	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#
ADDW0 =	000000	424			
ADDW1 =	000000	424			
ADDW10 =	000000	424			
ADDW11 =	000000	424			
ADDW12 =	000000	424			
ADDW13 =	000000	424			
ADDW14 =	000000	424			
ADDW15 =	000000	424			
ADDW2 =	000000	424			
ADDW3 =	000000	424			
ADDW4 =	000000	424			
ADDW5 =	000000	424			
ADDW6 =	000000	424			
ADDW7 =	000000	424			
ADDW8 =	000000	424			
ADDW9 =	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		
ADEVN =	000000	424			
RENV =	000000	424	435		
RENVN =	000000	424	436		
RFATAL =	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			
RPASS =	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	428			
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#		
BACT	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#			
BRS	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#		

ROL6	014206	5150	5159#											
ROL7	014230	5162	5163	5164	5171#									
ROR1	014272	5187	5188	5189	5195#									
ROR2	014302	5190	5199#											
ROR3	014320	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*	3583	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#											
RO	=%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*

3174	3175	3176	3177	3178	3211*	3212	3213	3214	3215	3216	3243*	3244
3245	3246	3247	3248	3273*	3275*	3278	3288*	3290*	3293	3320*	3321*	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 737*	739*	4076*	4077*	4078*	4088	4105*	4109	4124*	4127*	4131	4143*	4147
R2 4160*	4163	4177*	4181	4192*	4200	5423*	5427	5437*				
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

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*						
777*	779*	5425*	5452*									
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									
817*	819*	5428*	5429*	5430	5453*	5454*	5455	5458*	5459*	5460		
405*	481*	492*	837*	839*	873*	4073*	4090	4092	4111	4113	4123*	4226*
4227*	5537*											
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*								
S80	010066	3642	3650*									
S82	010210	3706	3714*									
S84	010334	3770	3778*									
S85	010422	3804	3823*									
S85A	010414	3809	3817*									
S85X	010432	3806*	3808	3828*	3829							
S85XAD	010434	3805	3817	3829*								
S86	010474	3846	3856*									
S86X	010504	3847*	3848	3861*								
S87	010544	3879	3889*									
S87X	010554	3880*	3894*	3895								
S87XAD	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									
SNMBOA	004172	2081	2082	2088*								
SNMBIA	004276	2146	2147	2153*								

R3 =%000003
R4 =%000004

R5 =%000005
R6 =%000006

R7 =%000007
SBC1
SBC2
SBC3
SBC4
SBC5
SBC6
SBC7
S80
S82
S84
S85
S85A
S85X
S85XAD
S86
S86X
S87
S87X
S87XAD
SCOPE =
SETBR
SETCC
SETUP
SET2BR
SHL
SHR
SNMBOA
SNMBIA

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#		
SOPX	004034	2005#	2014*	2015*	2028
SOPXAD	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#		

TST131	010270	3738	3742	3763#
TST132	010350	3765	3779	3802#
TST133	010436	3818	3844#	
TST134	010506	3851	3877#	
TST135	010560	3884	3932#	
TST136	011124	4037	4067#	
TST137	011602	4201	4223#	
TST14	001300	774#		
TST140	011656	4225	4236	4263#
TST141	011742	4265	4286	4300#
TST142	012032	4302	4324	4338#
TST143	012122	4340	4361	4375#
TST144	012214	4377	4400	4426#
TST145	012332	4428	4466	4480#
TST146	012474	4482	4533	4557#
TST147	012532	4559	4566	4580#
TST15	001334	776	781	794#
TST150	012616	4582	4604	4618#
TST151	012704	4620	4642	4666#
TST152	013070	4668	4729	4743#
TST153	013206	4745	4782	4806#
TST154	013332	4808	4848	4862#
TST155	013512	4864	4916	4930#
TST156	013552	4932	4939	4964#
TST157	013724	4966	5018	5031#
TST16	001370	796	801	814#
TST160	014072	5033	5086	5111#
TST161	014240	5113	5166	5180#
TST162	014402	5182	5234	5248#
TST163	014552	5250	5304	5318#
TST164	014732	5320	5377	5416#
TST165	015172	5465#		
TST17	001424	816	821	834#
TST2	000644	502	535	562#
TST20	001460	836	841	870#
TST21	001520	872	876	889#
TST22	001556	891	894	907#
TST23	001614	909	912	925#
TST24	001652	927	930	958#
TST25	001716	960	965	978#
TST26	001774	980	984	994
TST27	002034	1009	1014	1027#
TST3	000700	564	568	581#
TST30	002100	1029	1034	1047#
TST31	002140	1049	1054	1081#
TST32	002210	1083	1101	1128#
TST33	002260	1130	1148	1175#
TST34	002330	1177	1195	1222#
TST35	002400	1224	1242	1291#
TST36	002456	1293	1314	1337#
TST37	002536	1339	1358	1378#
TST4	000736	583	587	600#
TST40	002602	1380	1393	1415#
TST41	002652	1417	1432	1453#
TST42	002730	1455	1473	1497#
TST43	003012	1499	1519	1543#

1007#

TST44	003100	1545	1567	1591#											
TST45	003164	1593	1614	1633#											
TST46	003256	1635	1659	1687#											
TST47	003336	1689	1708	1734#											
TST5	000774	602	606	619#											
TST50	003432	1736	1761	1788#											
TST51	003522	1790	1813	1827#											
TST52	003604	1829	1849	1878#											
TST53	003662	1880	1898	1920#											
TST54	003742	1922	1938	1961#											
TST55	004022	1963	1979	2001#											
TST56	004102	2018	2041#												
TST57	004142	2043	2051	2073#											
TST6	001032	621	624	661#											
TST60	004202	2075	2083	2105#											
TST61	004244	2107	2116	2137#											
TST62	004340	2139	2165	2186#											
TST63	004420	2188	2208	2229#											
TST64	004544	2231	2276	2296#											
TST65	004630	2298	2320	2342#											
TST66	004744	2344	2382	2402#											
TST67	005022	2404	2423	2443#											
TST7	001062	663	667	680#											
TST70	005106	2445	2467	2487#											
TST71	005170	2489	2509	2529#											
TST72	005252	2531	2551	2570#											
TST73	005306	2572	2578	2597#											
TST74	005342	2599	2605	2626#											
TST75	005504	2628	2681	2700#											
TST76	005630	2702	2748	2768#											
TST77	005666	2770	2777	2796#											
WAIT	015240	5476#	5477	5479											
WATE	015464	5541#	5542	5544											
YBR	015104	5433*	5436*	5446#											
YNTAB	015370	5420	5515#												
\$APTHD	000330	457	463#												
\$CPUOP	000326	439#													
\$DEVCT	000310	430#													
\$ENDAD	015264	416	5473	5483#											
\$ENV	000320	435#													
\$ENVH	000321	436#	5471	5538											
\$ERN =	000353	398#	511	512#	520	521#	531	532#	540	541#	573	574#	592	593#	
		611	612#	629	630#	672	673#	690	691#	708	709#	726	727#	746	
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	1852	1888	1901	1930	1941	1971	1982	2009	2021	2054	2086	2119	2151	2168	2200
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	2780	2808	2837	2872	2882	2912	2940	2950	2980	2989	3018	3028	3056	3083	3110
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TYPTXT
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ASL	5254	5269	5284	5298										
ASR	5324	5340	5355	5371										
BCC	740	760	780	800	820	840	984	1013	1053	1228	3277	3292	3340	3357
	3469	3483	3550	3582	4397	4450	4727	4813	4830	4900	5016	5058	5118	5133
	5203	5255	5270	5326	5342	5511								
BOS	1229	2050	2114	2163	2195	2263	2307	2369	3325	3405	3423	3455	3514	3612
	4489	4533	4565	4588	4640	4780	4846	5038	5053	5299	5512			4382
BEQ	504	535	568	587	606	624	667	685	703	721	741	761	781	801
	841	876	894	912	930	965	994	1014	1034	1054	1088	1100	1295	1314
	1382	1393	1420	1432	1460	1473	1505	1519	1552	1567	1600	1614	1643	1659
	1708	1744	1761	1797	1813	1834	1849	1885	1898	1927	1938	1968	1979	2006
	2051	2116	2165	2197	2208	2250	2265	2276	2309	2320	2371	2423	2467	2509
	2578	2605	2631	2644	2655	2670	2681	2726	2738	2777	2805	2834	2869	2909
	2947	2977	2986	3015	3025	3053	3080	3107	3141	3179	3217	3249	3279	3294
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	3715	3742	3770	3779	3809	3818	3851	3884	3939	3948	3962	3974	3983	3996
	4023	4037	4095	4114	4132	4150	4166	4182	4201	4236	4385	4399	4451	4487
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	5189	5204	5219	5257	5272	5300	5304	5327	5343	5358	5375	5377	5474	5481
5501														5500
BGT	2707	5503												
BHI	4284	4322	4359	4501	4700	4765	4869	4937	4971	5507				
BIC	2642	2667	4344	4358	4526	4825	4911	5080	5337	5429	5454	5459		
BICB	2975	3138	3176	3214	3246									
BIS	2652	3051	4381	4396	4444	4761	4895	4982	5368					
BISB	2803	2907	3078	3105	3139	3177	3215	3247						
BIT	2737	2747	4306	4321	5427									
BITB	5471	5538												
BLE	5504													
BLOS	2082	2147	2239	2355	2412	2455	2498	2540	4269	4307	4345	4433	4464	4515
	4625	4672	4686	4712	4750	4884	4914	4986	5001	5084	5148	5162	5217	5232
	5356	5372	5508											4602
BLT	2716	5502												5285
BMI	1135	1147	1242	1305	1342	2049	2083	2115	2148	2164	2196	2240	2264	2308
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	4816	4832	4902	5018	5040	5055	5071	5121	5190	5234	5258	5328	5506	4781
BNE	502	515	524	564	583	602	621	663	682	700	718	736	756	776
	816	836	872	891	909	927	960	980	1009	1029	1049	1083	1087	1101
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	4302	4340	4377	4428	4482	4559	4582	4620	4668	4745	4808	4847	4864	4932
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	1845	1896	1936	1977	2016	4286	4324	4361	4434	4466	4674	4702	4767	4848
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	5344	5359	5374	5477	5505	5542								5302
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	735	755	775	795	815	835	871	890	893	908	911	926	929	959	964
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RESET	5482														
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RTS	4229														
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3150	3167	3172	3173	3184	3188	3205	3210	3222	3225	3237	3242	3254	3257	3267
3272	3284	3299	3303	3314	3319	3332	3347	3364	3368	3377	3382	3397	3414	3433
3437	3446	3451	3462	3476	3490	3494	3504	3509	3523	3527	3539	3544	3545	3559
3563	3573	3578	3589	3593	3602	3607	3608	3619	3623	3634	3639	3647	3656	3659
3568	3673	3683	3686	3696	3701	3711	3720	3723	3733	3738	3747	3750	3760	3765
3775	3784	3787	3799	3804	3805	3814	3823	3827	3841	3846	3847	3856	3850	3874
3879	3880	3889	3893	3929	3934	3935	3944	3953	3967	3979	3988	4001	4014	4028
4042	4045	4064	4069	4070	4081	4100	4119	4137	4155	4171	4187	4206	4210	4220
4225	4232	4241	4244	4260	4265	4276	4291	4295	4297	4302	4314	4329	4333	4335
4340	4352	4366	4370	4372	4377	4390	4405	4409	4423	4428	4440	4456	4471	4475
4477	4402	4494	4508	4522	4538	4542	4554	4559	4571	4575	4577	4582	4594	4609
4613	4615	4620	4632	4647	4651	4663	4668	4679	4693	4707	4719	4734	4738	4740
4745	4757	4772	4787	4791	4803	4808	4821	4837	4853	4857	4859	4864	4876	4891
4907	4921	4925	4927	4932	4944	4948	4961	4966	4978	4993	5008	5023	5027	5028
5033	5046	5061	5076	5091	5095	5108	5113	5126	5141	5155	5171	5175	5177	5182
5195	5210	5225	5239	5243	5245	5250	5263	5278	5292	5309	5313	5315	5320	5333
5349	5364	5382	5386	5413	5418	5419	5448	5462	5467	5468	5488			
1	398	402	409	424	500	503	512	518	521	532	538	541	562	565
571	574	581	584	590	593	600	603	609	612	619	622	627	630	661
664	670	673	680	683	688	691	698	701	706	709	716	719	724	727

.IIF

.LIST

734	737	744	747	754	757	768	774	777	784	787	794	797	804	807	
814	817	824	827	834	837	844	847	870	873	879	882	889	892	897	
900	907	910	915	918	925	928	933	936	958	961	968	971	978	981	
987	990	997	1000	1007	1010	1017	1020	1027	1030	1037	1040	1047	1050	1057	
1060	1081	1084	1091	1095	1104	1108	1128	1131	1138	1142	1151	1155	1175	1178	
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1878	1881	1888	1891	1901	1905	1920	1923	1930	1933	1941	1945	1961	1964	1971	
1974	1982	1986	2001	2004	2009	2012	2021	2025	2041	2044	2054	2058	2073	2076	
2086	2090	2105	2108	2119	2123	2137	2140	2151	2155	2168	2172	2186	2189	2200	
2204	2211	2214	2229	2232	2243	2247	2253	2256	2268	2272	2279	2282	2296	2299	
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2719	2722	2729	2732	2741	2744	2751	2754	2768	2771	2780	2783	2796	2799	2808	
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2929	2932	2940	2943	2950	2953	2969	2972	2980	2983	2989	2992	3005	3008	3018	
3021	3028	3031	3046	3049	3056	3059	3073	3076	3083	3086	3100	3103	3110	3113	
3132	3135	3144	3148	3170	3173	3182	3186	3208	3211	3220	3223	3240	3243	3252	
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4185	4189	4204	4208	4223	4226	4233	4239	4242	4263	4266	4274	4278	4289	4293	
4300	4303	4312	4316	4327	4331	4338	4341	4350	4354	4364	4368	4375	4378	4388	
4392	4403	4407	4426	4429	4438	4442	4454	4458	4469	4473	4480	4483	4492	4496	
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4717	4721	4732	4736	4743	4746	4755	4759	4770	4774	4785	4789	4806	4809	4819	
4823	4835	4839	4851	4855	4862	4865	4874	4878	4889	4893	4905	4909	4919	4923	
4930	4933	4942	4946	4964	4967	4976	4980	4991	4995	5006	5010	5021	5025	5031	
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5153	5157	5169	5173	5180	5183	5193	5197	5208	5212	5223	5227	5237	5241	5248	
5251	5261	5265	5276	5280	5290	5294	5307	5311	5318	5321	5331	5335	5347	5351	
5362	5366	5380	5384	5416	5419	5449	5465	5468	5490						
MACRO	1														
MCALL	409														
MEXIT	447														
NLIST	1	398	401	409	424	500	503	512	518	521	532	538	541	562	565
571	574	581	584	590	593	600	603	609	612	619	622	627	630	661	665
664	670	673	680	683	688	691	698	701	706	709	716	719	724	727	734
734	737	744	747	754	757	768	774	777	784	787	794	797	804	807	814
814	817	824	827	834	837	844	847	870	873	879	882	889	892	897	900
900	907	910	915	918	925	928	933	936	958	961	968	971	978	981	987
987	990	997	1000	1007	1010	1017	1020	1027	1030	1037	1040	1047	1050	1057	1060
1060	1081	1084	1091	1095	1104	1108	1128	1131	1138	1142	1151	1155	1175	1178	1185
1185	1189	1198	1202	1222	1225	1232	1236	1245	1249	1291	1294	1298	1301	1308	

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)