RP11-C/RP02

RELIABILITY

MD-11-DZRPF-B

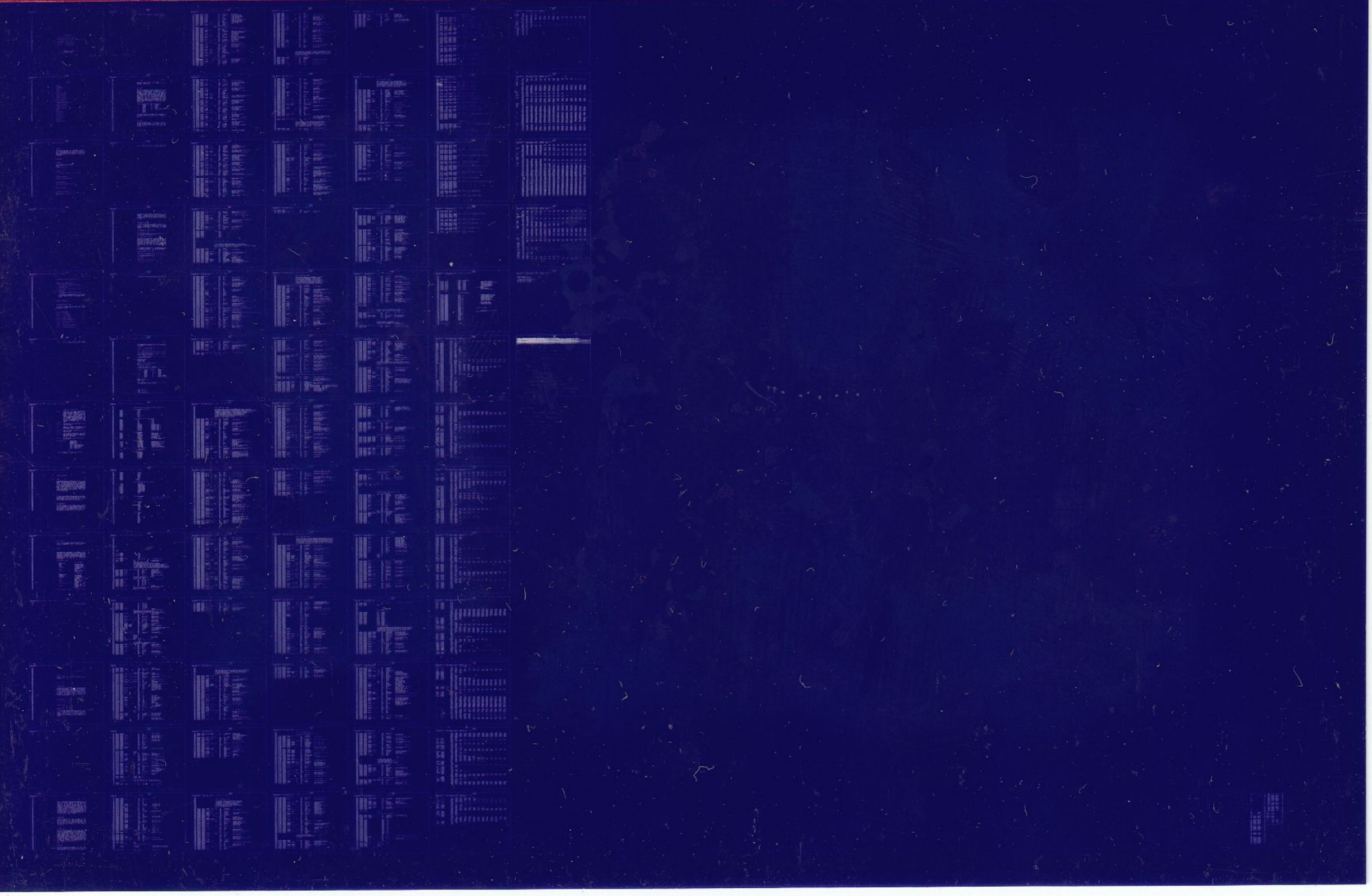
EP-DZRPF-B-DL-A

OCT 1976

FICHE 1 OF 1

digital

Made in U.S.A.



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IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZRPF-B-D

PRODUCT NAME: RP11 DISK DATA AND ADDRESS TEST

DATE CREATED: JUNE 15, 1973

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: JOE STUBBLEBINE

CONTENTS

1.0 ABSTRACT

THIS PROGRAM TESTS BOTH THE ADDRESSING CAPABILITY AND THE DATA RELIABILITY OF THE OF THE PR11 AND THE RP02. THE PROGRAM CONSIST OF SEVEN TESTS ANY ONE OF WHICH IS SELECTABLE BY THE OPERATOR. A CONVERSATION MODE EXISTS WHICH ALLOWS THE OPERATOR TO DEFINE TEST PARAMETERS.

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP11 STANDARD FAMILY PROCESSOR
RP11 DISK PACK CONTROLLER WITH UP TO EIGHT RP02 DRIVES
ASR33 OR EQUIVELANT.

2.2 STORAGE

8K OF STORAGE IS REQUIRED TO RUN THIS PROGRAM.

2.3 PRELIMINARY PROGRAMS

DZRPE RP11 DISKLESS DIAGNOSTIC

3.0 LOADING PRODEDURE

USE STANDARD PROCEDURE FOR ABS TAPES

4.0 STARTING PROCEDURE

4.1 CONTROL SWITCH SETTINGS

SEE 5.1.1 (ALL SWITCHES DOWN FOR WORST CARE TESTING-UNIT0).

```
   144                                  4.2     STARTING ADDRESS
```

THE PROGRAM MUST ALWAYS BE STARTED AT 200.

4.3 PROGRAM AND/OR OPERATOR ACTION

1. LOAD PROGRAM INTO MEMORY USING ABS LOADER.
2. LOAD ADDRESS 200.
3. SET SWITCHES. ALL DOWN FOR WORST CASE-UNIT 0.
4. PRESS START.
5. THE PROGRAM WILL LOOP AND TYPE PASS COUNT.
6. WHILE IN TEST 5 (DATA RELIABILITY) THE DISPLAY WILL CONTAIN THE NUMBER OF THE PATTERN CURRENTLY IN USE IN ORDER TO SHOW THE PROGRESS OF THE TEST.

5.0 OPERATING PROCEDURES

5.1 OPERATIONAL SWITCH SETTINGS

AT SA 200 ALL SWITCHES DOWN IS WORST CASE TESTING FOR UNIT 0. PASS COUNT WILL BE TYPED OUT AT THE COMPLETION OF A PASS.

5.1.1 SWITCH SETTINGS ARE:

SW<15>=1....HALT ON ERROR

SW<14>=1....LOOP ON ERROR

SW<13>=1....INHIBIT PRINTOUT

SW<12>=1....INHIBIT BACKGROUND TEST

SW<11>=1....RING BELL ON ERROR

SW<10>=1....LOOP ON TEST

SW<09>=1....INHIBIT DATA COMPARISON

SW<08>=1....ENTER CONVERSATION MODE

```
   201                                  SW<05>      USED TO CONTROL HOW MANY COMPARE  ERRORS
   202                                              WILL  BE TYPED OUT AS A RESULT OF A READ
```

OPERATION IN THE DATA TEST.

SW<05>=1....CHECK FOR UP TO THREE COMPARE ERRORS WITHIN THE READ BUFFER AND TYPE ALL APPROPRIATE ERROR INFORMATION FOR EACH ERROR. NOTE IF THE DISK DISCOVERS AN ERROR, IT WILL FINISH READING THE CURRENT SECTOR AND THEN STOP. SO IF A VALID COMPARE ERROR IS ENCOUNTERED, AND THE PROGRAM CONTINUES SCANNING THE BUFFER, IT MAY GO BEYOND THE AREA WHERE THE DISK TRANSFERRED DATA. IF THIS HAPPENS, THE RECEIVED DATA WILL BE ZEROS.

SW<05>=0....CHECK FOR ONLY ONE COMPARE ERROR WITHIN THE READ BUFFER.

SW<04> USED TO CONTROL THE AMOUNT OF INFORMATION TYPED ON REREAD ATTEMPTS AFTER A READ FAILURE IN DATA TEST.

SW<04>=1....TYPE ALL ERROR INFORMATION ON EACH REREAD ATTEMPT.

SW<04>=0....TYPE THE ERROR INFORMATION ON THE FIRST READ ERROR ONLY. AFTER THE ERROR GOES AWAY OR IS UNRECOVERABLE, THE NUMBER OF REREADS IS THEN TYPED.

SW<03>=1....RUN TEST SELECTED BY SWITCH POSITIONS SW0 THRU SW2

SW<00>THRU SW<02>	TEST SELECTED
0	ADDRESS TEST 0
1	ADDRESS TEST 1
2	ADDRESS TEST 2
3	TEST3 - WRITE CHECK TEST
4	TEST4 - MEMORY ADDRESS TEST
5	TEST5 - DATA RELIABILITY
6	TEST6 - RANDOM TEST
7	TEST7 - POWER FAIL TEST

NOTE

IF IT IS DESIRED TO SELECT AN INDIVIDUAL TEST, ALSO SET SW<10> LOOP ON TEST.

5.2 SUBROUTINE ABSTRACTS

5.2.1 SCOPE

THIS SUBROUTINE CALL IS PLACED AT THE END OF EACH SUBTEST AND PROVIDES THE ABILITY TO LOOP ON AN ERROR. WHENEVER AN ERROR IS DETECTED, AN ERROR FLAG IS SET. THIS FLAG IS TESTED BY THE SCOPE ROUTINE. IF SET, AND LOOP ON ERROR SW<14> IS SET, THE PROGRAM WILL LOOP BACK AND REPEAT THE CONDITIONS CAUSING THE ERROR. PRIOR TO EACH SCOPE CALL THE LOOP ADDRESS IS MOVED INTO LOCATION LAD. ONCE THE PROGRAM STARTS LOOPING ON AN ERROR, IT WILL CONTINUE LOOPING EVEN THOUGH THE ERROR MAY BE INTERMITTENT. TO GO OUT OF THE LOOP RESET SW<14>.

5.2.2 HLT

THIS ROUTINE IS ENTERED UPON DETECTION OF AN ERROR. IT WILL TYPE THE PC OF THE ERROR AND ADDITIONAL ERROR INFORMATION. THIS ROUTINE TEST FOR HALT ON ERROR, INHIBIT TYPEOUTS, AND RING THE BELL. IT ALSO SETS THE ERROR FLAG USED BY THE SCOPE ROUTINE.

5.2.3 BACKGROUND TEST

THIS TEST IS ENTERED BY THE PROGRAM WHILE WAITTING FOR AN INTERRUPT. IT DOES A SERIES OF NEGATE BYTE INSTRUCTIONS TO PROVIDE WORSE CASE NPR TIMING AND IT WILL TIMEOUT IF AN INTERRUPT FAILS TO OCCUR. THE BACKGROUND TEST MAY BE INHIBITED BY SETTING SW<12> WHICH CAUSE THE PROGRAM TO DO A WAIT INSTRUCTION.

5.2.4 TRAP CATCHER

A".+2" - "HALT" SEQUENCE IS REPEATED FROM 0-776 TO CATCH ANY UNEXPECTED TRAPS. THUS ANY UNEXPECTED TRAPS OR INTERRUPTS WILL HALT AT THE VECTOR +2.

6.0 ERRORS

6.1 WHEN ERRORS ARE ENCOUNTERED, THE ADDRESS OF THE ERROR ALONG WITH THE CONTENTS OF RPDS, RPER AND RPCS ARE TYPED. BY REFERRING TO THE LISTING ADDITIONAL INFORMATION CAN BE FOUND REGARDING THE CAUSE OF THE ERROR IN THE COMMENTS. WHEN APPROPRIATE, ADDITIONAL INFORMATION IS TYPED OUT SUCH AS EXPECTED AND RECEIVED RESULTS OF AN OPERATION. ALL INFORMATION IS IN OCTAL.

ERROR MESSAGE FORMAT

1.	PC=	PC OF FAILURE
	STATUS ERROR	
	RPDS=	CONTENTS OF RPDS
	RPER=	CONTENTS OF RPER
	RPCS=	CONTENTS OF RPCS
	CYLINDER=	CYLINDER ADDRESS OF THE ERROR
	HEAD=	HEAD ADDRESS OF THE ERROR
	SECTOR=	SECTOR ADDRESS OF THE ERROR
2.	PC=	PC OF FAILURE
	COMPARE ERROR	
	EXPECTED=	DATA EXPECTED
	RECEIVED=	DATA RECEIVED
	CYLINDER=	CYLINDER ADDRESS OF THE ERROR
	HEAD=	HEAD ADDRESS OF THE ERROR
	SECTOR=	SECTOR ADDRESS OF THE ERROR
	WORD COUNT INTO SECTOR=	DISTANCE INTO SECTOR. THE COUNT STARTS AT ONE.
	READ NO.	INDICATES WHICH READ ATTEMPT IS IN PROGRESS.
3.	TOTAL REREADS ON ERROR=	TOTAL READS BEFORE

```
   350                                                          RECOVERY.   TOTAL OF
   351                                                          24  INDICATES  ERROR
```

WAS UNRECOVERABLE

7.0 RESTRICTIONS

TEST 7 (POWER FAIL) WILL BE EXECUTED ONLY IF SELECTED BY THE SWITCHES. IT WILL HALT AT COMPLETION.

8.0 MISCELLANEOUS

8.1 EXECUTION TIME

THE PASS COUNT WILL BE TYPED OUT AT THE END OF EACH PASS THRU THE PROGRAM. DUE TO THE TIME NECESSARY TO RUN ANY INDIVIDUAL TESTS, TESTS ARE NOT ITERATED. IF YOU WISH TO LOOP ON ANY PARTICULAR TEST, SELECT THE TEST IN SWITCH POSITIONS SW<00> THRU SW<02> AND SET SW<03> AND SW<10>. WHEN IN TEST 5 (DATA RELIABILITY) ITS PROGRESS CAN BE MONITORED BY LOOKING AT THE DISPLAY. IT WILL CONTAIN THE NUMBER OF THE PATTERN CURRENTLY IN USE.

8.2 STACK POINTER

STACK IS INITIALLY SET TO 50C.

9.0 PROGRAM DISCRIPTION

9.1 ADDRESS TEST 0

IN THIS TEST THE PROGRAM SEEKS FROM 0 TO N AND BACK TO 0. N STARTS AT ZERO THEN INCREMENTS TO 1 AND UP THRU 312. DONE IS TIMED OUT, SEEK UNDERWAY IS TESTED, UNIT READY IS TIMED OUT. ATTENTION INTERRUPT AND THE INTERRUPT FLAG ARE TESTED, AND THE CONTENTS OF THE SELECTED CYLINDER REGISTER ARE CHECKED.

9.2 ADDRESS TEST 1

```
   408
   409                                  WRITE 5000(OCTAL) WORDS IN THE TEN SECTORS  ON  EACH
```

TRACK. THE FIRST WORD OF EACH SECTOR IS THE CYLINDER ADDRESS AND THE REMAINING WORDS CONTAIN THE HEAD AND SECTOR ADDRESS. AFTER EACH WRITE OPERATION, THE CONTENTS OF RPCA AND RPDA ARE EXAMINED TO SEE THAT THEY UPDATED CORRECTLY. AFTER WRITTING THE ENTIRE PACK, THE DATA IS READ BACK TEN SECTORS AT A TIME AND VERIFIED. IF THE FIRST WORD OF A SECTOR DOES NOT COMPARE THE WRONG CYLINDER WAS PROBABLY SELECTED. AN ERROR ON THE FIRST WORD IS INDICATED BY TYPING "CYL" AFTER THE ERRING DATA. IF ANY OTHER WORD FAILS THE WRONG HEAD OR SECTOR WAS PROBABLY SELECTED. IN THIS CASE THE RIGHT HALF OF THE DATA TYPED EQUALS THE SECTOR ADDRESS AND THE LEFT HALF EQUALS THE TRACK ADDRESS.

9.3 ADDRESS TEST 2

WRITE THE FIRST WORD OF EACH CYLINDER WITH THE CYLINDER ADDRESS. THEN SEEK FROM 312 TO 0. THEN SEEK TO 311 AND BACK TO 1 UNTIL THE ADDRESSES CROSS AND GO BACK TO ZERO. AFTER EACH SEEK VERIFY THE POSITION OF THE HEAD BY READING THE FIRST WORD OF THE CYLINDER AND COMPARING IT WITH THE SELECTED CYLINDER.

9.4 WRITECHECK TEST

THIS TEST VERIFIES THE WRITE CHECK LOGIC AND THE ABILITY OF THE HARDWARE TO FILL THE REMAINDER OF A SECTOR WITH ZEROS WHEN A PARTIAL SECTOR IS WRITTEN. IN THE WRITE CHECK PORTION A FLOATING ONE AND A FLOATING ZERO PATTERN ARE USED TO TEST THE WRITE CHECK COMPARE LOGIC. THE PATTERN IS WRITTEN AND WRITE CHECKED EXPECTING NO ERRORS. THE BUFFER IS THEN CLEARED AND THE DATA IS WRITE CHECKED AGAIN. AN ERROR IS EXPECTED. AFTER WRITE CHECK IS TESTED, A SECTOR IS WRITTEN WITH ALL ONES AND THEN A TWO WORD WRITE IS PERFORMED. THE ENTIRE SECTOR IS READ AND VERIFIED. THE FIRST TWO WORDS SHOULD BE ONES AND THE REMAINDER SHOULD BE ZERO.

9.5 MEMORY TEST

THIS TEST CONSIST OF TWO SEGMENTS. THE FIRST PART TEST THE ACCESSIBILITY OF MEMORY WITHOUT UTILIZING MEMORY MANAGEMENT. EACH LOCATION FROM THE END OF THE PROGRAM TO THE TOP OF MEMORY (NOT TO EXCEED 28K)

```
466                                     IS WRITTEN WITH ITS ADDRESS.  THIS DATA  IS  WRITTEN
467                                     ON  THE DISK.  THE MEMORY IS CLEARED AND THE DATA IS
```

READ BACK AND VERIFIED. IN SEGMENT TWO, THE EXTENDED ADDRESS BITS ARE TESTED IF MEMORY MANAGEMENT IS AVAILABLE.

9.6 DATA TEST

DATA TEST VERIFIES THE DATA RELIABILITY OF THE DRIVE. THE SEQUENCE IS WRITE THE PACK, WRITE CHECK, AND READ IT. THIS SEQUENCE CONTINUES FOR THE 15 PATTERNS DEFINED BELOW. IF A DATA ERROR IS ENCOUNTERED DURING A READ OPERATION, THE OPERATION IS REPEATED 20 TIMES OR UNTIL THE ERROR GOES AWAY. AFTER THE TENTH TIME THE HEADS ARE HOMED AND REPOSITIONED. WITH EACH READ ERROR THE READ RETRY NUMBER IS TYPED OUT ALONG WITH THE ERROR INFORMATION. THIS WAY IT CAN BE DETERMINED IF AN ERROR IS RECOVERABLE OR NON-RECOVERABLE. IF A READ STATUS ERROR OCCURS AND IT IS A SOFT ERROR (PARITY ERROR), THE DATA IS COMPARED TO PROVIDE ADDITIONAL INFORMATION.

NUMBER	DATA PATTERN	NUMBER	DATA PATTERN
0	163126	11	167356
1	052525	12	156735
2	125252	13	135673
3	031463	14	073567
4	007417	15	177777 - 000000
5	010421	16	RANDOM DATA
6	021042		
7	042104		
10	104210		

THE LENGTH OF EACH DATA TRANSFER IS DETERMINED BY THE SIZE OF MEMORY AND IS INDICATED BY A TYPEOUT AT THE BEGINNING OF THE PROGRAM, IF IN CONVERSATION MODE.

9.7 RANDOM TEST

IN THIS TEST RANDOM DATA OF 400(OCTAL) WORDS IS WRITTEN ON RANDOM SECTORS. IT IS THEN WRITE CHECKED AND READ. THIS IS REPEATED 5000 TIMES. THE READ RECOVERY TECHNIQUE IS THE SAME AS DESCRIBED UNDER DATA TEST(9.4).

9.8 POWER FAIL TEST

```
                                                        ;
                                        TESTS THE ABILITY OF THE RP11 TO SENSE POWER FAILURE
                                        AND  TO  HOME THE HEADS.  AS SOON AS THE OPERATOR IS
```

REQUESTED TO TURN OFF POWER, THE PROGRAM WILL LOOP READING A SECTOR FROM THE DISK. AFTER POWER IS RESTORED, THE PROGRAM CHECKS THAT THE HEADS ARE ON CYLINDER ZERO AND THAT THE CONTENTS OF MEMORY ABOVE THE PROGRAM HAS NOT BEEN AFFECTED BY THE POWER FAILURE.

9.9 CONVERSATION MODE

CONVERSATION MODE MAY BE ENTERED BY SETTING SW<08> TO A 1. IF SELECTED A NUMBER OF QUESTIONS WILL BE ASKED TO DETERMINE TEST PARAMETERS. ALL NUMBER RESPONSES SHOULD BE IN OCTAL FOLLOWED BY A CARRIAGE RETURN.

THE CONVERSATION IS AS FOLLOWS:

DATA TEST ONLY?(Y OR N)

IF THE OPERATOR RESPONDS YES, THE PROGRAM ENTERS THE DATA MODE ONLY, TEST 5 AND TEST 6.

MULTI DRIVE MODE?(Y OR N)

WITHIN THE MULTI DRIVE MODE, THE PROGRAM ALLOWS THE OPERATOR TO EXERCISE ALL SYSTEM DRIVES WITHOUT RESTARTING THE PROGRAM. A COMPLETE PASS IS MADE ON DRIVE ZERO AND THE PROGRAM THEN GOES TO THE NEXT DRIVE UNTIL ALL DRIVES ARE DONE. AT THIS TIME THE PASSCOUNT IS UPDATED AND TYPED OUT. THE PROGRAM CYCLES BACK TO UNIT ZERO AND CONTINUES. BEFORE TESTING STARTS ON A UNIT, THE UNIT NUMBER IS TYPED OUT.

IF THE OPERATOR RESPONDS YES - THE PROGRAM ASKS FOR THE NUMBER OF DRIVES. IF THE OPERATOR RESPONDS NO - THE PROGRAM ASKS FOR WHICH DRIVE TO EXERCISE.

NUMBER OF DRIVES 1 TO 10 (OCTAL)?

RESPOND WITH THE NUMBER OF DRIVES ON THE SYSTEM.

IF THE OPERATOR RESPONDS "NO" TO MULTI DRIVE MODE THE FOLLOWING QUESTION IS ASKED.

WHICH DRIVE?

RESPOND WITH UNIT NUMBER OF DRIVE TO TEST

OPTIONAL WORD COUNT ?(Y OR N)

```
582                                     PROVIDES THE OPPORTUNITY TO SPECIFY  YOUR  OWN  WORD
583                                     COUNT  WHICH MAY NOT EXCEED THE STANDARD WORD COUNT.
```

```
                                                                    PAGE 12


                        THE STANDARD WORD COUNT IS TYPED OUT AT THE START OF
                        THE  PROGRAM.  IF RESPONSE IS NO - THE NEXT QUESTION
                        IS SKIPPED.

                        LENGTH (1 TO STANDARD WORD COUNT)?

                        SPECIFY WORD COUNT IN OCTAL.

                        DO YOU WISH TO SELECT THE DISK TEST ADDR?(Y OR N)

                        THIS WILL ALLOW THE OPERATOR TO  SELECT  A  SPECIFIC
                        AREA OF THE DSIK FOR TESTING.

                        IF  THE  OPERATOR  RESPONDS  "YES"   THE   FOLLOWING
                        QUESTIONS WILL BE ASKED.

                        STARTING CYLINDER
                        STARTING HEAD
                        STARTING TRACK

                        RESPOND WITH THE DESIRED ADDRESS IN OCTAL

                        OPTIONAL DATA PATTERN NO.?

                        YOU HAVE THE  OPTION  OF  SELECTING  ANY  INDIVIDUAL
                        PATTERN OR SELECTING ALL PATTERNS.

                        PATTERN NO.  PATTERN    PATTERN NO.     PATTERN
                           0         163126         10          404210
                           1         052525         11          167356
                           2         125252         12          156735
                           3         031463         13          135673
                           4         007417         14          073567
                           5         010421         15          177777 - 000000
                           6         021042         16          RANDOM PATTERN
                           7         042104         17          SELECTS ALL PATTERNS

                        WRITE?  (Y OR N)
                        WRITE CHECK?  (Y OR N)
                        READ?  (Y OR N)

                        THESE QUESTIONS ALLOW YOU TO SELECT  THE  OPERATIONS
                        TO BE PERFORMED IN THE DATA TESTS.



                                %

                        .LIST   ME
                        .NLIST  MC,MD,CND
                        .ABS
                        .TITLE  FRONT END
                ;COPYRIGHT 1972, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
```

```
                                ;CONTAINS DEFINITIONS, REGISTER ASSIGNMENTS AND MACRO CALLS

                                ;GENERAL REGISTER ASSIGNMENTS
000000                                  R0=%0
000001                                  R1=%1
000002                                  R2=%2
000003                                  R3=%3
000004                                  R4=%4
000005                                  R5=%5
000006                                  SP=%6
000007                                  PC=%7

                                ;STATUS REGISTER (PSW) BIT ASSIGNMENTS
000001                                  C=1                     ;C BIT
000002                                  V=2                     ;V BIT
000004                                  Z=4                     ;Z BIT
000010                                  N=10                    ;N BIT
000020                                  T=20                    ;T BIT
000340                                  PRI7=340                ;PRIORITY LEVEL 7
000300                                  PRI6=300                ;PRIORITY LEVEL 6
000240                                  PRI5=240                ;PRIORITY LEVEL 5
000200                                  PRI4=200                ;PRIORITY LEVEL 4
000140                                  PRI3=140                ;PRIORITY LEVEL 3
000100                                  PRI2=100                ;PRIORITY LEVEL 2
000040                                  PRI1=40                 ;PRIORITY LEVEL 1

                                ;VECTOR ADDRESSES
000004                                  ERRVEC=4                ;ERROR VECTOR
000010                                  RESVEC=10               ;RESERVED INST VECTOR
000014                                  TBITVEC=14              ;T BIT VECTOR
000020                                  IOTVEC=20               ;IOT TRAP VECTOR
000024                                  PFVEC=24                ;POWER FAIL VECTOR
000030                                  EMTVEC=30               ;EMT VECTOR
000034                                  TRAPVEC=34              ;TRAP VECTOR

                                ;REGISTER ADDRESSES
177776                                  PSW=177776              ;PROCESSOR STATUS REGISTER
177560                                  TKS=177560              ;KEYBOARD CSR
177562                                  TKB=177562              ;ADDR OF KEYBOARD BUFFER
177564                                  TPS=177564              ;TELEPRINTER CSR
177566                                  TPB=177566              ;TELEPRINTER BUFFER
177570                                  SWR=177570              ;CONSOLE SWITCH REGISTER
177570                                  DISPLAY=177570          ;CONSOLE DISPLAY REGISTER

                                ;INITIAL STACK POINTER
000500                                  STKPTR=500              ;PROGRAM STACK POINTER

                                ;BIT ASSIGNMENTS
100000                                  B15=100000
040000                                  B14=40000
020000                                  B13=20000
010000                                  B12=10000
004000                                  B11=4000
002000                                  B10=2000
001000                                  B9=1000
```

```
                                B8=400
                                B7=200
                                B6=100
                                B5=40
                                B4=20
                                B3=10
                                B2=4
                                B1=2
                                B0=1

                        ;MEMORY MANAGEMENT REGISTER ASSIGNMENTS

                                SR0=177572
                                KIPAR0=172340
                                KIPAR1=172342
                                KIPAR2=172344
                                KIPAR7=172356
                                KIPDR0=172300
                                KIPDR1=172302
                                KIPDR2=172304
                                KIPDR7=172316
                                RW=6
                                UP=00


                        ;INSTRUCTION EQUATES
                                HLT=TRAP                ;HLT IS A TRAP TO THE ERROR ROUTINE

                                SCOPE=EMT               ;SCOPE IS AN EMT TRAP


                        ;INDEX OF MACROS
                        ;       .SCOPE
                        ;       .SAVE
                        ;       .REST
                        ;       .ERROR
                        ;       .PRINT
                        ;       .DUMP
                        ;       .RAND
                        ;       .READ
                        ;       .PACK

                        ;INDEX OF CALLS
                        ;       SCOPE
                        ;       SAVE
                        ;       REST
                        ;       HLT
                        ;       PRINT
                        ;       DUMP
                        ;       DUMPF
                        ;       SDUMP
                        ;       SDUMPF
                        ;       RAND
                        ;       READ
                        ;       PACK
```

```
                    000046                          .=46
000046  012060                                      MEXIT
                    000052                          .=52
000052  040000                                      40000
                                                    .LIST   ME
                    000200                          .=200
000200  012707  002336                              MOV     #START,PC       ;GO TO START OF TEST
                    001000                          .=1000
001000  000000                      ICNT:   0                               ;CONTAINS PASS COUNT
001002  000000                      LAD:    0                               ;PROGRAM TRACE
                                    ;SCOPE (EMT) SERVICE ROUTINE
                                    ;THIS ROUTINE WILL LOOP IF AN ERROR OCCURED AND
                                    ;LOOP ON ERROR SWITCH IS SET (BIT 14). IF LOOPING IS INDICATED
                                    ;THE CONTENTS OF "LAD" EQUAL THE LOOP ADDRESS. IN ORDER
                                    ;TO LOOP ON ERROR, BIT 14 OF THE SWITCH REGISTER MUST BE SET AND
                                    ;LOCATION "ERRFLG" MUST BE NEGATIVE INDICATING AN ERROR. ONCE THE
                                    ;LOOP IS INITIATED IT WILL CONTINUE UNTIL SWITCH 14 IS CLEARED.

001004  032737  040000  177570       SCOPE$: BIT     #B14,@#SWR              ;LOOP ON ERROR?
001012  001403                              BEQ     2$                      ;BRANCH IF NO
001014  005767  000220                      TST     ERRFLG                  ;IS THERE AN ERROR?
001020  100403                              BMI     1$                      ;BRANCH IF YES
001022  005067  000212               2$:    CLR     ERRFLG                  ;RESET ERROR CONDITION
001026  000002                              RTI                             ;EXIT
001030  016716  177746               1$:    MOV     LAD,(SP)                ;MODIFY RETURN ADDRESS
001034  000002                              RTI                             ;EXIT
                                    ;ROUTINE TO SAVE REGISTERS ON THE STACK.
                                    ;CALLED BY SAVE MACRO
001036  012667  000020               SAVE$:  MOV     (SP)+,1$                        ;SAVE RETURN PC
001042  010546                              MOV     R5,-(SP)
001044  010446                              MOV     R4,-(SP)
001046  010346                              MOV     R3,-(SP)
001050  010246                              MOV     R2,-(SP)
001052  010146                              MOV     R1,-(SP)
001054  010046                              MOV     R0,-(SP)
001056  016707  000000                      MOV     1$,PC                   ;RETURN
001062  000000                      1$:     0                               ;CONTAINS RETURN ADDRESS
                                    ;ROUTINE TO RESTORE REGISTERS SAVED ON THE STACK
                                    ;CALLED BY REST MACRO
001064  012667  000020               REST$:  MOV     (SP)+,1$                ;SAVE RETURN PC
```

```
                                        MOV     (SP)+,R0
                                        MOV     (SP)+,R1
                                        MOV     (SP)+,R2
                                        MOV     (SP)+,R3
                                        MOV     (SP)+,R4
                                        MOV     (SP)+,R5
001104  016707  000000                  MOV     1$,PC           ;RETURN
001110  000000                  1$:     0                       ;CONTAINS RETURN ADDR
                                ;ERROR SERVICE ROUTINE CALLED BY HLT
                                ;THIS ROUTINE WILL HALT ON ERROR, RING THE BELL, AND
                                ;TRANSFER CONTROL TO A USER SUPPLIED ROUTINE IF SPECIFIED
001112  005737  177570          ERROR:  TST     @#SWR           ;HALT ON ERROR?
001116  100001                          BPL     3$              ;BRANCH IF NO
001120  000000                          HALT
001122  032737  004000  177570  3$:     BIT     #B11,@#SWR      ;RING THE BELL?
001130  001403                          BEQ     1$              ;BRANCH IF NO
001132  004567  000144                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
001136  001250                          BELL
001140  032737  020000  177570  1$:     BIT     #B13,@#SWR      ;SKIP TYPEOUT?
001146  001022                          BNE     2$              ;BRANCH IF YES
001150  004567  000110                  JSR     R5,PRINT$       ;PRINT MESSAGE
001154  001252                          ERRPC
001156  011667  000062                  MOV     (6),HLTAD$      ;GET ERROR PC+2
001162  162767  000002  000054          SUB     #2,HLTAD$       ;MODIFY
001170  117767  000050  000044          MOVB    @HLTAD$,HLTCT$  ;SAVE HLT ARGUEMENT
001176  016767  000042  000356          MOV     HLTAD$,TTY
001204  004767  000134                  JSR     PC,PRINTR       ;TYPE LOCATION WITH LEADING ZEROS
001210  004767  013146                  JSR     PC,MSG          ;GO TO USER ERROR ROUTINE
001214  005737  177570          2$:     TST     @#SWR           ;HALT ON ERROR?
001220  100001                          BPL     4$              ;BRANCH IF NO
001222  000000                          HALT
001224  052767  100000  000006  4$:     BIS     #B15,ERRFLG     ;SET ERROR FLAG
001232  005267  000010                  INC     ERRORS          ;UPDATE ERROR COUNTER
001236  000002                          RTI
001240  000000                  ERRFLG: 0
001242  000000                  HLTCT$: 0
001244  000000                  HLTAD$: 0                       ;PC OF ERROR
001246  000000                  ERRORS: 0                       ;ERROR COUNT
001250  000007                  BELL:   .ASCIZ  <7>
001252  005015  005015  041520  ERRPC:  .ASCIZ  <15><12><15><12>'PC= '
001260  020075    000
        001264                          .EVEN
                                ;THIS ROUTINE WILL PRINT AN ASCIZ MESSAGE.
                                ;THE MESSAGE MUST TERMINATE IN 0
001264  032737  020000  177570  PRINT$: BIT     #B13,@#SWR      ;INHIBIT TYPEOUTS?
001272  001403                          BEQ     PRNTF$          ;BRANCH IF NO
001274  062705  000002                  ADD     #2,R5           ;UPDATE RETURN ADDR
001300  000205                          RTS     R5
001302  105737  177564          PRNTF$: TSTB    @#TPS           ;WAIT FOR PRINTER TO FINISH
001306  100375                          BPL     .-4
001310  010546                          MOV     R5,-(SP)
001312  062716  000002                  ADD     #2,(SP)         ;ADJUST RETURN PC
001316  011505                          MOV     (R5),R5         ;GET MESSAGE ADDR
001320  105715                  1$:     TSTB    (R5)            ;CHECK FOR TERMINATOR
001322  001002                          BNE     2$
001324  012605                          MOV     (SP)+,R5        ;GET RETURN ADDR
```

```
 864  001326  000205                          RTS     R5              ;RETURN
 865  001330  112537  177566          2$:     MOVB    (R5)+,@#TPB     ;PRINT CHARACTER
 866  001334  105737  177564                  TSTB    @#TPS           ;WAIT TILL DONE
 867  001340  100375                          BPL     .-4
 868  001342  000766                          BR      1$
 869                          ;THIS ROUTINE TYPES A LOCATION IN OCTAL
 870  001344  032737  020000  177570  PRINTR: BIT     #B13,@#SWR      ;INHIBIT TYPEOUT?
 871  001352  001406                          BEQ     PRINTA          ;BRANCH IF NO
 872  001354  000207                          RTS     PC
 873  001356  032737  020000  177570  PRINTS: BIT     #B13,@#SWR      ;INHIBIT TYPEOUT?
 874  001364  001405                          BEQ     PRINTB          ;BRANCH IF NO
 875  001366  000207                          RTS     PC
 876  001370  112767  000001  000140  PRINTA: MOVB    #1,.PR          ;SET ZERO FILL SWITCH
 877  001376  000402                          BR      .+6             ;SKIP
 878  001400  005067  000132          PRINTB: CLR     .PR             ;SUPPRESS LEADING ZEROS
 879  001404  112767  177772  000125          MOVB    #-6,.PR+1       ;SET COUNT
 880  001412  010446                  .PTIT:  MOV     R4,-(SP)        ;SAVE R4
 881  001414  012704  001540                  MOV     #.PR+2,R4       ;SET POINTER TO FIRST CHARACTER
 882  001420  105014                          CLRB    (R4)            ;CLEAR FIRST BYTE
 883  001422  000413                          BR      .PRF            ;ROTATE FIRST BIT
 884  001424  105014                  .PRL:   CLRB    (R4)            ;CLEAR BYTE OF CHAR
 885  001426  032767  000100  000102          BIT     #100,.PR        ;BIT TYPING MODE
 886  001434  001006                          BNE     .PRF            ;YES SKIP 2 ROTATES
 887  001436  006167  000120                  ROL     TTY             ;ROTATE BIT INTO C
 888  001442  106114                          ROLB    (4)             ;PACK IT
 889  001444  006167  000112                  ROL     TTY
 890  001450  106114                          ROLB    (4)
 891  001452  006167  000104          .PRF:   ROL     TTY
 892  001456  106114                          ROLB    (4)
 893  001460  105714                          TSTB    (4)             ;IS IT ZERO
 894  001462  001402                          BEQ     .+6             ;SKIP INC
 895  001464  105267  000046                  INCB    .PR             ;SET FILL SWITCH
 896  001470  105767  000042                  TSTB    .PR             ;CHECK FILL SWITCH
 897  001474  001402                          BEQ     .+6             ;SKIP BITSET
 898  001476  152724  000060                  BISB    #'0,(4)+        ;MAKE INTO ASCIZ CHAR
 899  001502  105267  000031                  INCB    .PR+1           ;INC COUNT
 900  001506  001346                          BNE     .PRL            ;REPEAT
 901  001510  022704  001540                  CMP     #.PR+2,R4       ;EMPTY BUFFER
 902  001514  001002                          BNE     .+6             ;SKIP IF NOT
 903  001516  112724  000060                  MOVB    #'0,(4)+                ;LOAD ONE ZERO
 904  001522  105014                          CLRB    (4)             ;NULL TERMINATOR
 905  001524  004567  177534                  JSR     R5,PRINT$       ;PRINT MESSAGE
 906  001530  001540                          .PR+2
 907  001532  012604                          MOV     (SP)+,R4        ;RESTORE R4
 908  001534  000207                          RTS     PC
 909  001536  000012          .PR:    .BLKW   12
 910  001562  000000          TTY:    0
 911  001564                  RAND$:
 912  001564  004767  177246                  JSR     PC,SAVE$        ;SAVE THE REGISTERS
 913  001570  016700  000106                  MOV     LONUM,R0        ;SET R0 WITH LOW
 914  001574  016701  000100                  MOV     HINUM,R1        ;SET R1 WITH HIGH
 915  001600  012703  177771                  MOV     #-7,R3          ;SET SHIFT COUNT
 916  001604  005002                          CLR     R2
 917  001606  006300          1$:     ASL     R0              ;SHIFT R0 LEFT AND
 918  001610  006101                          ROL     R1              ;ROTATE CARRY INTO R1 AND
 919  001612  006102                          ROL     R2              ;ROTATE CARRY INTO R2
```

```
                                        INC     R3              ;CHECK FOR DONE
                                        BNE     1$
                                        ADD     LONUM,R2        ;ADD # TO MAKE X 129
                                        ADC     R1              ;PROPOGATE CARRY
                                        ADD     HINUM,R1        ;ADD # TO MAKE X 129
                                        ADC     R2              ;PROPOGATE CARRY
                                        ADD     #1057,R0
                                        ADC     R1              ;PROPOGATE CARRY
                                        ADC     R2              ;PROPOGATE CARRY
                                        ADD     #47401,R1
                                        ADC     R2
                                        ADD     #6,R2
                                        ADD     R2,R0
                                        ADC     R1
                                        MOV     R0,LONUM
                                        MOV     R1,HINUM
                                        JSR     PC,REST$        ;RESTORE THE REGISTERS
                                        RTS     PC

                        HINUM:  0
                        LONUM:  0
                        READ$:  MOV     R3,-(6)         ;SAVE R3
                        1$:     MOV     #INPUT$,R3      ;GET BUFFER ADDR
                        2$:     CMP     #INPUT$+20,R3   ;BUFFER FULL?
                                BEQ     4$              ;YES..TYPE ?
                                TSTB    @#177560                ;WAIT FOR A CHAR
                                BPL     .-4
                                MOVB    @#177562,(3)    ;GET CHAR
                                BICB    #200,(3)                ;GET RID OF JUNK
                                CMPB    #177,(3)                ;IS IT A RUBOUT?
                                BNE     3$              ;SKIP IF NO
                        4$:
                                JSR     R5,PRINT$       ;PRINT MESSAGE
                                READM$
                                BR      1$              ;CLEAR BUFFER AND START OVER
                        3$:     MOV     @#TKB,@#TPB     ;ECHO THE CHAR
                                TSTB    @#TPS
                                BPL     .-4             ;WAIT FOR READY
                                CMPB    #15,(3)+                ;CHECK FOR RETURN
                                BNE     2$              ;LOOP IF NOT RETURN
                                CLRB    -1(3)           ;REMOVE THE RETURN
                                JSR     R5,PRINT$       ;PRINT MESSAGE
                                READL$
                                MOV     (6)+,R3         ;RESTORE R3
                                RTS     PC              ;RETURN

                        INPUT$: .BLKW   20
                        READM$: .ASCIZ  '?'<15><12>
                        READL$: .ASCIZ  <12>

                        ;TAKE THE CONTENTS OF THE TTY INPUT BUFFER AND
                        ;PACK THEM INTO ONE WORD TO CREATE AN OCTAL NUMBER

                        PACK$:
                                JSR     PC,SAVE$        ;SAVE THE REGISTERS
                                CLR     NUM$
```

```
  976  002072  005000                          CLR     R0
  977  002074  105760  002014          2$:     TSTB    INPUT$(R0)
  978  002100  001402                          BEQ     1$
  979  002102  005200                          INC     R0
  980  002104  000773                          BR      2$
  981  002106  005300                  1$:     DEC     R0
  982  002110  004767  000166                  JSR     PC,PAC$         ;GET OCTAL CHAR
  983  002114  016767  000212  000212          MOV     PK$,NUM$        ;PACK FIRST CHAR
  984  002122  004767  000154                  JSR     PC,PAC$         ;GET OCTAL CHAR
  985  002126  000241                          CLC
  986  002130  006167  000176                  ROL     PK$
  987  002134  006167  000172                  ROL     PK$
  988  002140  006167  000166                  ROL     PK$
  989  002144  056767  000162  000162          BIS     PK$,NUM$        ;PACK SECOND CHAR
  990  002152  004767  000124                  JSR     PC,PAC$         ;GET OCTAL CHAR
  991  002156  000241                          CLC
  992  002160  000367  000146                  SWAB    PK$
  993  002164  006067  000142                  ROR     PK$
  994  002170  006067  000136                  ROR     PK$
  995  002174  056767  000132  000132          BIS     PK$,NUM$        ;PACK THIRD CHAR
  996  002202  004767  000074                  JSR     PC,PAC$         ;GET OCTAL CHAR
  997  002206  000367  000120                  SWAB    PK$
  998  002212  000241                          CLC
  999  002214  006167  000112                  ROL     PK$
 1000  002220  056767  000106  000106          BIS     PK$,NUM$        ;PACK FOURTH CHAR
 1001  002226  004767  000050                  JSR     PC,PAC$         ;GET OCTAL CHAR
 1002  002232  000367  000074                  SWAB    PK$
 1003  002236  000241                          CLC
 1004  002240  006167  000066                  ROL     PK$
 1005  002244  006167  000062                  ROL     PK$
 1006  002250  006167  000056                  ROL     PK$
 1007  002254  006167  000052                  ROL     PK$
 1008  002260  056767  000046  000046          BIS     PK$,NUM$        ;PACK FIFTH CHAR
 1009  002266  000402                          BR      PKEX1$
 1010  002270  062706  000002          PKEX$:  ADD     #2,SP           ;MODIFY STACK
 1011  002274                          PKEX1$:
 1012  002274  004767  176564                  JSR     PC,REST$        ,RESTORE THE REGISTERS
 1013  002300  000207                          RTS     PC              ;EXIT
 1014
 1015  002302  005700                  PAC$:   TST     R0
 1016  002304  100771                          BMI     PKEX$
 1017  002306  005067  000020                  CLR     PK$
 1018  002312  116067  002014  000012          MOVB    INPUT$(R0),PK$  ;GET INPUT CHAR
 1019  002320  005300                          DEC     R0
 1020  002322  042767  177770  000002          BIC     #177770,PK$     ;CLEAR UNWANTED BITS
 1021  002330  000207                          RTS     PC
 1022
 1023  002332  000000                  PK$:    0
 1024  002334  000000                  NUM$:   0
 1025                                  .TITLE  RP11C RELIABILITY TEST
 1026
 1027          000254                  VECTOR=254                      ;DISK INTERRUPT TRAP ASSIGNMENT
 1028          000256                  STATUS=256                      ;INTERRUPT PRIORITY ASSIGNMENT
 1029
 1030
 1031  002336  000005                  START:  RESET                   ;CLEAR THE WORLD
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1032  002340  012706  000500                  MOV     #STKPTR,SP      ;SETUP STACK
1033  002344  004767  011352                  JSR     PC,INIT         ;INITIALIZE VECTORS
1034  002350  004567  013102                  JSR     R5,EXTMEN       ;SET UP DATA BUFFERS
1035  002354  005067  176420                  CLR     ICNT            ;CLEAR THE PASS COUNTER
1036  002360  005067  015100                  CLR     FLAG            ;CLEAR PROGRAM FLAG
1037  002364  005067  015130                  CLR     DSKNOR          ;CLEAR UNIT FLAG
1038  002370  005067  015102                  CLR     CYLINDER        ;CLEAR THE CYLINDER ADDRESS
1039  002374  005067  015100                  CLR     DMA             ;CLEAR DAR REGISTERS
1040  002400  005067  015100                  CLR     PATNU           ;CLEAR PATTERN COUNT
1041  002404  032737  000400  177570          BIT     #BB.@#SWR       ;USE CONVERSATION MODE?
1042  002412  001005                          BNE     LCONM           ;BRANCH IF YES
1043  002414  052767  070000  015042          BIS     #70000,FLAG
1044  002422  000167  000726                  JMP     ADTST
1045                                  ;ENTER OPERATOR CONVERSATION MODE
1046  002426                        LCONM:
1047  002426  004567  176650                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1048  002432  016630                          SPECMES
1049  002434  016767  015050  177120          MOV     SWRDCT,TTY
1050  002442  004767  176732                  JSR     PC,PRINTB       ;FORCE TYPE LOCATION - SUPPRESS ZEROS
1051  002446  004567  176630                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1052  002452  016667                          CON1                    ;ASK ABOUT DATA TEST ONLY
1053  002454  004767  177224                  JSR     PC,READ$        ;INPUT MESSAGE
1054  002460  122767  000131  177326          CMPB    #131,INPUT$     ;TEST FOR YES
1055  002466  001003                          BNE     .+10            ;BRANCH IF NO
1056  002470  052767  002000  014766          BIS     #B10,FLAG       ;SET DATA TEST ONLY FLAG
1057  002476  004567  176600                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1058  002502  016722                          CON2                    ;ASK ABOUT MULTI DRIVE MODE
1059  002504  004767  177174                  JSR     PC,READ$        ;INPUT MESSAGE
1060  002510  122767  000131  177276          CMPB    #131,INPUT$     ;TEST FOR YES
1061  002516  001040                          BNE     DATTES          ;BRANCH IF NO
1062  002520  052767  004000  014736          BIS     #B11,FLAG       ;SET MULTI UNIT FLAG
1063  002526                        DSKDR:
1064  002526  004567  176550                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1065  002532  016756                          CON3                    ;GET NO. OF UNITS
1066  002534  004767  177144                  JSR     PC,READ$        ;INPUT MESSAGE
1067  002540  004767  177316                  JSR     PC,PACK$        ;CONVERT INPUT TO A NUMBER
1068  002544  005767  177564                  TST     NUM$            ;IS IT ZERO
1069  002550  001766                          BEQ     DSKDR
1070  002552  162767  000001  177554          SUB     #1,NUM$
1071  002560  022767  000010  177546          CMP     #10,NUM$        ;IS NO. TOO HIGH
1072  002566  101757                          BLOS    DSKDR
1073  002570  016767  177540  014722          MOV     NUM$,DSKNOR     ;SAVE HIGHEST UNIT NO.
1074  002576  042767  177770  014714          BIC     #177770,DSKNOR
1075  002604  000241                          CLC
1076  002606  006167  014706                  ROL     DSKNOR
1077  002612  006167  014702                  ROL     DSKNOR
1078  002616  000423                          BR      ASKWC
1079  002620                        DATTES:
1080  002620  004567  176456                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1081  002624  017020                          CON4                    ;ASK UNIT NUMBER
1082  002626  004767  177052                  JSR     PC,READ$        ;INPUT MESSAGE
1083  002632  004767  177224                  JSR     PC,PACK$        ;CONVERT INPUT TO A NUMBER
1084  002636  022767  000010  177470          CMP     #10,NUM$        ;IS NO = OR>10
1085  002644  101765                          BLOS    DATTES          ;NO
1086  002646  000241                          CLC
1087  002650  006167  177460                  ROL     NUM$
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1088  002654  006167  177454                  ROL     NUM$
1089  002660  056767  177450  014576          BIS     NUM$,FLAG       ;SAVE UNIT UNDER TEST
1090  002666                          ASKWC:
1091  002666  004567  176410                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1092  002672  017037                          CON5                    ;ASK ABOUT OPTIONAL WORD COUNT
1093  002674  004767  177004                  JSR     PC,READ$        ;INPUT MESSAGE
1094  002700  122767  000131  177106          CMPB    #131,INPUT$     ;TEST FOR YES
1095  002706  001031                          BNE     TKSR            ;ASK ABOUT OPTIONAL DAR
1096  002710                          WCCON:
1097  002710  004567  176366                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1098  002714  017077                          CON6                    ;ASK LENGTH OF WC
1099  002716  004767  176762                  JSR     PC,READ$        ;INPUT MESSAGE
1100  002722  004767  177134                  JSR     PC,PACK$        ;CONVERT INPUT TO A NUMBER
1101  002726  005767  177402                  TST     NUM$
1102  002732  001766                          BEQ     WCCON
1103  002734  016767  014550  014600          MOV     SWRDCT,WORK
1104  002742  005267  014574                  INC     WORK
1105  002746  026767  014570  177360          CMP     WORK,NUM$       ;IS NO. GREATER THAN AVAILABLE CORE?
1106  002754  101755                          BLOS    WCCON           ;YES ASK FOR COUNT AGAIN
1107  002756  016767  177352  014524          MOV     NUM$,SWRDCT     ;OPERATING WORD COUNT
1108  002764  016767  014520  014502          MOV     SWRDCT,WRDCT
1109  002772                          TKSR:
1110  002772  004567  176304                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1111  002776  017150                          CON7A                   ;ASK ABOUT DISK ADDR
1112  003000  004767  176700                  JSR     PC,READ$        ;INPUT MESSAGE
1113  003004  122767  000131  177002          CMPB    #131,INPUT$     ;WILL OPERATOR SUPPLY ADDR?
1114  003012  001055                          BNE     OPPAT           ;BRANCH IF NO
1115  003014  052767  000040  014442          BIS     #BS,FLAG
1116  003022                          OPDAR:
1117  003022  004567  176254                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1118  003026  017257                          CON7C                   ;GET CYLINDER ADDR
1119  003030  004767  176650                  JSR     PC,READ$        ;INPUT MESSAGE
1120  003034  004767  177022                  JSR     PC,PACK$        ;CONVERT INPUT TO A NUMBER
1121  003040  022767  000313  177266          CMP     #313,NUM$       ;IS CYLINDER LEGAL
1122  003046  101765                          BLOS    OPDAR
1123  003050  016767  177260  014410          MOV     NUM$,SCYL       ;SAVE ADDR
1124  003056                          OPDA1:
1125  003056  004567  176220                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1126  003062  017127                          CON7                    ;GET HEAD ADDR
1127  003064  004767  176614                  JSR     PC,READ$        ;INPUT MESSAGE
1128  003070  004767  176766                  JSR     PC,PACK$        ;CONVERT INPUT TO A NUMBER
1129  003074  022767  000024  177232          CMP     #24,NUM$
1130  003102  101765                          BLOS    OPDA1           ;BRANCH IF HEAD ADDR TOO HIGH
1131  003104  016767  177224  014356          MOV     NUM$,SHED       ;SAVE ADDR
1132  003112                          OPDA2:
1133  003112  004567  176164                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1134  003116  017234                          CON7B                   ;GET SECTOR ADDR
1135  003120  004767  176560                  JSR     PC,READ$        ;INPUT MESSAGE
1136  003124  004767  176732                  JSR     PC,PACK$        ;CONVERT INPUT TO A NUMBER
1137  003130  022767  000012  177176          CMP     #12,NUM$        ;IS SECTOR ADDR TOO HIGH?
1138  003136  101765                          BLOS    OPDA2
1139  003140  016767  177170  014324          MOV     NUM$,SSEC       ;SAVE ADDR
1140
1141  003146                          OPPAT:
1142  003146  004567  176130                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1143  003152  017304                          CON9                    ;ASK ABOUT DATA PATTERNS
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 1144  003154  004767  176524                      JSR     PC,READ$        ;INPUT MESSAGE
 1145  003160  004767  176676                      JSR     PC,PACK$        ;CONVERT INPUT TO A NUMBER
 1146  003164  022767  000020  177142              CMP     #20,NUM$        ;TEST FOR CORRECT NO
 1147  003172  101765                              BLOS    OPPAT           ;ASK AGAIN
 1148  003174  022767  000017  177132              CMP     #17,NUM$
 1149  003202  001411                              BEQ     OPWRT           ;DATA PATTERN UNDER PROGRAM CONTROL
 1150  003204  052767  100000  014252              BIS     #B15,FLAG       ;SET PROGRAM FLAG
 1151  003212  016767  177116  014264              MOV     NUM$,PATNU      ;OPERATOR WANTS TO SELECT DATA
 1152  003220  000241                              CLC
 1153  003222  006167  014256                      ROL     PATNU
 1154  003226  042767  070000  014230  OPWRT:      BIC     #70000,FLAG     ;CLEAR OP MODE BITS IN FLAG
 1155  003234  004567  176042                      JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
 1156  003240  017341                              CON9                    ;ASK ABOUT WRITE
 1157  003242  004767  176436                      JSR     PC,READ$        ;INPUT MESSAGE
 1158  003246  122767  000131  176540              CMPB    #131,INPUT$     ;TEST FOR YES
 1159  003254  001003                              BNE     OPRD            ;ASK ABOUT WRITE CHECK
 1160  003256  052767  040000  014200              BIS     #B14,FLAG       ;YES SET FLAG BIT
 1161  003264                          OPRD:
 1162  003264  004567  176012                      JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
 1163  003270  017411                              CON11                   ;ASK ABOUT READ
 1164  003272  004767  176406                      JSR     PC,READ$        ;INPUT MESSAGE
 1165  003276  122767  000131  176510              CMPB    #131,INPUT$     ;TEST FOR YES ANSWER
 1166  003304  001003                              BNE     OPWCK
 1167  003306  052767  010000  014150              BIS     #B12,FLAG       ;SET FLAG TO READ
 1168  003314                          OPWCK:
 1169  003314  004567  175762                      JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
 1170  003320  017362                              CON10                   ;ASK ABOUT WRITE CHECK
 1171  003322  004767  176356                      JSR     PC,READ$        ;INPUT MESSAGE
 1172  003326  122767  000131  176460              CMPB    #131,INPUT$
 1173  003334  001003                              BNE     CHKMOD
 1174  003336  052767  020000  014120              BIS     #B13,FLAG       ;SET WRITE CHECK FLAG
 1175  003344  032767  070000  014112  CHKMOD:     BIT     #70000,FLAG     ;MAKE SURE SOME OPERATION WAS SELECTED
 1176  003352  001725                              BEQ     OPWRT
 1177
 1178
 1179  003354  005737  000042          ADTST:      TST     @#42            ;UNDER MONITOR CONTROL?
 1180  003360  001444                              BEQ     1$              ;BRANCH IF NO
 1181  003362  005067  014132                      CLR     DSKNOR
 1182  003366  012777  000001  014044  3$:         MOV     #1,@RPCS        ;CLEAR THE RP11C
 1183  003374  116777  014120  014040              MOVB    DSKNOR,@RPCS1   ;SELECT THE DRIVE
 1184  003402  005777  014052                      TST     @RPDS           ;IS THE UNIT READY?
 1185  003406  100003                              BPL     2$              ;BRANCH IF NO
 1186  003410  005267  014104                      INC     DSKNOR          ;UPDATE UNIT NUMBER
 1187  003414  000764                              BR      3$
 1188  003416  005367  014076          2$:         DEC     DSKNOR          ;DSKNOR = NUMBER OF UNITS
 1189  003422  000241                              CLC
 1190  003424  006167  014070                      ROL     DSKNOR
 1191  003430  006167  014064                      ROL     DSKNOR
 1192  003434  052767  004000  014022              BIS     #B11,FLAG       ;SET MULTI DRIVE FLAG
 1193  003442  005767  014052                      TST     DSKNOR          ;WERE ANY UNITS AVAILABLE?
 1194  003446  100011                              BPL     1$              ;BRANCH IF YES
 1195  003450  004567  175610                      JSR     R5,PRINT$       ;PRINT MESSAGE
 1196  003454  016535                              MES20
 1197  003456  013701  000042                      MOV     @#42,R1         ;ABORT - NO UNITS AVAILABLE
 1198  003462  005067  174354                      CLR     42              ;SET ABORT FLAG
 1199  003466  000167  006366                      JMP     MEXIT
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1200  003472  032767  004000  013764  1$:     BIT     #B11,FLAG       ;ARE WE IN MULTI DRIVE MODE?
1201  003500  001422                          BEQ     EXMFLG          ;BRANCH IF NO
1202  003502  004567  175574                  JSR     R5,PRNTF$       ;FORCE PRINT THE MESSAGE
1203  003506  016370                          MES11
1204  003510  016767  013750  014014          MOV     FLAG,ACNVX      ;TELL OPERATOR THE UNIT UNDER TEST
1205  003516  006067  014010                  ROR     ACNVX
1206  003522  006067  014004                  ROR     ACNVX
1207  003526  042767  177770  013776          BIC     #177770,ACNVX
1208  003534  016767  013772  176020          MOV     ACNVX,TTY
1209  003542  004767  175632                  JSR     PC,PRINTB       ;FORCE TYPE LOCATION - SUPPRESS ZEROS
1210  003546  032737  000010  177570  EXMFLG: BIT     #B3,@#SWR       ;RUN SELECTED TEST?
1211  003554  001410                          BEQ     1$              ;BRANCH IF NO
1212  003556  013700  177570                  MOV     @#SWR,R0        ;GET SWITCH SETTINGS
1213  003562  042700  177770                  BIC     #177770,R0
1214  003566  000241                          CLC
1215  003570  006100                          ROL     R0
1216  003572  000170  003612                  JMP     @TSTTBL(R0)     ;GO TO SELECTED TEST
1217  003576  032767  002000  013660  1$:     BIT     #B10,FLAG       ;DATA TEST ONLY?
1218  003604  001412                          BEQ     ADT1            ;NO
1219  003606  000167  004520                  JMP     DATAT           ;DO DATA TEST
1220
1221  003612  003632                  TSTTBL: ADT1
1222  003614  004312                          ADT2
1223  003616  005370                          ADT3
1224  003620  006024                          WRCK
1225  003622  007220                          MEMTST
1226  003624  010332                          DATAT
1227  003626  011166                          RANEX
1228  003630  012074                          PFTST
1229
1230
1231
1232                                  .SBTTL  ***** TEST 0 *****
1233
1234
1235                                  ;IN THIS TEST THE PROGRAM SEEKS FROM 0 TO N AND THEN BACK
1236                                  ;TO 0.  N STARTS AT ZERO THEN INCREMENTS TO 1 AND UP THRU 312
1237                                  ;DONE IS TIMED OUT, SELECTED UNIT CYLINDER ADDRESS IS TESTED, SEEK UNDERWAY
1238                                  ;IS CHECK, AND THE ATTENTION FLAG IS TESTED.
1239
1240  003632  005067  013700          ADT1:   CLR     TESTNO
1241  003636  004567  175422                  JSR     R5,PRINT$       ;PRINT MESSAGE
1242  003642  016225                          MES6
1243  003644  016767  013666  175710          MOV     TESTNO,TTY
1244  003652  004767  175500                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
1245  003656  012737  004300  000254  RADT1:  MOV     #INTCK,@#VECTOR ;SET UP DISK VECTOR
1246  003664  012737  000340  000256          MOV     #340,@#STATUS
1247  003672  004567  007752                  JSR     R5,DSKNOS       ;SELECT UNIT
1248  003676  005067  013574                  CLR     CYLINDER
1249  003702  005067  013640                  CLR     WORK2           ;CYLINDER COUNTER
1250  003706  005067  013636                  CLR     WORK3           ;POINTER
1251  003712  012737  000200  177776          MOV     #PRI4,@#PSW     ;ALLOW INTERRUPTS
1252  003720  047777  013534  013532  9$:     BIC     @RPDS,@RPDS     ;CLEAR ATTENTION BITS
1253  003726  116777  013544  013514          MOVB    CYLINDER,@RPCA  ;SET CYLINDER REGISTER
1254  003734  052777  020011  013476          BIS     #20011,@RPCS    ;SEEK AND ENABLE ATTN INTERRUPT
1255  003742  005067  000342                  CLR     INTFLG          ;CLEAR INTERRUPT FLAG
```

```
1256  003746  012700  000025                MOV     #25,R0
1257  003752  005300                1$:     DEC     R0              ;DELAY FOR DONE TO SET
1258  003754  001376                        BNE     1$
1259  003756  105777  013456                TSTB    @RPCS           ;TEST FOR DONE
1260  003762  100402                        BMI     2$              ;BRANCH DONE SET
1261  003764  104400                        HLT                     ;DONE DID NOT SET AFTER SEEK
1262  003766  000471                        BR      8$
1263  003770  005767  013552          2$:     TST     WORK2           ;DON'T TEST SEEK UNDERWAY
1264  003774  001406                        BEQ     3$              ;IF FIRST TIME THRU
1265  003776  032777  002000  013454        BIT     #B10,@RPDS      ;DID SEEK UNDERWAY SET?
1266  004004  001002                        BNE     3$              ;BRANCH IF YES
1267  004006  104400                        HLT                     ;SEEK UNDERWAY DID NOT SET
1268  004010  000460                        BR      8$
1269  004012  005000                3$:     CLR     R0
1270  004014  005200                5$:     INC     R0              ;TIMEOUT UNIT READY
1271  004016  005777  013436                TST     @RPDS           ;IS UNIT READY?
1272  004022  100414                        BMI     6$              ;BRANCH IF YES
1273  004024  005237  017554                INC     @#CYLA
1274  004030  005337  017554                DEC     @#CYLA
1275  004034  005237  017554                INC     @#CYLA
1276  004040  005337  017554                DEC     @#CYLA
1277  004044  005700                        TST     R0              ;TIMEOUT?
1278  004046  001362                        BNE     5$              ;BRANCH IF NO
1279  004050  104400                        HLT                     ;READY DID NOT SET AFTER SEEK
1280  004052  000437                        BR      8$
1281  004054  005767  000230          6$:     TST     INTFLG          ;DID INTERRUPT OCCUR?
1282  004060  001002                        BNE     12$             ;BRANCH IF YES
1283  004062  104400                        HLT                     ;INTERRUPT DID NOT OCCUR ON ATTENTION BIT
1284  004064  000432                        BR      8$
1285  004066  004767  007764          12$:    JSR     PC,GATTN        ;DETERMINE ATTENTION BIT
1286  004072  036777  010010  013360        BIT     ATTN,@RPDS      ;IS ATTENTION BIT SET?
1287  004100  001002                        BNE     7$              ;BRANCH IF YES
1288  004102  104400                        HLT                     ;ATTENTION BIT DID NOT SET
1289  004104  000422                        BR      8$
1290  004106  126777  013364  013346  7$:     CMPB    CYLINDER,@RPCA1 ;IS SELECTED CYLINDER ADDRESS CORRECT?
1291  004114  001412                        BEQ     11$
1292  004116  016767  013354  010426        MOV     CYLINDER,EXP$   ;EXPECTED RESULTS
1293  004124  005067  010424                CLR     REC$
1294  004130  117767  013326  010416        MOVB    @RPCA1,REC$     ;RECEIVED RESULTS
1295  004136  104401                        HLT     +1              ;CONTENTS OF SELECTED CYLINDER ADDR REGISTER INCORRECT
1296  004140  000404                        BR      8$
1297  004142  005777  013272          11$:    TST     @RPCS           ;ANY DEVICE ERRORS
1298  004146  100001                        BPL     8$              ;BRANCH IF NO
1299  004150  104400                        HLT                     ;DEVICE ERROR AFTER SEEK OPERATION
1300  004152  032777  004000  013300  8$:     BIT     #B11,@RPDS      ;SEEK INCOMPLETE?
1301  004160  001411                        BEQ     4$              ;BRANCH IF NO
1302  004162  112777  000015  013250        MOVB    #15,@RPCS       ;ISSUE HOME COMMAND
1303  004170  105777  013244                TSTB    @RPCS           ;WAIT FOR DONE
1304  004174  100375                        BPL     .-4
1305  004176  005777  013256                TST     @RPDS           ;WAIT FOR UNIT READY
1306  004202  100375                        BPL     .-4
1307  004204  012767  003720  174570  4$:     MOV     #9$,LAD         ;SET UP LOOP
1308  004212  104000                        SCOPE
1309  004214  005767  013330                TST     WORK3           ;SEEK CYLINDER ZERO?
1310  004220  100411                        BMI     10$             ;BRANCH IF YES
1311  004222  005267  013320                INC     WORK2           ;UPDATE CYLINDER
```

```
1312  004226  016767  013314  013242          MOV     WORK2,CYLINDER
1313  004234  052767  100000  013306          BIS     #B15,WORK3      ;SET SEEK ZERO FLAG
1314  004242  000626                          BR      9$
1315  004244  005067  013226          10$:    CLR     CYLINDER
1316  004250  005067  013274                  CLR     WORK3           ;CLEAR SEEK ZERO FLAG
1317  004254  022767  000312  013264          CMP     #312,WORK2      ;HAS LAST CYLINDER BEEN REACHED?
1318  004262  001216                          BNE     9$              ;BRANCH IF NO
1319  004264  032737  002000  177570          BIT     #B10,@#SWR      ;REPEAT TEST
1320  004272  001407                          BEQ     ADT2            ;NO-GO TO NEXT
1321  004274  000167  177356                  JMP     RADT1           ;YES
1322
1323
1324  004300  012767  000001  000002  INTCK:  MOV     #1,INTFLG       ;SET INTERRUPT FLAG
1325  004306  000002                          RTI
1326  004310  000000                  INTFLG: 0
```

```
                                        .SBTTL  ***** TEST 1 *****

                                        ;WRITE 5000 (OCTAL) WORDS IN TEN SECTORS ON EACH TRACK.  THE FIRST
                                        ;WORD OF EACH SECTOR IS THE CYLINDER NUMBER AND THE REMAINING WORDS CONTAIN
                                        ;THE HEAD AND SECTOR ADDRESS.  THEN EACH SECTOR IS READ BACK TEN AT A TIME AND
                                        ;COMPARED.  IF THE FIRST WORD OF A SECTOR DOES NOT COMPARE, THE WRONG
                                        ;CYLINDER WAS PROBABLY SELECTED.  A NON COMPARE ON THE FIRST
                                        ;WORD IS INDICATED BY TYPING "CYL" AFTER THE ERRING DATA.
                                        ;IF ANY OTHER WORD FAILS THE WRONG HEAD OR SECTOR WAS
                                        ;SELECTED.  THE RIGHT HALF OF THE DATA TYPED EQUALS THE SECTOR
                                        ;AND THE LEFT HALF INDICATES THE HEAD.

004312  012767  000001  013216  ADT2:   MOV     #1,TESTNO
004320  004567  174740                  JSR     R5,PRINT$       ;PRINT MESSAGE
004324  016225                          MES6
004326  016767  013204  175226          MOV     TESTNO,TTY
004334  004767  175016                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
004340  004567  007304          RADT2:  JSR     R5,DSKNOS       ;SELECT THE DRIVE
004344  052777  000015  013066  1$:     BIS     #15,@RPCS       ;SEEK HOME
004352  012700  000025                  MOV     #25,R0
004356  005300                  2$:     DEC     R0              ;GIVE DONE A CHANCE TO SET
004360  001376                          BNE     2$
004362  105777  013052                  TSTB    @RPCS           ;IS DONE SET?
004366  100402                          BMI     3$              ;YES-BRANCH
004370  104400                          HLT                     ;DONE DID NOT SET AFTER A SEEK HOME
004372  000425                          BR      6$              ;CHECK FOR LOOPING
004374  005000                  3$:     CLR     R0
004376  005200                  5$:     INC     R0
004400  005777  013054                  TST     @RPDS           ;IS UNIT READY?
004404  100414                          BMI     4$              ;YES BRANCH
004406  005237  017554                  INC     @#CYLA
004412  005337  017554                  DEC     @#CYLA
004416  005237  017554                  INC     @#CYLA
004422  005337  017554                  DEC     @#CYLA
004426  005700                          TST     R0              ;HAS UNIT TIMED OUT
004430  001362                          BNE     5$              ;NO-BRANCH
004432  104400                          HLT                     ;READY DID NOT SET AFTER HOME SEEK
004434  000404                          BR      6$              ;CHECK FOR LOOPING
004436  005777  012776          4$:     TST     @RPCS           ;ANY ERRORS?
004442  100001                          BPL     6$              ;NO-BRANCH
004444  104400                          HLT                     ;DRIVE ERRORS AFTER HOME SEEK
004446  012767  004344  174326  6$:     MOV     #1$,LAD         ;SETUP LOOP ADDRESS
004454  104000                          SCOPE
004456  012767  005000  013010          MOV     #5000,WRDCT     ;SETUP WORD COUNT FOR 10 SECTORS
004464  012767  017556  013014          MOV     #OUTBUF,BUF     ;SETUP OUTPUT BUFFER ADDR
004472  005067  013002                  CLR     DMA
004476  005067  012774                  CLR     CYLINDER
004502  012700  017556          SEABUF: MOV     #OUTBUF,R0      ;GET BUFFER STARTING ADDR
004506  012701  000400          21$:    MOV     #400,R1         ;SECTOR COUNT
004512  016720  012760                  MOV     CYLINDER,(R0)+  ;GENERATE PATTERN SO THAT THE
004516  005301                          DEC     R1              ;THE FIRST WORD OF EACH SECTOR
004520  016720  012754          1$:     MOV     DMA,(R0)+       ;EQUALS THE CYLINDER ADDR AND
004524  005301                          DEC     R1              ;THE REMAINDER EQUALS THE HEAD AND
004526  001374                          BNE     1$              ;SECTOR ADDR
004530  122767  000011  012742          CMPB    #11,DMA
```

```
1383  004536  001403                          BEQ     22$
1384  004540  005267  012734                  INC     DMA             ;UPDATE SECTOR COUNT
1385  004544  000760                          BR      21$
1386  004546  105067  012726          22$:    CLRB    DMA
1387  004552  004567  005742          4$:     JSR     R5,FUNCT        ;WRITE TEN SECTORS
1388  004556  000003                  .WORD   3
1389  004560  005000                          CLR     R0
1390  004562  005200                  3$:     INC     R0
1391  004564  105777  012650                  TSTB    @RPCS           ;IS DONE SET?
1392  004570  100404                          BMI     2$              ;YES BRANCH
1393  004572  005700                          TST     R0              ;TEST FOR TIMEOUT
1394  004574  001372                          BNE     3$              ;BRANCH IF NO
1395  004576  104400                          HLT                     ;DONE DID NOT SET AFTER WRITE
1396  004600  000503                          BR      5$
1397  004602  005777  012632          2$:     TST     @RPCS           ;ANY DEVICE ERRORS?
1398  004606  100002                          BPL     6$              ;BRANCH IF NO
1399  004610  104400                          HLT                     ;RP11C STATUS ERROR AFTER WRITE
1400  004612  000476                          BR      5$
1401  004614  005067  012722          6$:     CLR     WORK            ;INCREMENT FLAG
1402  004620  017767  012626  007726          MOV     @RPDA,REC$      ;GET DISK ADDR
1403  004626  042767  177760  007720          BIC     #177760,REC$    ;SAVE SECTOR ADDR
1404  004634  005767  007714                  TST     REC$
1405  004640  001404                          BEQ     9$              ;BRANCH IF SECTOR = ZERO
1406  004642  005067  007704                  CLR     EXP$
1407  004646  104401                          HLT     +1              ;SECTOR ADDR IN RPDA DID NOT UPDATE
1408  004650  000457                          BR      5$              ;PROPERLY AFTER A TEN SECTOR WRITE
1409  004652  117767  012576  007674  9$:     MOVB    @RPDA1,REC$     ;GET THE HEAD ADDR
1410  004660  116767  012615  007664          MOVB    DMA+1,EXP$      ;SECTOR ADDR OUTPUTTED
1411  004666  122767  000023  007656          CMPB    #23,EXP$        ;DID WE OUTPUT HEAD 23?
1412  004674  001005                          BNE     7$              ;BRANCH IF NO
1413  004676  005067  007650                  CLR     EXP$            ;RESET HEAD ADDR
1414  004702  010667  012634                  MOV     SP,WORK         ;SET INCREMENT FLAG
1415  004706  000402                          BR      8$
1416  004710  005267  007636          7$:     INC     EXP$
1417  004714  126767  007632  007632  8$:     CMPB    EXP$,REC$       ;IS DISK HEAD ADDR CORRECT?
1418  004722  001402                          BEQ     12$             ;BRANCH IF YES
1419  004724  104401                          HLT     +1              ;HEAD ADDR IN RPDA WAS INCORRECT
1420  004726  000430                          BR      5$              ;AFTER TEN SECTOR WRITE
1421  004730  005067  007620          12$:    CLR     REC$
1422  004734  117767  012510  007612          MOVB    @RPCA,REC$      ;GET DISK CYLINDER ADDR
1423  004742  016767  012530  007602          MOV     CYLINDER,EXP$
1424  004750  005767  012566                  TST     WORK            ;IS INCREMENT FLAG SET?
1425  004754  001410                          BEQ     13$             ;BRANCH IF NO
1426  004756  005267  007570                  INC     EXP$
1427  004762  022767  000313  007562          CMP     #313,EXP$       ;WAS IT LAST CYLINDER?
1428  004770  001002                          BNE     13$             ;BRANCH IF NO
1429  004772  005067  007554                  CLR     EXP$
1430  004776  026767  007550  007550  13$:    CMP     EXP$,REC$       ;IS DISK CYLINDER ADDR CORRECT?
1431  005004  001401                          BEQ     5$              ;BRANCH IF YES
1432  005006  104401                          HLT     +1              ;CYLINDER ADDR IN RPCA IS NOT
1433                                                                  ;CORRECT AFTER TEN SECTOR WRITE
1434  005010  032777  004000  012442  5$:     BIT     #B11,@RPDS      ;SEEK INCOMPLETE?
1435  005016  001411                          BEQ     10$             ;BRANCH IF NO
1436  005020  112777  000015  012412          MOVB    #15,@RPCS       ;ISSUE HOME COMMAND
1437  005026  105777  012406                  TSTB    @RPCS           ;WAIT FOR DONE
1438  005032  100375                          BPL     .-4
```

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 1439  005034  005777  012420                    TST     @RPDS           ;WAIT FOR UNIT READY
 1440  005040  100375                            BPL     .-4
 1441  005042  012767  004552  173732  10$:      MOV     #4$,LAD         ;SETUP LOOP ADDR
 1442  005050  104000                            SCOPE
 1443  005052  004767  006162                    JSR     PC,DISBUF       ;SETUP NEXT DISK ADDR
 1444  005056  000611                            BR      SEABUF          ;WRITE NEXT SECTOR
 1445  005060  012767  005000  012406            MOV     #5000,WRDCT     ;RESTORE WORD COUNT
 1446  005066  052777  000015  012344            BIS     #15,@RPCS       ;SEEK HOME
 1447  005074  105777  012340                    TSTB    @RPCS
 1448  005100  100375                            BPL     .-4             ;WAIT FOR DONE AFTER SEEK HOME
 1449  005102  005777  012352                    TST     @RPDS
 1450  005106  100375                            BPL     .-4             ;WAIT FOR DRIVE READY AFTER SEEK HOME
 1451  005110  012700  017556          RDSECT:   MOV     #OUTBUF,R0
 1452  005114  012701  005000                    MOV     #5000,R1
 1453  005120  005020                  23$:      CLR     (R0)+           ;CLEAR THE BUFFER
 1454  005122  005301                            DEC     R1
 1455  005124  001375                            BNE     23$
 1456  005126  004567  005366                    JSR     R5,FUNCT        ;READ TEN SECTORS
 1457  005132  000005                  .WORD     5
 1458  005134  105777  012300                    TSTB    @RPCS
 1459  005140  100375                            BPL     .-4             ;WAIT FOR DONE AFTER READ
 1460  005142  005777  012272                    TST     @RPCS           ;ANY ERRORS?
 1461  005146  100006                            BPL     ADHGT           ;BRANCH NO ERRORS
 1462  005150  104400                            HLT                     ;STATUS ERROR AFTER A READ
 1463  005152  032777  040000  012260            BIT     #B14,@RPCS      ;WAS IT A DATA ERROR?
 1464  005160  001401                            BEQ     ADHGT           ;IF YES GO COMPARE DATA
 1465  005162  000446                            BR      ADTER1
 1466  005164  012700  017556          ADHGT:    MOV     #OUTBUF,R0
 1467  005170  012701  000400          ADHGT1:   MOV     #400,R1
 1468  005174  026710  012276                    CMP     CYLINDER,(0)    ;IS CYLINDER WORD CORRECT?
 1469  005200  001017                            BNE     ADERC           ;BRANCH IF NO
 1470  005202  005720                            TST     (0)+
 1471  005204  005301                            DEC     R1
 1472  005206  026710  012266          SANHT:    CMP     DMA,(0)         ;IS HEAD-SECTOR WORD CORRECT?
 1473  005212  001016                            BNE     ADERR           ;BRANCH IF NO
 1474  005214  005720                            TST     (0)+
 1475  005216  005301                            DEC     R1
 1476  005220  001372                            BNE     SANHT
 1477  005222  122767  000011  012250            CMPB    #11,DMA
 1478  005230  001423                            BEQ     ADTER1
 1479  005232  005267  012242                    INC     DMA
 1480  005236  000754                            BR      ADHGT1
 1481  005240  016767  012232  007304  ADERC:    MOV     CYLINDER,EXP$   ;CORRECT DATA/ADDRESS
 1482  005246  000403                            BR      ADERC1
 1483  005250  016767  012224  007274  ADERR:    MOV     DMA,EXP$        ;CORRECT DATA/ADDRESS
 1484  005256  011067  007272          ADERC1:   MOV     (0),REC$        ;INCORRECT DATA
 1485  005262  104401                            HLT     +1              ;DATA COMPARE ERROR
 1486  005264  022701  000400                    CMP     #400,R1         ;WAS FIRST WORD INCORRECT?
 1487  005270  001003                            BNE     ADTER1          ;BRANCH IF NO
 1488  005272  004567  173766                    JSR     R5,PRINT$       ;PRINT MESSAGE
 1489  005276  016404                            MES12                   ;WRONG CYLINDER PROBABLY SELECTED
 1490  005300  105067  012174          ADTER1:   CLRB    DMA
 1491  005304  032777  004000  012146            BIT     #B11,@RPDS      ;SEEK INCOMPLETE?
 1492  005312  001411                            BEQ     1$              ;BRANCH IF NO
 1493  005314  112777  000015  012116            MOVB    #15,@RPCS       ;ISSUE HOME COMMAND
 1494  005322  105777  012112                    TSTB    @RPCS           ;WAIT FOR DONE
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 1495  005326  100375                          BPL     .-4
 1496  005330  005777  012124                  TST     @RPDS           ;WAIT FOR UNIT READY
 1497  005334  100375                          BPL     .-4
 1498  005336  012767  005110  173436  1$:     MOV     #RDSECT,LAD     ;SETUP LOOP
 1499  005344  104000                          SCOPE
 1500  005346  004767  005666                  JSR     PC,DISBUF       ;SETUP NEXT DISK ADDRESS
 1501  005352  000656                          BR      RDSECT          ;CHECK NEXT SECTOR
 1502  005354  032737  002000  177570          BIT     #B10,@#SWR      ;LOOP ON TEST?
 1503  005362  001402                          BEQ     ADT3            ;BRANCH IF NO
 1504  005364  000167  176750                  JMP     RADT2
```

```
1505                                            .SBTTL  ***** TEST 2 *****
1506
1507                                            ;WRITE THE FIRST WORD OF EACH CYLINDER WITH THE CYLINDER ADDRESS.
1508                                            ;THEN SEEK FROM 312 TO 0.  THEN SEEK TO 311 AND BACK TO 1
1509                                            ;UNTIL THE NUMBERS CROSS.  AFTER EACH SEEK VERIFY THE POSITION
1510                                            ;BY READING THE FIRST WORD ON THE CYLINDER AND COMPARING
1511                                            ;AGAINST CYLINDER REQUESTED.
1512
1513  005370  012767  000002  012140  ADT3:     MOV     #2,TESTNO
1514  005376  004567  173662                   JSR     R5,PRINT$       ;PRINT MESSAGE
1515  005402  016225                           MES6
1516  005404  016767  012126  174150           MOV     TESTNO,TTY
1517  005412  004767  173740                   JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
1518  005416  004767  006300           RADT3:  JSR     PC,INIT         ;INITIALIZE VECTORS
1519  005422  004567  006222                   JSR     R5,DSKNOS       ;SELECT UNIT
1520  005426  005067  012046                   CLR     DMA
1521  005432  005067  012040                   CLR     CYLINDER
1522  005436  012767  000001  012030           MOV     #1,WRDCT        ;SET UP WORD COUNT
1523  005444  012767  017556  012034           MOV     #OUTBUF,BUF     ;SETUP BUFFER ADDR
1524  005452  016737  012020  017556  WRCYL:  MOV     CYLINDER,@#OUTBUF       ;INSERT PATTERN
1525  005460  004567  005034                   JSR     R5,FUNCT        ;WRITE PATTERN ON FIRST SECTOR
1526  005464  000003                   .WORD   3                       ;OF CYLINDER
1527  005466  105777  011746                   TSTB    @RPCS           ;WAIT FOR DONE
1528  005472  100375                           BPL     .-4
1529  005474  005777  011740                   TST     @RPCS           ;AND ERRORS?
1530  005500  100002                           BPL     1$              ;BRANCH IF NO
1531  005502  104400                           HLT                     ;DEVICE ERROR WHILE WRITING
1532  005504  000407                           BR      2$
1533  005506  022767  000312  011762  1$:     CMP     #312,CYLINDER   ;ALL CYLINDERS WRITTEN?
1534  005514  001403                           BEQ     2$              ;BRANCH IF YES
1535  005516  005267  011754                   INC     CYLINDER
1536  005522  000753                           BR      WRCYL
1537  005524  032777  004000  011726  2$:     BIT     #B11,@RPDS      ;SEEK INCOMPLETE?
1538  005532  001411                           BEQ     3$              ;BRANCH IF NO
1539  005534  112777  000015  011676           MOVB    #15,@RPCS       ;ISSUE HOME COMMAND
1540  005542  105777  011672                   TSTB    @RPCS           ;WAIT FOR DONE
1541  005546  100375                           BPL     .-4
1542  005550  005777  011704                   TST     @RPDS           ;WAIT FOR UNIT READY
1543  005554  100375                           BPL     .-4
1544  005556  012767  005452  173216  3$:     MOV     #WRCYL,LAD      ;SETUP UP LOOP
1545  005564  104000                           SCOPE
1546  005566  005067  011704                   CLR     CYLINDER
1547  005572  012767  000311  011746           MOV     #311,WORK2
1548  005600  005067  011744                   CLR     WORK3
1549  005604  005067  011742                   CLR     WORK4           ;INC - DEC FLAG
1550  005610  016767  011712  011670  ADT32:  MOV     INBUF,BUF
1551  005616  004567  004676                   JSR     R5,FUNCT        ;READ THE FIRST WORD OF THE
1552  005622  000005                   .WORD   5                       ;CYLINDER
1553  005624  105777  011610                   TSTB    @RPCS           ;WAIT FOR DONE AFTER READ
1554  005630  100375                           BPL     .-4
1555  005632  005777  011602                   TST     @RPCS           ;ANY ERRORS?
1556  005636  100002                           BPL     3$              ;BRANCH IF NO
1557  005640  104400                           HLT                     ;ERROR AFTER READING ONE WORD
1558  005642  000413                           BR      5$
1559  005644  027767  011656  011624  3$:     CMP     @INBUF,CYLINDER ;COMPARE DATA READ AGAINST CYLINDER
1560  005652  001407                           BEQ     5$              ;BRANCH IF EQUAL
```

```
1561  005654  016767  011616  006670          MOV     CYLINDER,EXP$   ;CORRECT DATA
1562  005662  017767  011640  006664          MOV     @INBUF,REC$     ;INCORRECT DATA
1563  005670  104401                          HLT     +1              ;DATA COMPARE ERROR-PROBABLY WENT
1564                                                                  ;TO THE WRONG CYLINDER
1565  005672  032777  004000  011560  5$:     BIT     #B11,@RPDS      ;SEEK INCOMPLETE?
1566  005700  001411                          BEQ     2$              ;BRANCH IF NO
1567  005702  112777  000015  011530          MOVB    #15,@RPCS       ;ISSUE HOME COMMAND
1568  005710  105777  011524                  TSTB    @RPCS           ;WAIT FOR DONE
1569  005714  100375                          BPL     .-4
1570  005716  005777  011536                  TST     @RPDS           ;WAIT FOR UNIT READY
1571  005722  100375                          BPL     .-4
1572  005724  012767  005610  173050  2$:     MOV     #ADT32,LAD      ;SETUP LOOP
1573  005732  104000                          SCOPE
1574  005734  005767  011612                  TST     WORK4           ;INC - DEC FLAG
1575  005740  100411                          BMI     1$
1576  005742  005267  011602                  INC     WORK3           ;UPDATE LOW COUNT
1577  005746  016767  011574  011522          MOV     WORK2,CYLINDER
1578  005754  052767  100000  011570          BIS     #B15,WORK4      ;SET DECREMENT FLAG
1579  005762  000712                          BR      ADT32
1580  005764  005367  011556          1$:     DEC     WORK2           ;DECREMENT HIGH COUNT
1581  005770  005067  011556                  CLR     WORK4           ;CLEAR FLAG
1582  005774  016767  011550  011474          MOV     WORK3,CYLINDER
1583  006002  005767  011540                  TST     WORK2           ;DONE YET
1584  006006  001300                          BNE     ADT32           ;BRANCH-NO
1585  006010  032737  002000  177570          BIT     #B10,@#SWR      ;LOOP ON TEST?
1586  006016  001402                          BEQ     WRCK            ;NO
1587  006020  000167  177372                  JMP     RADT3           ;YES
```

```
                                        .SBTTL  ***** TEST 3 *****

                                        ;THIS ROUTINE VERIFIES THE WRITE CHECK LOGIC AND
                                        ;THE ABILITY OF THE HARDWARE TO FILL THE REMAINDER
                                        ;OF A SECTOR WITH ZEROS WHEN A PARTIAL SECTOR
                                        ;IS WRITTEN.  IN THE WRITE CHECK PORTION A
                                        ;FLOATING ONE AND FLOATING ZERO PATTERNS ARE USED
                                        ;TO TEST THE COMPARE LOGIC AND TO VERIFY THAT A
                                        ;WRITE CHECK ERROR WILL OCCUR.

006024  012767  000003  011504  WRCK:   MOV     #3,TESTNO
006032  004567  173226                  JSR     R5,PRINT$       ;PRINT MESSAGE
006036  016225                          MES6
006040  016767  011472  173514          MOV     TESTNO,TTY
006046  004767  173304                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
006052  004767  005644          RWRCK:  JSR     PC,INIT         ;INITIALIZE
006056  004567  005566                  JSR     R5,DSKNOS       ;SELECT UNIT
006062  005067  011410                  CLR     CYLINDER
006066  005067  011406                  CLR     DMA
006072  005000                          CLR     R0              ;PATTERN FLAG
006074  012701  000001                  MOV     #1,R1           ;STARTING PATTERN
006100  012767  017556  011400          MOV     #OUTBUF,BUF     ;SETUP OUTPUT BUFFER
006106  012767  000400  011360          MOV     #400,WRDCT      ;SETUP WORDCOUNT
006114  005002                  23$:    CLR     R2
006116  010162  017556          1$:     MOV     R1,OUTBUF(R2)   ;GENERATE TEST PATTERN
006122  005722                          TST     (R2)+           ;UPDATE MODIFIER
006124  022702  000400                  CMP     #400,R2         ;HAS BUFFER BEEN FILLED?
006130  001372                          BNE     1$              ;BRANCH IF NO
006132  004567  004362                  JSR     R5,FUNCT        ;WRITE PATTERN
006136  000003                  .WORD   3
006140  105777  011274                  TSTB    @RPCS           ;WAIT FOR DONE
006144  100375                          BPL     .-4
006146  005777  011266                  TST     @RPCS           ;ANY DEVICE ERRORS?
006152  100002                          BPL     2$              ;BRANCH IF NO
006154  104400                          HLT                     ;ERROR AFTER WRITING ONE SECTOR
006156  000475                          BR      3$
006160  004567  004334          2$:     JSR     R5,FUNCT        ;WRITE CHECK THE DATA
006164  000007                  .WORD   7
006166  105777  011246                  TSTB    @RPCS           ;WAIT FOR DONE
006172  100375                          BPL     .-4
006174  005777  011240                  TST     @RPCS           ;ANY DEVICE ERRORS?
006200  100012                          BPL     4$              ;BRANCH IF NO
006202  104400                          HLT                     ;ERROR AFTER WRITE CHECK OPERATION
006204  004567  173054                  JSR     R5,PRINT$       ;PRINT MESSAGE
006210  016345                          MES10
006212  016767  011340  173342          MOV     OUTBUF,TTY
006220  004767  173120                  JSR     PC,PRINTR       ;TYPE LOCATION WITH LEADING ZEROS
006224  000452                          BR      3$
006226  005700                  4$:     TST     R0              ;ARE WE FLOATING A ONE?
006230  001411                          BEQ     20$             ;BRANCH IF YES
006232  005002                          CLR     R2              ;FILL BUFFER WITH ONES
006234  012762  177777  017556  21$:    MOV     #177777,OUTBUF(R2)
006242  005722                          TST     (R2)+
006244  022702  000400                  CMP     #400,R2
006250  001371                          BNE     21$
```

```
 1644  006252  000407                          BR      22$
 1645  006254  005002                  20$:    CLR     R2
 1646  006256  005062  017556            5$:   CLR     OUTBUF(R2)      ;CLEAR OUTPUT BUFFER
 1647  006262  005722                        TST     (R2)+
 1648  006264  022702  000400                CMP     #400,R2         ;ENTIRE BUFFER CLEAR?
 1649  006270  001372                        BNE     5$              ;BRANCH IF NO
 1650  006272  004567  004222          22$:  JSR     R5,FUNCT        ;WRITE CHECK THE DATA AND
 1651  006276  000007                  .WORD 7                       ;EXPECT AN ERROR
 1652  006300  105777  011134                TSTB    @RPCS           ;WAIT FOR DONE
 1653  006304  100375                        BPL     .-4
 1654  006306  032777  000010  011142        BIT     #B3,@RPER       ;IS WRITE CHECK ERROR SET?
 1655  006314  001011                        BNE     6$              ;BRANCH IF YES
 1656  006316  104400                        HLT                     ;WRITE CHECK ERROR DID NOT SET
 1657  006320  004567  172740                JSR     R5,PRINT$       ;PRINT MESSAGE
 1658  006324  016345                        MES10
 1659  006326  010167  173230                MOV     R1,TTY
 1660  006332  004767  173006                JSR     PC,PRINTR       ;TYPE LOCATION WITH LEADING ZEROS
 1661  006336  000405                        BR      3$
 1662  006340  005777  011074          6$:   TST     @RPCS           ;DID ERROR FLAG SET?
 1663  006344  100402                        BMI     3$              ;BRANCH IF YES
 1664  006346  104400                        HLT                     ;ERROR FLAG DID NOT SET AFTER WRITE CHECK ERROR
 1665  006350  000400                        BR      3$
 1666  006352  012767  006114  172422  3$:   MOV     #23$,LAD        ;SETUP LOOP ADDR
 1667  006360  104000                        SCOPE
 1668  006362  005700                        TST     R0              ;ARE WE FLOATING A ONE?
 1669  006364  001013                        BNE     9$              ;BRANCH IF NO
 1670  006366  000241                        CLC
 1671  006370  006101                        ROL     R1              ;ROTATE PATTERN
 1672  006372  103402                        BCS     10$             ;BRANCH IF COMPLETE
 1673  006374  000167  177514                JMP     23$
 1674  006400  012700  000001          10$:  MOV     #1,R0           ;SET PATTERN FLAG
 1675  006404  012701  077777                MOV     #077777,R1      ;SET NEW PATTERN IN R1
 1676  006410  000167  177500                JMP     23$
 1677  006414  000241                  9$:   CLC
 1678  006416  006201                        ASR     R1              ;ROTATE FLOATING ZERO PATTERN
 1679  006420  052701  100000                BIS     #B15,R1
 1680  006424  103002                        BCC     PATFIL          ;HAS ZERO BEEN FLOATED
 1681  006426  000167  177462                JMP     23$             ;JUMP IF NO
 1682
 1683
 1684
 1685                                  ;CHECK THE ABILITY OF THE RP11C TO CLEAR THE REMAINDER OF A SECTOR
 1686                                  ;ON A PARTIAL WRITE OPERATION. A SECTOR OF ALL ONES IS WRITTEN AND
 1687                                  ;THEN A TWO WORD WRITE OPERATION IS PERFORMED. THE SECTOR IS THEN
 1688                                  ;READ BACK AND VERIFIED. THE FIRST TWO WORDS SHOULD BE ONES AND
 1689                                  ;THE REST SHOULD BE ZEROS.
 1690
 1691  006432  012701  017556          PATFIL: MOV     #OUTBUF,R1
 1692  006436  012700  177777                  MOV     #177777,R0
 1693  006442  012702  000400                  MOV     #400,R2
 1694  006446  010021                  1$:     MOV     R0,(R1)+        ;GENERATE ALL ONES PATTERN
 1695  006450  005302                          DEC     R2
 1696  006452  001375                          BNE     1$
 1697  006454  004567  004040                  JSR     R5,FUNCT        ;WRITE SECTOR WITH ONES
 1698  006460  000003                  .WORD   3
 1699  006462  105777  010752                  TSTB    @RPCS           ;WAIT FOR DONE
```

```
1700  006466  100375                          BPL     .-4
1701  006470  005777  010744                  TST     @RPCS           ;ANY DEVICE ERRORS
1702  006474  100002                          BPL     2$              ;BRANCH IF NO
1703  006476  104400                          HLT                     ;ERROR AFTER WRITING ONE SECTOR ALL 1'S
1704  006500  000473                          BR      3$
1705  006502  012767  000002  010764  2$:     MOV     #2,WRDCT        ;SETUP FOR TWO WORD WRITE
1706  006510  004567  004004                  JSR     R5,FUNCT        ;WRITE TWO WORD
1707  006514  000003                  .WORD   3
1708  006516  105777  010716                  TSTB    @RPCS           ;WAIT FOR DONE
1709  006522  100375                          BPL     .-4
1710  006524  005777  010710                  TST     @RPCS           ;ANY ERRORS?
1711  006530  100002                          BPL     4$              ;BRANCH IF NO
1712  006532  104400                          HLT                     ;ERROR ON ONE WORD WRITE
1713  006534  000455                          BR      3$
1714  006536  012767  000400  010730  4$:     MOV     #400,WRDCT      ;SETUP WORD COUNT
1715  006544  004567  003750                  JSR     R5,FUNCT        ;READ SECTOR
1716  006550  000005                  .WORD   5
1717  006552  105777  010662                  TSTB    @RPCS           ;WAIT FOR DONE
1718  006556  100375                          BPL     .-4
1719  006560  005777  010654                  TST     @RPCS           ;ANY ERRORS
1720  006564  100006                          BPL     5$              ;BRANCH IF NO
1721  006566  104400                          HLT                     ;ERROR AFTER READING ONE SECTOR
1722  006570  032777  040000  010642          BIT     #B14,@RPCS      ;WAS IT A DATA ERROR?
1723  006576  001401                          BEQ     5$              ;BRANCH IF YES
1724  006600  000433                          BR      3$
1725  006602  022767  177777  010746  5$:     CMP     #177777,OUTBUF  ;COMPARE FIRST WORD SHOULD BE ONES
1726  006610  001410                          BEQ     6$              ;BRANCH IF OK
1727  006612  012767  177777  005732          MOV     #177777,EXP$
1728  006620  016767  010732  005726          MOV     OUTBUF,REC$
1729  006626  104401                          HLT     +1              ;DATA COMPARE ERROR ON FIRST
1730  006630  000417                          BR      3$              ;WORD READ
1731  006632  012700  017562          6$:     MOV     #OUTBUF+4,R0
1732  006636  012701  000374                  MOV     #374,R1
1733  006642  005720                  9$:     TST     (R0)+           ;REMAINDER OF SECTOR SHOULD BE CLEAR
1734  006644  001003                          BNE     7$              ;BRANCH IF NO
1735  006646  005301                          DEC     R1
1736  006650  001374                          BNE     8$
1737  006652  000406                          BR      3$
1738  006654  016067  177776  005672  7$:     MOV     -2(R0),REC$
1739  006662  005067  005664                  CLR     EXP$
1740  006666  104401                          HLT     +1              ;DATA FOUND IN AREA OF SECTOR
1741                                                                  ;WHICH SHOULD HAVE BEEN CLEARED
1742                                                                  ;BY A ONE WORD WRITE
1743  006670  012767  006432  172104  3$:     MOV     #PATFIL,LAD     ;SET UP LOOP ADDR
1744  006676  104000                          SCOPE
1745
1746                                  ;CHECK THE SETTING OF EOP WHEN TRYING TO WRITE BEYOND
1747                                  ;THE LIMITS OF THE PACK.  THE FIRST SECTOR OF THE PACK IS
1748                                  ;WRITTEN WITH ZEROS.  THEN A TWO SECTOR WRITE OF ALL
1749                                  ;ONE'S IS ISSUED FOR CYLINDER 312, HEAD 23, AND SECTOR 11.
1750                                  ;EOP AND ERROR BITS SHOULD SET.  THE FIRST SECTOR OF THE
1751                                  ;PACK IS CHECKED TO MAKE SURE IT IS STILL ZERO.
1752
1753  006700  005067  010574          EOPTST: CLR     DMA             ;CLEAR DISK ADDRESS
1754  006704  005067  010566                  CLR     CYLINDER
1755  006710  012767  000400  010556          MOV     #400,WRDCT      ;SET WORDCOUNT TO ONE SECTOR
```

```
 1756  006716  012767  017556  010562          MOV     #OUTBUF,BUF     ;SETUP OUTPUT BUFFER
 1757  006724  005001                          CLR     R1
 1758  006726  005061  017556          1$:     CLR     OUTBUF(R1)      ;CLEAR THE OUTPUT BUFFER
 1759  006732  005721                          TST     (R1)+
 1760  006734  022701  000400                  CMP     #400,R1
 1761  006740  001372                          BNE     1$
 1762  006742  004567  003552                  JSR     R5,FUNCT        ;WRITE SECTOR ZERO WITH ZEROS
 1763  006746  000003                  .WORD   3
 1764  006750  105777  010464                  TSTB    @RPCS           ;WAIT FOR DONE
 1765  006754  100375                          BPL     .-4
 1766  006756  005777  010456                  TST     @RPCS           ;ANY DEVICE ERRORS
 1767  006762  100002                          BPL     2$              ;BRANCH IF NO
 1768  006764  104400                          HLT                     ;ERROR AFTER WRITING SECTOR ZERO WITH ZEROS
 1769  006766  000502                          BR      3$
 1770  006770  012767  001000  010476  2$:     MOV     #1000,WRDCT     ;SET WORDCOUNT EQUAL TO TWO SECTORS
 1771  006776  112767  000312  010472          MOVB    #312,CY_INDER   ;SELECT CYLINDER 312
 1772  007004  012767  000011  010466          MOV     #11,DMA         ;SELECT RECTOR 11
 1773  007012  112767  000023  010461          MOVB    #23,DMA+1       ;SELECT HEAD 23
 1774  007020  012702  177777                  MOV     #177777,R2
 1775  007024  005001                          CLR     R1
 1776  007026  010261  017556          4$:     MOV     R2,OUTBUF(R1)   ;SET OUTPUT BUFFER TO ONES
 1777  007032  005721                          TST     (R1)+
 1778  007034  022701  001000                  CMP     #1000,R1
 1779  007040  001372                          BNE     4$
 1780  007042  004567  003452                  JSR     R5,FUNCT        ;ISSUE TWO SECTOR WRITE TO
 1781  007046  000003                  .WORD   3                       ;CYLINDER 312, HEAD 23, AND SECTOR 11
 1782  007050  105777  010364                  TSTB    @RPCS           ;WAIT FOR DONE
 1783  007054  100375                          BPL     .-4
 1784  007056  032777  000002  010372          BIT     #B1,@RPER       ;DID EOP ERROR FLAG SET?
 1785  007064  001002                          BNE     5$              ;BRANCH IF SET
 1786  007066  104400                          HLT                     ;EOP ERROR FLAG DID NOT SET WHEN
 1787  007070  000441                          BR      3$              ;WRITE OPERATOR EXCEEDS THE PACK
 1788  007072  032777  100000  010340  5$:     BIT     #B15,@RPCS      ;DID THE ERROR FLAG SET?
 1789  007100  001002                          BNE     6$              ;BRANCH IF SET
 1790  007102  104400                          HLT                     ;ERROR DID NOT SET AFTER GENERATING
 1791  007104  000433                          BR      3$              ;EOP
 1792  007106  012767  000002  010360  6$:     MOV     #2,WRDCT
 1793  007114  005067  010360                  CLR     DMA             ;CLEAR THE DISK ADDRESS
 1794  007120  005067  010352                  CLR     CYLINDER
 1795  007124  004567  003370                  JSR     R5,FUNCT        ;READ THE FIRST SECTOR OF THE PACK
 1796  007130  000005                  .WORD   5                       ;AND EXPECT TO FIND ZEROS
 1797  007132  105777  010302                  TSTB    @RPCS           ;WAIT FOR READY
 1798  007136  100375                          BPL     .-4
 1799  007140  005777  010274                  TST     @RPCS           ;WERE THERE ANY ERRORS?
 1800  007144  100002                          BPL     7$              ;BRANCH IF NO
 1801  007146  104400                          HLT                     ;ERROR ENCOUNTERED ON 2 WORD READ
 1802  007150  000411                          BR      3$              ;OF FIRST SECTOR ON THE PACK
 1803  007152  016767  010400  005374  7$:     MOV     OUTBUF,REC$     ;GET FIRST WORD OF BUFFER
 1804  007160  005767  005370                  TST     REC$            ;DOES 1ST SECTOR STILL CONTAIN ZEROS?
 1805  007164  001403                          BEQ     3$              ;BRANCH IF YES
 1806  007166  005067  005360                  CLR     EXP$
 1807  007172  104401                          HLT     +1              ;CONTENTS OF THE FIRST SECTOR OF THE
 1808                                                                  ;PACK CHANGED AFTER FORCING EOP
 1809                                                                  ;ERROR, OPERATION PROBABLY
 1810                                                                  ;WRAPPED AROUND.
 1811  007174  012767  006700  171600  3$:     MOV     #EOPTST,LAD
```

```
 1812  007202  104000                          SCOPE
 1813  007204  032737  002000  177570          BIT     @#B10,@#SWR     ;LOOP ON TEST?
 1814  007212  001402                          BEQ     MEMTST          ;BRANCH IF NO
 1815  007214  000167  176632                  JMP     RWRCK
```

```
                                        .SBTTL  ***** TEST 4 *****

                                        ;THIS ROUTINE CONSIST OF TWO SEGMENTS.  THE FIRST
                                        ;PART TEST THE ACCESSIBILITY OF MEMORY WITHOUT
                                        ;UTILIZING MEMORY MANAGEMENT.  EACH LOCATION
                                        ;FROM THE END OF THE PROGRAM TO THE TOP OF MEMORY
                                        ;(NOT TO EXCEED 28K) IS WRITTEN WITH ITS ADDR.  THIS
                                        ;DATA IS THEN WRITTEN ON THE DISK.  THE BUFFER IS
                                        ;CLEARED AND THE DATA IS READ BACK AND VERIFIED.
                                        ;IN PART TWO, THE EXTENDED ADDRESS BITS ARE TESTED.

007220  012767  000004  010310  MEMTST: MOV     #4,TESTNO
007226  004567  172032                 JSR     R5,PRINT$       ;PRINT MESSAGE
007232  016225                         MES6
007234  016767  010276  172320         MOV     TESTNO,TTY
007242  004767  172110                 JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
007246  012767  177700  010250         MOV     #-100,PASSC     ;SETUP ITERATION COUNT
007254  004767  004442          RMEMT: JSR     PC,INIT         ;INITIALIZE
007260  016700  006416                 MOV     MEMSIZ,R0       ;GET TOP OF CORE
007264  162700  017556                 SUB     #OUTBUF,R0      ;DETERMINE SIZE OF BUFFER IN BYTES
007270  000241                         CLC
007272  006000                         ROR     R0              ;CONVERT TO WORDS
007274  042700  000001                 BIC     #1,R0           ;KEEP NUMBER EVEN
007300  010067  010170                 MOV     R0,WRDCT        ;SAVE WORD COUNT OF TRANSFER
007304  012702  017556          7$:    MOV     #OUTBUF,R2
007310  012703  017556                 MOV     #OUTBUF,R3      ;GENERATE A PATTERN SO THAT EACH
007314  010322                 1$:     MOV     R3,(R2)+        ;LOCATION CONTAINS ITS ADDRESS
007316  005723                         TST     (R3)+
007320  020267  006356                 CMP     R2,MEMSIZ       ;HAS ENTIRE PATTERN BEEN GENERATED?
007324  101773                         BLOS    1$              ;BRANCH IF NO
007326  012767  017556  010152         MOV     #OUTBUF,BUF     ;SET UP BUFFER ADDR
007334  005067  010140                 CLR     DMA
007340  005067  010132                 CLR     CYLINDER
007344  004567  003150                 JSR     R5,FUNCT        ;WRITE ADDRESS PATTERN
007350  000003                 .WORD   3
007352  105777  010062                 TSTB    @RPCS           ;WAIT FOR DONE
007356  100375                         BPL     .-4
007360  005777  010054                 TST     @RPCS           ;ANY ERRORS?
007364  100002                         BPL     2$              ;BRANCH IF NO
007366  104400                         HLT                     ;ERROR AFTER WRITING ADDR PATTERN
007370  000446                         BR      3$
007372  016700  010076          2$:    MOV     WRDCT,R0
007376  012701  017556                 MOV     #OUTBUF,R1
007402  005021                 10$:    CLR     (R1)+           ;CLEAR THE BUFFER
007404  005300                         DEC     R0
007406  001375                         BNE     10$
007410  004567  003104                 JSR     R5,FUNCT        ;READ ADDRESS PATTERN
007414  000005                 .WORD   5
007416  105777  010016                 TSTB    @RPCS           ;WAIT FOR DONE
007422  100375                         BPL     .-4
007424  005777  010010                 TST     @RPCS           ;ANY ERRORS?
007430  100006                         BPL     4$              ;BRANCH IF NO
007432  104400                         HLT                     ;ERROR AFTER READING ADDR PATTERN
007434  032777  040000  007776         BIT     #B14,@RPCS      ;IS THIS A DATA ERROR?
007442  001401                         BEQ     4$              ;BRANCH IF YES
007444  000420                         BR      3$
```

```
 1872  007446  012702  017556          4$:     MOV     #OUTBUF,R2
 1873  007452  010203                          MOV     R2,R3           ;COMPARE THE ADDR PATTERN
 1874  007454  020322                  6$:     CMP     R3,(R2)+        ;IS DATA CORRECT?
 1875  007456  001005                          BNE     5$              ;BRANCH IF NO
 1876  007460  005723                          TST     (R3)+
 1877  007462  020267  006214                  CMP     R2,MEMSIZ       ;IS ENTIRE BUFFER VERIFIED
 1878  007466  101772                          BLOS    6$              ;BRANCH IF NO
 1879  007470  000406                          BR      3$
 1880  007472  010367  005054          5$:     MOV     R3,EXP$
 1881  007476  016267  177776  005050          MOV     -2(R2),REC$
 1882  007504  104401                          HLT     +1              ;COMPARE ERROR UTILIZING ADDR PATTERN
 1883  007506  012767  007304  171266  3$:     MOV     #7$,LAD         ;SETUP LOOP ADD
 1884  007514  104000                          SCOPE
 1885
 1886                                  ;CHECK THE SETTING OF NON EXISTENT MEMORY FLAG IN RPER.
 1887
 1888  007516  012767  000001  007750  NONEX:  MOV     #1,WRDCT        ;SETUP WORD COUNT
 1889  007524  012767  160000  007754          MOV     #160000,BUF     ;LOAD ADDR TO FORCE NON EX MEMORY
 1890  007532  004567  002762                  JSR     R5,FUNCT        ;ISSUE A WRITE COMMAND AND
 1891  007536  000063                  .WORD   63                      ;EXPECT NON EX MEMORY
 1892  007540  105777  007674                  TSTB    @RPCS           ;WAIT FOR READY
 1893  007544  100375                          BPL     .-4
 1894  007546  032777  000004  007702          BIT     #B2,@RPER       ;DID NON EX MEMORY SET
 1895  007554  001002                          BNE     1$              ;BRANCH IF SET
 1896  007556  104400                          HLT                     ;NON EX MEMORY DID NOT SET
 1897  007560  000413                          BR      2$
 1898  007562  032777  040000  007650  1$:     BIT     #B14,@RPCS      ;DID HARD ERROR SET ON NON EX MEMORY
 1899  007570  001002                          BNE     3$              ;BRANCH IF SET
 1900  007572  104400                          HLT                     ;HARD ERROR DID NOT SET
 1901  007574  000405                          BR      2$
 1902  007576  032777  100000  007634  3$:     BIT     #B15,@RPCS      ;DID THE ERROR FLAG SET AFTER NON EX MEMORY
 1903  007604  001001                          BNE     2$              ;BRANCH IF SET
 1904  007606  104400                          HLT                     ;ERROR FLAG DID NOT SET
 1905  007610  012767  007516  171164  2$:     MOV     #NONEX,LAD
 1906  007616  104000                          SCOPE
 1907
 1908                                  ;IF MEMORY MANAGEMENT IS AVAILABLE CHECK THE EXTENDED MEMORY ADDRESS
 1909                                  ;BITS.
 1910
 1911  007620  012767  010312  170156  EXTTST: MOV     #EXTTRP,4       ;SETUP TIMEOUT TRAP
 1912  007626  012767  000340  170152          MOV     #PRI7,6
 1913  007634  005737  177572                  TST     @#SR0           ;IF MEMORY MANAGEMENT IS NOT
 1914                                                                  ;AVAILABLE THE PROGRAM WILL TRAP
 1915                                                                  ;AND TRANSFER TO END OF THE TEST
 1916  007640  012767  010306  170136          MOV     #EXTRP,4
 1917  007646  012737  007600  172356          MOV     #7600,@#KIPAR7  ;OPEN I/O REGISTERS
 1918  007654  005037  172340                  CLR     @#KIPAR0        ;FREE FIRST 4K
 1919  007660  012737  002000  172342          MOV     #2000,@#KIPAR1
 1920  007666  012737  177406  172300          MOV     #400*256.-400+UP+RW,@#KIPDR0    ;SET KIPDR0=RW UP 400 BLOCKS
 1921  007674  012737  177406  172302          MOV     #400*256.-400+UP+RW,@#KIPDR1    ;SET KIPDR1=RW UP 400 BLOCKS
 1922  007702  012737  177406  172316          MOV     #400*256.-400+UP+RW,@#KIPDR7    ;SET KIPDR7=RW UP 400 BLOCKS
 1923  007710  012737  000001  177572          MOV     #1,@#SR0        ;TURN ON MEMORY MANAGEMENT
 1924  007716  012702  020000                  MOV     #20000,R2       ;R2 EQUALS BASE ADDR
 1925  007722  012712  177777          7$:     MOV     #177777,(R2)    ;INSERT PATTERN INTO 200000
 1926  007726  012767  000002  007540          MOV     #2,WRDCT        ;SETUP WORDCOUNT
 1927  007734  005067  007546                  CLR     BUF             ;CLEAR BUFFER ADDR
```

```
1928  007740  004567  002554                  JSR     R5,FUNCT        ;WRITE TWO WORDS ON DISK STARTING
1929  007744  000023                  .WORD   23                      ;AT LOCATION 200000
1930                                                                  ;TO SET MEXO
1931  007746  105777  007466                  TSTB    @RPCS           ;WAIT FOR READY
1932  007752  100375                          BPL     .-4
1933  007754  005777  007460                  TST     @RPCS
1934  007760  100002                          BPL     1$
1935  007762  104400                          HLT                     ;STATUS ERROR AFTER 2 WORD WRITE
1936  007764  000441                          BR      2$              ;USING MEXO
1937  007766  032777  000020  007444  1$:     BIT     #B4,@RPCS       ;MEXO SHOULD HAVE SET?
1938  007774  001002                          BNE     3$              ;BRANCH IF SET
1939  007776  104400                          HLT                     ;MEXO DID NOT SET
1940  010000  000430                          BR      2$
1941  010002  005012                  3$:     CLR     (R2)            ;CLEAR LOCATION 200000
1942  010004  004567  002510                  JSR     R5,FUNCT        ;READ TWO WORDS INTO LOCATIONS
1943  010010  000025                  .WORD   25                      ;200000 AND 200001.
1944  010012  105777  007422                  TSTB    @RPCS           ;WAIT FOR READY
1945  010016  100375                          BPL     .-4
1946  010020  005777  007414                  TST     @RPCS           ;ANY ERRORS?
1947  010024  100002                          BPL     4$              ;BRANCH IF NO
1948  010026  104400                          HLT                     ;ERROR OFTER READING 2 WORDS
1949  010030  000417                          BR      2$
1950  010032  032777  000020  007400  4$:     BIT     #B4,@RPCS       ;DID MEXO SET?
1951  010040  001002                          BNE     5$              ;BRANCH IF YES
1952  010042  104400                          HLT                     ;MEXO DID NOT SET AFTER 2 WORD
1953  010044  000411                          BR      2$              ;READ STARTING AT 200000
1954  010046  022712  177777          5$:     CMP     #177777,(R2)    ;WAS DATA READ INTO LOCATION
1955  010052  001406                          BEQ     2$              ;200000 CORRECTLY? - BRANCH IF YES
1956  010054  012767  177777  004470          MOV     #177777,EXP$
1957  010062  011267  004466                  MOV     (R2),REC$
1958  010066  104401                          HLT     +1              ;DATA COMPARE ERROR AT 200000
1959  010070  012767  007722  170704  2$:     MOV     #7$,LAD         ;SETUP ERROR LOOP
1960  010076  104000                          SCOPE
1961  010100  012737  004000  172342  EXTT1:  MOV     #4000,@#KIPAR1
1962  010106  012702  020000                  MOV     #20000,R2       ;R2 EQUALS THE BASE ADDR
1963  010112  012712  177777          7$:     MOV     #177777,(R2)    ;INSERT PATTERN INTO 400000
1964  010116  004567  002376                  JSR     R5,FUNCT
1965  010122  000043                  .WORD   43
1966  010124  105777  007310                  TSTB    @RPCS           ;WAIT FOR READY
1967  010130  100375                          BPL     .-4
1968  010132  005777  007302                  TST     @RPCS           ;ANY ERRORS?
1969  010136  100002                          BPL     4$              ;BRANCH IF NO
1970  010140  104400                          HLT
1971  010142  000441                          BR      2$              ;ERROR AFTER READING 2 WORDS
1972  010144  032777  000040  007266  4$:     BIT     #B5,@RPCS       ;DID MEX1 SET?
1973  010152  001002                          BNE     10$             ;BRANCH IF YES
1974  010154  104400                          HLT                     ;MEX1 DI NOT SET WITH A TWO WORD
1975                                                                  ;TRANSFER STARTING AT 400000
1976  010156  000433                          BR      2$
1977  010160  005012                  10$:    CLR     (R2)            ;CLEAR LOCATION 400000
1978  010162  004567  002332                  JSR     R5,FUNCT        ;READ TWO WORDS STARTING AT 400000
1979  010166  000045                  .WORD   45
1980  010170  105777  007244                  TSTB    @RPCS           ;WAIT FOR READY
1981  010174  100375                          BPL     .-4
1982  010176  005777  007236                  TST     @RPCS           ;ANY ERRORS?
1983  010202  100002                          BPL     11$             ;BRANCH IF NO
```

```
 1984  010204  104400                          HLT                     ;ERROR WHILE READING TWO WORDS
 1985  010206  000417                          BR      2$
 1986  010210  022712  177777          11$:    CMP     #177777,(R2)    ;WAS DATA READ INTO LOCATION 400000
 1987  010214  001407                          BEQ     6$              ;CORRECTLY? - BRANCH IF YES
 1988  010216  012767  177777  004326          MOV     #177777,EXP$
 1989  010224  011267  004324                  MOV     (R2),REC$
 1990  010230  104401                          HLT     +1              ;DATA COMPARE ERROR AT 400000 IF
 1991  010232  000405                          BR      2$              ;RECEIVED=0 - LOCATION WASN'T ACCESSED
 1992  010234  032777  000040  007176  6$:     BIT     #B5,@RPCS       ;DID MEX1 SET?
 1993  010242  001001                          BNE     2$
 1994  010244  104400                          HLT                     ;MEX1 DID NOT SET AFTER 2 WORD TRANSFER
 1995                                                                  ;STARTING AT 377777
 1996  010246  012767  010112  170526  2$:     MOV     #7$,LAD         ;SETUP ERROR LOOP
 1997  010254  104000                          SCOPE
 1998  010256  000413                          BR      EXTRP
 1999  010260  005267  007240          EXTEND: INC     PASSC           ;INCREMENT ITERATION COUNT
 2000  010264  001402                          BEQ     1$
 2001  010266  000167  176762                  JMP     RMEMT
 2002  010272  032737  002000  177570  1$:     BIT     #B10,@#SWR      ;LOOP ON TEST?
 2003  010300  001414                          BEQ     DATAT
 2004  010302  000167  176746                  JMP     RMEMT
 2005
 2006  010306  005037  177572          EXTRP:  CLR     @#SR0           ;TURN OFF MEMORY MANAGEMENT
 2007  010312  012706  000500          EXTTRP: MOV     #STKPTR,SP      ;RESTORE STACK
 2008  010316  012767  000006  167460          MOV     #6,4
 2009  010324  005067  167456                  CLR     6
 2010  010330  000753                          BR      EXTEND
```

```
                                        .SBTTL  ***** TEST 5 *****
                                        ;WRITE, WRITE CHECK, AND READ OPERATIONS ARE PERFORMED ON THE DRIVE
                                        ;THE DATA IS FIRST WRITTEN AND THEN WRITE CHECKED, THEN THE DATA
                                        ;IS READ. IF THE DATA IS TO BE COMPARED, THE INPUT BUFFER IS CLEARED
                                        ;RIGHT AFTER READ IS ISSUED. THEN THE DATA IS COMPARED WHILE READ
                                        ;IS IN PROGRESS. THIS IS DONE TO IMPROVE EFFICIENCY. THIS SEQUENCE
                                        ;IS REPEATED FOR THE ENTIRE PACK SURFACE FOR EACH OF THE 22 PATTERNS.

010332  012767  000005  007176  DATAT:  MOV     #5,TESTNO
010340  004567  170720                  JSR     R5,PRINT$       ;PRINT MESSAGE
010344  016225                          MES6
010346  016767  007164  171206          MOV     TESTNO,TTY
010354  004767  170776                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
010360  016700  007120          RDATAT: MOV     PATNU,R0        ;GET PATTERN NO.
010364  000241                          CLC
010366  006000                          ROR     R0
010370  010037  177570                  MOV     R0,@#SWR        ;DISPLAY PATTERN NO. IN USE
010374  005067  007076                  CLR     CYLINDER
010400  005067  007074                  CLR     DMA
010404  012737  000200  177776          MOV     #PRI4,@#PSW     ;ENABLE INT SYSTEM
010412  016767  007072  007054          MOV     SWRDCT,WRDCT
010420  012737  012602  000254          MOV     #DKINT,@#VECTOR ;SETUP DISK VECOTR
010426  012737  000340  000256          MOV     #340,@#STATUS
010434  004767  003460          DATP:   JSR     PC,PASEL        ;GENERATE PATTERN
010440  012767  017556  007040          MOV     #OUTBUF,BUF     ;SETUP BUFFER ADDR
010446  032767  040000  007010          BIT     #B14,FLAG       ;WRITE?
010454  001424                          BEQ     WRICK           ;BRANCH IF NO
010456  004767  002520          LDAT:   JSR     PC,OPDSEL       ;ANY OPERATOR ADDR PARAMETERS?
010462  004567  002032                  JSR     R5,FUNCT        ;WRITE WITH INTERRUPTS
010466  000103                  .WORD   103
010470  032737  010000  177570          BIT     #B12,@#SWR      ;DETERMINE HOW TO WAIT FOR INT
010476  001003                          BNE     1$
010500  004767  005200                  JSR     PC,NPR          ;GENERATE WORSE CASE NPR CYCLES
010504  000401                          BR      2$
010506  000001                  1$:     WAIT
010510  012767  010456  170264  2$:     MOV     #LDAT,LAD       ;SETUP LOOP ADDR
010516  104000                          SCOPE
010520  004767  002514                  JSR     PC,DISBUF       ;PREPARE NEW DISK ADDR
010524  000754                          BR      LDAT
010526  032767  020000  006730  WRICK:  BIT     #B13,FLAG       ;WRITE CHECK?
010534  001424                          BEQ     DREAD           ;BRANCH IF NO
010536  004767  002440          3$:     JSR     PC,OPDSEL       ;ANY OPERATOR ADDR PARAMETERS?
010542  004567  001752                  JSR     R5,FUNCT        ;WRITE CHECK THE DATA
010546  000107                  .WORD   107
010550  032737  010000  177570          BIT     #B12,@#SWR      ;DETERMINE HOW TO WAIT FOR INT
010556  001003                          BNE     1$
010560  004767  005120                  JSR     PC,NPR          ;GENERATE WORSE CASE NPR CYCLES
010564  000401                          BR      2$
010566  000001                  1$:     WAIT
010570  012767  010536  170204  2$:     MOV     #3$,LAD         ;SETUP LOOP ADDR
010576  104000                          SCOPE
010600  004767  002434                  JSR     PC,DISBUF       ;PREPARE NEW DISK ADDR
010604  000754                          BR      3$
010606  032767  010000  006650  DREAD:  BIT     #B12,FLAG       ;READ?
010614  001530                          BEQ     MSTR            ;BRANCH IF NO
```

```
2067  010616  005067  006706          ESH:    CLR     RDERR           ;CLEAR READ ERROR COUNT
2068  010622  004767  002354                  JSR     PC,OPDSEL       ;ANY OPERATOR ADDR PARAMETERS?
2069  010626  005067  173456          DSKRD:  CLR     INTFLG          ;CLEAR THE INTERRUPT FLAG
2070  010632  004567  001662                  JSR     R5,FUNCT        ;READ THE DATA
2071  010636  000105                  .WORD   105
2072  010640  032737  001000  177570          BIT     #B9,@#SWR       ;COMPARE DATA?
2073  010646  001411                          BEQ     1$              ;BRANCH IF YES
2074  010650  032737  010000  177570          BIT     #B12,@#SWR      ;DETERMINE HOW TO WAIT FOR INT
2075  010656  001003                          BNE     2$
2076  010660  004767  005020                  JSR     PC,NPR          ;GENERATE WORSE CASE NPR CYCLES
2077  010664  000431                          BR      3$
2078  010666  000001                  2$:     WAIT
2079  010670  000427                          BR      3$
2080  010672  016700  006576          1$:     MOV     WRDCT,R0        ;CLEAR THE INPUT BUFFER
2081  010676  012702  000012                  MOV     #12,R2
2082  010702  012701  017556                  MOV     #OUTBUF,R1
2083  010706  005021                  4$:     CLR     (R1)+
2084  010710  005021                          CLR     (R1)+
2085  010712  005021                          CLR     (R1)+
2086  010714  005021                          CLR     (R1)+
2087  010716  005021                          CLR     (R1)+
2088  010720  005021                          CLR     (R1)+
2089  010722  005021                          CLR     (R1)+
2090  010724  005021                          CLR     (R1)+
2091  010726  005021                          CLR     (R1)+
2092  010730  005021                          CLR     (R1)+
2093  010732  160200                          SUB     R2,R0
2094  010734  100364                          BPL     4$
2095  010736  004767  003650                  JSR     PC,COMPAR       ;COMPARE THE DATA
2096  010742  105777  006472                  TSTB    @RPCS           ;WAIT FOR READY
2097  010746  100375                          BPL     .-4
2098  010750  005767  006560          3$:     TST     INTERR          ;WERE THERE ANY ERRORS
2099  010754  001424                          BEQ     5$              ;BRANCH IF NO
2100  010756  005267  006546                  INC     RDERR           ;UPDATE ERROR COUNT
2101  010762  022767  000024  006540          CMP     #20.,RDERR      ;MORE THAN 20 ERRORS?
2102  010770  001416                          BEQ     5$              ;BRANCH IF YES
2103  010772  022767  000012  006530          CMP     #10.,RDERR      ;IS THIS TENTH ERROR?
2104  011000  001312                          BNE     DSKRD           ;BRANCH IF NO
2105  011002  112777  000015  006430          MOVB    #15,@RPCS       ;HOME THE HEADS
2106  011010  105777  006424                  TSTB    @RPCS           ;WAIT FOR DONE
2107  011014  100375                          BPL     .-4
2108  011016  005777  006436                  TST     @RPDS
2109  011022  100375                          BPL     .-4             ;WAIT FOR READY
2110  011024  000700                          BR      DSKRD
2111  011026  005767  006476          5$:     TST     RDERR
2112  011032  001410                          BEQ     6$
2113  011034  004567  170224                  JSR     R5,PRINT$       ;PRINT MESSAGE
2114  011040  016240                          MES7
2115  011042  016767  006462  170512          MOV     RDERR,TTY
2116  011050  004767  170302                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
2117  011054  005067  006450          6$:     CLR     RDERR           ;CLEAR READ ERROR COUNTER
2118  011060  012767  010616  167714          MOV     #ESH,LAD        ;LOOP ADDR
2119  011066  104000                          SCOPE
2120  011070  004767  002144                  JSR     PC,DISBUF       ;GET NEW DISK ADDR
2121  011074  000650                          BR      ESH
2122  011076  032767  000040  006360  MSTR:  BIT     #B5,FLAG        ;LOOPING ON AN OPERATOR ADDR?
```

```
 2123  011104  001402                          BEQ     1$              ;NO CONTINUE
 2124  011106  000167  177322                  JMP     DATP            ;YES
 2125  011112  005767  006346          1$:     TST     FLAG
 2126  011116  100002                          BPL     2$              ;UNDER PROGRAM CONTROL
 2127  011120  000167  000614                  JMP     MULCHK          ;OPERATOR SELECTED PATTERN
 2128  011124  062767  000002  006352  2$:     ADD     #2,PATNU        ;INC PATTERN INDEX
 2129  011132  022767  000036  006344          CMP     #36,PATNU       ;PATTERNS EXCEEDED?
 2130  011140  001402                          BEQ     3$
 2131  011142  000167  177212                  JMP     RDATAT          ;NOT YET
 2132  011146  005067  006332          3$:     CLR     PATNU           ;LAST PATTERN USED
 2133  011152  032737  002000  177570          BIT     #B10,@#SWR      ;LOOP ON TEST?
 2134  011160  001402                          BEQ     RANEX           ;NO..GO TO RANDOM TEST
 2135  011162  000167  177172                  JMP     RDATAT          ;YES
```

```
                                        .SBTTL  ***** TEST 6 *****
                                        ;THIS IS A RANDOM ADDRESS AND DATA TEST.
011166 012767 000006 006342 RANEX:  MOV     #6,TESTNO
011174 004567 170064        RANEX:  JSR     R5,PRINT$       ;PRINT MESSAGE
011200 016225               RANEX:  MES6
011202 016767 006330 170352 RANEX:  MOV     TESTNO,TTY
011210 004767 170142        RANEX:  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
011214 004767 002502        RRANEX: JSR     PC,INIT
011220 012767 000034 006256 RRANEX: MOV     #34,PATNU
011226 012767 173000 006270 RRANEX: MOV     #-5000,PASSC    ;SET UP PASS COUNT
011234 012737 000200 177776 RRANEX: MOV     #PRI4,@#PSW
011242 012767 000400 006224 WRLG:   MOV     #400,WRDCT      ;SET UP WORD COUNT TO 1 SECTOR
011250 016767 006220 006264 WRLG:   MOV     WRDCT,WORK
011256 012701 017556        WRLG:   MOV     #OUTBUF,R1
011262 004767 002724        WRLG:   JSR     PC,RANDOM       ;GENERATE RANDOM PATTERN
011266                      1$:
011266 004767 170272        1$:     JSR     PC,RAND$        ;GENERATE TWO RANDOM NOS.
011272 016767 170404 006242 1$:     MOV     LONUM,WORK
011300 016767 170374 006236 1$:     MOV     HINUM,WORK1
011306 042767 177400 006226 1$:     BIC     #177400,WORK
011314 022767 000312 006220 1$:     CMP     #312,WORK       ;FORM RANDOM CYL ADDR
011322 002761               1$:     BLT     1$
011324 016767 006212 006144 1$:     MOV     WORK,CYLINDER   ;SAVE IT
011332 042767 160360 006204 1$:     BIC     #160360,WORK1
011340 122767 000011 006176 1$:     CMPB    #11,WORK1       ;FORM RANDOM SECTOR ADDR
011346 101003               1$:     BHI     2$
011350 042767 000010 006166 1$:     BIC     #10,WORK1
011356 122767 000023 006161 2$:     CMPB    #23,WORK1+1
011364 101003               2$:     BHI     3$              ;FORM RANDOM HEAD ADDR
011366 142767 000014 006151 2$:     BICB    #14,WORK1+1
011374 016767 006144 006076 3$:     MOV     WORK1,DMA       ;SAVE DESK ADDR.
011402 012767 017556 006076 RANLOP: MOV     #OUTBUF,BUF     ;SETUP OUTPUT BUFFER
011410 004567 001104        RANLOP: JSR     R5,FUNCT        ;WRITE RANDOM DATA AND
011414 000103               RANLOP: .WORD   103             ;ENABLE INTERRUPTS
011416 032737 010000 177570 RANLOP: BIT     #B12,@#SWR      ;DETERMINE HOW TO WAIT FOR INT
011424 001003               RANLOP: BNE     2$
011426 004767 004252        RANLOP: JSR     PC,NPR          ;TEST WORSE CASE NPR CYCLES
011432 000401               RANLOP: BR      4$
011434 000001               2$:     WAIT
011436 012767 011402 167336 4$:     MOV     #RANLOP,LAD     ;SETUP LOOP ADDR
011444 104000               4$:     SCOPE
011446 004567 001046        7$:     JSR     R5,FUNCT        ;WRITE CHECK THE DATA AND
011452 000107               7$:     .WORD   107             ;ENABLE INTERRUPT
011454 032737 010000 177570 7$:     BIT     #B12,@#SWR      ;HOW TO WAIT FOR INT?
011462 001003               7$:     BNE     1$
011464 004767 004214        7$:     JSR     PC,NPR          ;TEST WORSE CASE NPR CYCLES
011470 000401               7$:     BR      5$
011472 000001               1$:     WAIT
011474 012767 011446 167300 5$:     MOV     #7$,LAD         ;SETUP LOOP ADDR
011502 104000               5$:     SCOPE
011504 005067 006020        8$:     CLR     RDERR           ;CLEAR READ ERROR COUNTER
011510 005067 172574        11$:    CLR     INTFLG
011514 004567 001000        11$:    JSR     R5,FUNCT        ;READ RANDOM DATA AND
011520 000105               11$:    .WORD   105             ;ENABLE INTERRUPT
```

```
2192  011522  032737  010000  177570          BIT     #B12,@#SWR      ;HOW TO WAIT FOR INT?
2193  011530  001003                          BNE     3$
2194  011532  004767  004146                  JSR     PC,NPR          ;TEST WORSE CASE NPR CYCLES
2195  011536  000401                          BR      6$
2196  011540  000001                  3$:     WAIT
2197  011542  032737  001000  177570  6$:     BIT     #B9,@#SWR       ;COMPARE FOR ERRORS?
2198  011550  001006                          BNE     9$              ;BRANCH IF NO
2199  011552  032777  040000  005660          BIT     #B14,@RPCS      ;HARD ERROR?
2200  011560  001002                          BNE     9$              ;BRANCH IF YES
2201  011562  004767  003024                  JSR     PC,COMPARE      ;COMPARE DATA FOR ERRORS
2202  011566  005767  005742          9$:     TST     INTERR          ;READ ERROR?
2203  011572  001424                          BEQ     10$             ;BRANCH IF NO
2204  011574  005267  005730                  INC     RDERR           ;UPDATE ERROR COUNT
2205  011600  022767  000024  005722          CMP     #20.,RDERR      ;20 ERRORS YET?
2206  011606  001416                          BEQ     10$             ;BRANCH IF YES
2207  011610  022767  000012  005712          CMP     #10.,RDERR      ;IS THIS TENTH ERROR?
2208  011616  001334                          BNE     11$             ;BRANCH IF NO
2209  011620  112777  000015  005612          MOVB    #15,@RPCS       ;ISSUE HOME COMMAND
2210  011626  105777  005606                  TSTB    @RPCS           ;WAIT FOR DONE
2211  011632  100375                          BPL     .-4
2212  011634  005777  005620                  TST     @RPDS           ;WAIT FOR READY
2213  011640  100375                          BPL     .-4
2214  011642  000722                          BR      11$
2215  011644  005767  005660          10$:    TST     RDERR
2216  011650  001410                          BEQ     21$
2217  011652  004567  167406                  JSR     R5,PRINT$       ;PRINT MESSAGE
2218  011656  016240                          MES7
2219  011660  016767  005644  167674          MOV     RDERR,TTY
2220  011666  004767  167464                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
2221  011672  005067  005632          21$:    CLR     RDERR           ;CLEAR READ ERROR COUNTER
2222  011676  012767  011504  167076          MOV     #8$,LAD         ;SET UP LOOP ADDR
2223  011704  104000                          SCOPE
2224  011706  005267  005612                  INC     PASSC           ;INCREMENT PASS COUNT
2225  011712  001402                          BEQ     12$             ;BRANCH IF DONE
2226  011714  000167  177322                  JMP     WRLG            ;CONTINUE
2227  011720  005067  005560          12$:    CLR     PATNU
2228  011724  032737  002000  177570          BIT     #B10,@#SWR      ;LOOP ON TEST?
2229  011732  001402                          BEQ     MULCHK          ;NO
2230  011734  000167  177254                  JMP     RRANEX          ;LOOP
2231
2232                                  ;CHECK FOR MULTI DISK MODE
2233                                  ;IF IN MULTI DISK MODE REPORT "END"
2234                                  ;IF LAST DISK ON SYSTEM HAS BEEN
2235                                  ;EXERCISED.
2236
2237
2238  011740  005067  005534          MULCHK: CLR     DMA
2239  011744  005067  005526                  CLR     CYLINDER        ;CLEAR ADDRESS REGISTERS
2240  011750  032767  004000  005506          BIT     #B11,FLAG       ;ARE WE IN MULTI DISK MODE
2241  011756  001422                          BEQ     REPOEN          ;REPORT "END"
2242  011760  016767  005500  005554          MOV     FLAG,WORK       ;WHAT DISK ARE WE ON
2243  011766  042767  177743  005546          BIC     #177743,WORK    ;IF LAST DISK ON SYSTEM
2244  011774  026767  005542  005516          CMP     WORK,DSKNOR     ;REPORT END
2245  012002  001004                          BNE     INDRVE
2246  012004  042767  000034  005452          BIC     #34,FLAG
2247  012012  000404                          BR      REPOEN          ;REPORT "END" LAST DISK
```

```
 2348  012014  062767  000004  005442  INCRVE:  ADD     #4,FLAG          ;INC  DISK NO.
 2349  012022  000422                   BR       EXTPP            ;EXERCISE DISK
 2350  012024  005267  166750           REPDEN:  INC     ICNT             ;INCREMENT PASS COUNTER
 2351  012030  004567  167230                    JSR     R5,PRINT$        ;PRINT MESSAGE
 2352  012034  016026                             MES1                     ;REPORT END OF PASS
 2353  012036  016767  166736  167516             MOV     ICNT,TTY
 2354  012044  004767  167306                    JSR     PC,PRINTS        ;TYPE LOCATION-SUPRESS ZEROS
 2355  012050  013701  000042                    MOV     @#42,R1          ;GET MONITOR RETURN ADDRESS
 2356  012054  001405                             BEQ     EXTPP            ;BRANCH IF NOT UNDER MONITOR
 2357  012056  000005                             RESET
 2358  012060  004711                   MEXIT:   JSR     PC,(R1)          ;EXIT TO THE MONITOR
 2359  012062  000240                             NOP
 2360  012064  000240                             NOP
 2361  012066  000240                             NOP
 2362  012070  000167  171260           EXTPP:   JMP     ADTST            ;RECYCLE
 2363
 2364
```

```
                                        .SBTTL  ***** TEST 7 *****

                                        ;TEST THE ABILITY OF THE RP11C TO SENSE POWER FAILURE
                                        ;AND TO HOME THE HEADS.  WHEN POWER IS RESTORED
                                        ;THE CYLINDER ADDRESS IS TESTED FOR ZERO. AFTER TYPING THE MESSAGE
                                        ;REQUESTING POWER TO BE TURNED OFF THE PROGRAM GOES INTO
                                        ;A LOOP READING FROM THE DISK. AFTER POWER IS RESTORED,
                                        ;MEMORY IS CHECKED TO SEE THAT THE DISK DID NOT PUT ANY
                                        ;JUNK INTO MEMORY WHILE POWER WAS GOING DOWN.

012074  012706  000500          PFTST:  MOV     #STKPTR,SP
012100  012767  012470  165716          MOV     #PFD,24         ;SET UP POWER FAIL VECTOR
012106  012767  000340  165712          MOV     #PRI7,26        ;LOCKOUT INTERRUPTS
012114  004567  001530                  JSR     R5,DSKNOS       ;SELECT THE UNIT
012120  112777  000312  005322          MOVB    #312,@RPCA      ;SELECT CYLINDER 312
012126  052777  000011  005304          BIS     #11,@RPCS       ;ISSUE SEEK COMMAND
012134  012700  017556                  MOV     #OUTBUF,R0
012140  012720  025252          1$:     MOV     #25252,(R0)+    ;FILL MEMORY WITH CHECKERBOARD
012144  020067  003532                  CMP     R0,MEMSIZ       ;PATTERN
012150  101773                          BLOS    1$
012152  012767  000312  005316          MOV     #312,CYLINDER
012160  005067  005314                  CLR     DMA
012164  012767  000400  005302          MOV     #400,WRDCT
012172  012767  017556  005306          MOV     #OUTBUF,BUF
012200  105777  005234                  TSTB    @RPCS           ;WAIT FOR DONE
012204  100375                          BPL     .-4
012206  005777  005246                  TST     @RPDS           ;WAIT FOR UNIT READY
012212  100375                          BPL     .-4
012214  004567  000300                  JSR     R5,FUNCT        ;WRITE 1 SECTOR OF CHECKERBOARD
012220  000003                  .WORD   3
012222  105777  005212                  TSTB    @RPCS           ;WAIT FOR READY
012226  100375                          BPL     .-4
012230  032777  100000  005202          BIT     #B15,@RPCS      ;ANY ERRORS?
012236  001401                          BEQ     2$
012240  104400                          HLT                     ;DEVICE ERROR ON WRITE
012242  012767  012074  166532  2$:     MOV     #PFTST,LAD
012250  104000                          SCOPE
012252  004567  167006                  JSR     R5,PRINT$       ;PRINT MESSAGE
012256  016152                          MESS                    ;HAVE POWER TURNED OFF
012260  004567  000234          3$:     JSR     R5,FUNCT        ;GO INTO A LOOP READING
012264  000005                  .WORD   5                       ;THE DISK SURFACE
012266  105777  005146                  TSTB    @RPCS
012272  100375                          BPL     .-4
012274  000771                          BR      3$

                                        ;AFTER MACHINE IS POWERED DOWN AND UP CONTROL
                                        ;IS TRANSFERRED HERE.

012276  012777  000001  005134  PFT1:   MOV     #1,@RPCS        ;CLEAR THE CONTROLLER
012304  016767  005154  005230          MOV     FLAG,WORK       ;GET UNIT NUMBER
012312  000241                          CLC
012314  006067  005222                  ROR     WORK
012320  006067  005216                  ROR     WORK
012324  000367  005212                  SWAB    WORK
012330  042767  174377  005204          BIC     #174377,WORK
```

```
2321  012336  016777  005200  005074          MOV     WORK,@RPCS      ;SELECT THE UNIT
2322  012344  005777  005110                  TST     @RPDS
2323  012350  100352                          BPL     PFT1
2324  012352  105777  005104                  TSTB    @RPCA1          ;SELECTED CYLINDER SHOULD BE ZERO
2325  012356  001411                          BEQ     1$
2326  012360  005067  002166                  CLR     EXP$
2327  012364  005067  002164                  CLR     REC$
2328  012370  117767  005066  002156          MOVB    @RPCA1,REC$
2329  012376  104401                          HLT     +1              ;HEADS DID NOT RESTORE TO 0
2330  012400  000427                          BR      2$              ;ON POWER FAILURE
2331  012402  012700  017556          1$:     MOV     #OUTBUF,R0
2332  012406  022720  025252          4$:     CMP     #25252,(R0)+    ;DID MEMORY RETAIN PATTERN ON PF
2333  012412  001004                          BNE     3$              ;BRANCH IF NO
2334  012414  020067  003262                  CMP     R0,MEMSIZ
2335  012420  001372                          BNE     4$
2336  012422  000416                          BR      2$
2337  012424  012767  025252  002120  3$:     MOV     #25252,EXP$
2338  012432  016067  177776  002114          MOV     -2(R0),REC$
2339  012440  104403                          HLT     +3              ;CONTENTS OF MEMORY CHANGED AFTER PF
2340  012442  004567  166616                  JSR     R5,PRINT$       ;PRINT MESSAGE
2341  012446  016127                          MES4                    ;PRINT MEMORY LOCATION
2342  012450  010067  167106                  MOV     R0,TTY
2343  012454  004767  166664                  JSR     PC,PRINTR       ;TYPE LOCATION WITH LEADING ZEROS
2344  012460                          2$:
2345  012460  004567  166600                  JSR     R5,PRINT$       ;PRINT MESSAGE
2346  012464  017431                          END                     ;END OF TEST
2347  012466  000000                          HALT
2348
2349                                  ;POWER FAIL TRAP HANDLER
2350
2351  012470  012767  012500  165326  PFD:    MOV     #PFU,24         ;SET UP POWER UP VECTOR
2352  012476  000774                          BR      PFD
2353
2354                                  ;POWER UP TRAP HANDLER
2355
2356  012500  012767  000026  165316  PFU:    MOV     #26,24          ;SETUP TRAP CATCHER
2357  012506  005067  165314                  CLR     26
2358  012512  012706  000500                  MOV     #STKPTR,SP      ;RESTORE STACK
2359  012516  000667                          BR      PFT1            ;VERIFY POWER DOWN SEQUENCE
2360
```

```
                                        .SBTTL  *** SUBROUTINES ***

                                        ;THIS ROUTINE OUTPUTS THE FUNCTION FOUND AT
                                        ;THE CALL + 2.

012520  004567  001124          FUNCT:  JSR     R5,DSKNOS       ;SELECT THE UNIT
012524  016777  004750  004720          MOV     DMA,@RPDA       ;SETUP DISK ADDR REG
012532  116777  004740  004710          MOVB    CYLINDER,@RPCA  ;SETUP CYLINDER ADDR REG
012540  016777  004742  004700          MOV     BUF,@RPBA       ;SETUP BUS ADDR REG
012546  016777  004722  004670          MOV     WRDCT,@RPWC     ;SETUP WORD COUNT
012554  005477  004664                  NEG     @RPWC           ;COMPLIMENT WORD COUNT
012560  011567  000014                  MOV     (R5),FNCT       ;GET RPCS FUNCTION
012564  062705  000002                  ADD     #2,R5           ;UPDATE RETURN ADDR
012570  116777  000004  004642          MOVB    FNCT,@RPCS      ;OUTPUT THE FUNCTION
012576  000205                  RTS     R5
012600  000000          FNCT:   0


                                        ;RF11 DISK INTERRUPT HANDLER

012602  005067  004726          DKINT:  CLR     INTERR          ;CLEAR THE ERROR FLAG
012606  005777  004626                  TST     @RPCS           ;TEST FOR ERROR
012612  100402                  BMI     1$
012614  000167  000322                  JMP     INTEXT          ;JUMP IF NO ERRORS
012620  010667  004710          1$:     MOV     SP,INTERR       ;SET INTERRUPT ERROR FLAG
012624  005767  004700                  TST     RDERR           ;IS THIS THE FIRST ERROR ATTEMPT?
012630  001404                  BEQ     2$              ;BRANCH IF YES
012632  032737  000020  177570          BIT     #84,@#SWR       ;TYPE ALL ERROR ATTEMPTS?
012640  001524                  BEQ     DKI1            ;BRANCH IF NO
012642  104400          2$:     HLT                     ;STATUS ERROR AFTER INTERRUPT
012644  032777  000002  004566          BIT     #B1,@RPCS       ;CHECK FOR READ
012652  001012                  BNE     DELMES          ;BRANCH IF WRITTING
012654  004567  166404                  JSR     R5,PRINT$       ;PRINT MESSAGE
012660  016410                  MES13                   ;GIVE # OF READ ATTEMPT
012662  016767  004642  166672          MOV     RDERR,TTY
012670  004767  166462                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
012674  010667  004634          3$:     MOV     SP,INTERR

012700  005067  000274          DELMES: CLR     INT1
012704  117767  004540  000266          MOVB    @RPCA,INT1      ;GET CYLINDER ADDR
012712  017767  004534  000256          MOV     @RPDA,INTO      ;GET HEAD AND SECTOR ADDR
012720  042767  160360  000250          BIC     #160360,INTO    ;CLEAR UNWANTED BITS
012726  032777  000001  004522          BIT     #B0,@RPER       ;WAS IT AN ADDR ERROR?
012734  001026                  BNE     REDAC           ;BRANCH IF YES
012736  032767  000017  000232          BIT     #17,INTO        ;IS SECTOR = TO 0
012744  001403                  BEQ     DECTK           ;YES - BRANCH
012746  005367  000224                  DEC     INTO            ;BACK UP COUNT
012752  000417                  BR      REDAC
012754  132767  000037  000215  DECTK:  BITB    #37,INTO+1      ;IS HEAD = TO 0
012762  001406                  BEQ     DECCY           ;YES - BRANCH
012764  105367  000207                  DECB    INTO+1          ;BACK UP HEAD
012770  052767  000011  000200          BIS     #11,INTO        ;SET UP SECTOR
012776  000405                  BR      REDAC
013000  012767  011411  000170  DECCY:  MOV     #11411,INTO
013006  005367  000166                  DEC     INT1
013012                          REDAC:
```

```
2417  013012  004567  166246                    JSR     R5,PRINT$       ;PRINT MESSAGE
2418  013016  016424                            MES14                   ;REPORT CYLINDER ADDR
2419  013020  016767  000154  166534            MOV     INT1,TTY
2420  013026  004767  166324                    JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZERCS
2421  013032  005067  000142                    CLR     INT1
2422  013036  116767  000135  000134            MOVB    INT0+1,INT1
2423  013044  004567  166214                    JSR     R5,PRINT$       ;PRINT MESSAGE
2424  013050  016441                            MES15                   ;REPORT HEAD ADDR OF FAILURE
2425  013052  016767  000122  166502            MOV     INT1,TTY
2426  013060  004767  166272                    JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
2427  013064  116767  000106  000106            MOVB    INT0,INT1
2428  013072  004567  166166                    JSR     R5,PRINT$       ;PRINT MESSAGE
2429  013076  016452                            MES16                   ;REPORT SEC ADDR OF FAILURE
2430  013100  016767  000074  166454            MOV     INT1,TTY
2431  013106  004767  166244                    JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
2432  013112  032777  001000  004340  DKI1:     BIT     #B9,@RPDS       ;IS DRIVE UNSAFE?
2433  013120  001401                            BEQ     .+4
2434  013122  000000                            HALT                    ;DRIVE UNSAFE
2435  013124  032777  002000  004326            BIT     #B10,@RPDS      ;SEEK INCOMPLETE?
2436  013132  001403                            BEQ     INTEXT          ;BRANCH IF COMPLETE
2437  013134  112777  000015  004276            MOVB    #15,@RPCS       ;RECALIBRATE
2438  013142  105777  004272          INTEXT:   TSTB    @RPCS
2439  013146  100375                            BPL     .-4             ;WAIT FOR DONE
2440  013150  005777  004304                    TST     @RPDS
2441  013154  100375                            BPL     .-4             ;WAIT FOR READY
2442  013156  005767  002642                    TST     BCKFLG          ;DID WE COME FROM BACKGROUND TEST?
2443  013162  001402                            BEQ     1$              ;BRANCH IF NO
2444  013164  012716  016012                    MOV     #NPRRET,(SP)    ;MODIFY RETURN ADDR
2445  013170  010667  171114          1$:       MOV     SP,INTFLG       ;SET INTERRUPT OCCURRED FLAG
2446  013174  000002                            RTI
2447
2448  013176  000000          INT0:   0
2449  013200  000000          INT1:   0
2450
2451
2452
2453                                    ;ROUTINE TO SET UP CYLINDER AND DISK ADDRESS FROM
2454                                    ;OPERATOR INPUTS DURING CONVERSATION MODE.
2455
2456  013202  032767  000040  004254  OPDSEL:  BIT     #B5,FLAG        ;USE OPERATOR ADDR?
2457  013210  001001                            BNE     .+4
2458  013212  000207                            RTS     PC              ;NO
2459  013214  016767  004246  004254            MOV     SCYL,CYLINDER   ;GET CYLINDER ADDR
2460  013222  016767  004244  004250            MOV     SSEC,DMA        ;GET SECTOR ADDR
2461  013230  116767  004234  004243            MOVB    SHED,DMA+1      ;GET HEAD ADDR
2462  013236  000207                            RTS     PC
2463
2464
2465
2466                                    ;ROUTINE TO SETUP DISK BUFFERS
2467                                    ;ADD WORD COUNT TO STARTING DISK ADDRESSES
2468                                    ;COMPARE CALCULATED ADDRESS TO TERMINATING ADDRESS
2469
2470  013240  032767  000040  004216  DISBUF:  BIT     #B5,FLAG        ;DID OPERATOR SUPPLY ADDR?
2471  013246  001401                            BEQ     .+4
2472  013250  000461                            BR      BUFEXIT         ;OPERATOR DEFINED DISK ADDR
```

```
2473  013252  004767  000520                JSR     PC,BLSZ         ;DEFINE BLOCK SIZE
2474  013256  016767  004240  004260        MOV     BLOCK,WORK1
2475  013264  016767  004210  004250  INCSEC: MOV     DMA,WORK        ;GET DISK ADDR
2476  013272  042767  177760  004242        BIC     #177760,WORK    ;MASK OUT SECTOR COUNT
2477  013300  022767  000011  004234        CMP     #11,WORK        ;CHECK FOR LAST SECTOR
2478  013306  001406                        BEQ     INCSUR          ;CHECK SURFACE
2479  013310  005267  004164                INC     DMA             ;+1 SECTOR COUNT
2480  013314  005367  004202        DECBLK: DEC     BLOCK           ;-1 FROM BLOCK COUNT
2481  013320  001432                        BEQ     CMDAE           ;CMP DMA TO RPDA
2482  013322  000760                        BR      INCSEC          ;RECYCLE
2483  013324  042767  000017  004146  INCSUR: BIC     #17,DMA         ;FETCH ADDRESS
2484  013332  016767  004142  004202        MOV     DMA,WORK
2485  013340  042767  160377  004174        BIC     #160377,WORK
2486  013346  122767  000023  004167        CMPB    #23,WORK+1
2487  013354  001403                        BEQ     SWSUR           ;+1 SURFACE
2488  013356  105267  004117                INCB    DMA+1           ;INC HEAD NUMBER
2489  013362  000754                        BR      DECBLK          ;RECYCLE
2490  013364  005067  004110        SWSUR:  CLR     DMA             ;CLEAR THE DISK ADDRESS
2491  013370  005267  004102                INC     CYLINDER
2492  013374  022767  000313  004074        CMP     #313,CYLINDER   ;HAS LAST CYL BEEN EXCEEDED?
2493  013402  001404                        BEQ     BUFEXIT         ;BRANCH IF YES
2494  013404  000743                        BR      DECBLK
2495                        ;COME HERE AFTER DETERMINING THE STARTING ADDR OF THE NEXT
2496                        ;TRANSFER. NOW CHECK TO SEE THERE IS ENOUGH ROOM ON THE DISK
2497                        ;TO MAKE THE TRANSFER. IF NOT MODIFY THE WORD COUNT FOR THE FINAL
2498                        ;OUTPUT.
2499
2500
2501  013406  105767  004052        CMDAE:  TSTB    FLAG            ;CHECK FOR LAST DISK BUFFER
2502  013412  100015                        BPL     BUFINX
2503  013414  005067  004060        BUFEXIT: CLR    DMA             ;CLEAR ADDRESS BITS
2504  013420  005067  004052                CLR     CYLINDER        ;CLR CYLINDER REGISTER
2505  013424  062716  000002                ADD     #2,(6)          ;INC STOCK POINTER
2506  013430  042767  000200  004026        BIC     #200,FLAG
2507  013436  016767  004046  004030        MOV     SWRDCT,WRDCT
2508  013444  000500                        BR      EXTDR           ;EXIT
2509  013446  005067  004074        BUFINX: CLR     WORK2           ;CLEAR BLOCK COUNTER
2510  013452  016767  004022  004062        MOV     DMA,WORK
2511  013460  016767  004012  004062        MOV     CYLINDER,WORK3
2512  013466  042767  160360  004046        BIC     #160360,WORK
2513  013474  005267  004046        XINCSEC: INC    WORK2           ;INCREMENT BLOCK COUNT
2514  013500  005367  004040                DEC     WORK1           ;DECREMENT TOTAL BLOCKS REQUIRED
2515  013504  001460                        BEQ     EXTDR           ;EXIT IF BLOCK COUNT SATISFIED
2516  013506  122767  000011  004026        CMPB    #11,WORK        ;CHECK THE DISK ADDRESS TO
2517  013514  001403                        BEQ     XINCSUR         ;SEE IF THERE IS ENOUGH ROOM
2518  013516  005267  004020                INC     WORK            ;TO HANDLE THE OUTPUT REQUESTED
2519  013522  000764                        BR      XINCSEC
2520  013524  105067  004012        XINCSUR: CLRB   WORK
2521  013530  122767  000023  004005        CMPB    #23,WORK+1
2522  013536  001403                        BEQ     1$
2523  013540  105267  003777                INCB    WORK+1
2524  013544  000753                        BR      XINCSEC
2525  013546  005067  003770        1$:     CLR     WORK
2526  013552  022767  000312  003770        CMP     #312,WORK3      ;ARE WE ON THE LAST CYLINDER?
2527  013560  001403                        BEQ     2$              ;BRANCH IF YES
2528  013562  005267  003762                INC     WORK3
```

```
2529  013566  000742                                  BR      XINCSEC
2530  013570  016767  003752  003676  2$:     MOV     WORK2,WRDCT     ;COME HERE IF THERE IS NOT
2531  013576  000241                                  CLC             ;ENOUGH ROOM TO HANDLE THE
2532  013600  006167  003670                          ROL     WRDCT   ;REQUESTED OUTPUT. MODIFY THE
2533  013604  006167  003664                          ROL     WRDCT   ;WORDCOUNT TO FILL THE REMAINING
2534  013610  006167  003660                          ROL     WRDCT   ;SURFACE.
2535  013614  006167  003654                          ROL     WRDCT
2536  013620  006167  003650                          ROL     WRDCT
2537  013624  006167  003644                          ROL     WRDCT
2538  013630  006167  003640                          ROL     WRDCT
2539  013634  006167  003634                          ROL     WRDCT
2540  013640  052767  000200  003616                  BIS     #200,FLAG
2541  013646  000207                          EXTDR:  RTS     PC              ;EXIT
2542
2543
2544                                          ;ROUTINE TO SELECT THE DISK UNIT
2545
2546  013650  016767  003610  003664  DSKNOS: MOV     FLAG,WORK       ;FETCH THE FLAG WORD
2547  013656  006067  003660                  ROR     WORK
2548  013662  006067  003654                  ROR     WORK
2549  013666  000241                          CLC
2550  013670  000367  003646                  SWAB    WORK
2551  013674  042767  174377  003640          BIC     #174377,WORK    ;MASK THE DISK NUMBER
2552  013702  016777  003634  003530          MOV     WORK,@RPCS      ;LOAD THE ADDRESS IN THE ADDRESS REG
2553  013710  005777  003544                  TST     @RPDS           ;IS THE UNIT READY?
2554  013714  100401                          BMI     1$              ;BRANCH IF READY
2555  013716  104400                          HLT                     ;SELECTED UNIT NOT READY
2556  013720  000205                  1$:     RTS     R5              ;EXIT
2557
2558
2559                                          ;INITIALIZE THE VECTORS
2560
2561  013722  012767  001112  164104  INIT:   MOV     #ERROR,34       ;SETUP TRAP VECTOR
2562  013730  012767  000340  164100          MOV     #PRI7,36
2563  013736  012767  001004  164064          MOV     #SCOPE$,30      ;SETUP EMT VECTOR
2564  013744  012767  000340  164060          MOV     #PRI7,32
2565  013752  012737  012602  000254          MOV     #DKINT,@#VECTOR ;SETUP DISK INTERRUPT VECTOR
2566  013760  012737  000340  000256          MOV     #PRI7,@#STATUS
2567  013766  012737  000340  177776          MOV     #PRI7,@#PSW     ;LOCKOUT INTERRUPTS
2568  013774  000207                          RTS     PC
2569
2570
2571                                          ;THIS ROUTINE CONVERTS A WORD COUNT TO A BLOCK COUNT
2572
2573  013776  012767  000377  003516  BLSZ:   MOV     #377,BLOCK      ;DRIVE BLOCK SIZE
2574  014004  016767  003464  003530          MOV     WRDCT,WORK      ;FETCH WORD COUNT
2575  014012  036767  003504  003522          BIT     BLOCK,WORK
2576  014020  001410                          BEQ     RORBLK
2577  014022  046767  003474  003512          BIC     BLOCK,WORK      ;SET UP BLOCK OVERFLOW
2578  014030  005267  003466                  INC     BLOCK
2579  014034  066767  003462  003500          ADD     BLOCK,WORK
2580  014042  000367  003474          RORBLK: SWAB    WORK
2581  014046  016767  003470  003446          MOV     WORK,BLOCK      ;BLOCK COUNT
2582  014054  000207                          RTS     PC              ;EXIT
2583
2584
```

```
2585                                    ;DETERMINE THE APPROPRIATE ATTENTION BIT FROM
2586                                    ;THE UNIT NUMBER.
2587
2588  014056  016701  003402           GATTN:  MOV     FLAG,R1
2589  014062  006001                           ROR     R1
2590  014064  006001                           ROR     R1              ;GET UNIT NUMBER
2591  014066  005067  000014                   CLR     ATTN
2592  014072  042701  177770                   BIC     #177770,R1      ;ISOLATE UNIT
2593  014076  116167  014110  000002          MOVB    ATTNB(R1),ATTN  ;GET ATTENTION BIT
2594  014104  000207                           RTS     PC
2595
2596
2597  014106  000000                   ATTN:   0
2598  014110     001     002     004   ATTNB:  .BYTE   1,2,4,10,20,40,100,200
2599  014113     010     020     040
2600  014116     100     200
2601                                            .EVEN
2602
2603
2604
2605
2606                                    ;ROUTINE TO SELECT DATA PATTERNS FOR TEST
2607
2609                                    ;ENTER FROM JSR PC PASEL
2609  014120  016700  003360           PASEL:  MOV     PATNU,R0        ;SET UP PATTERN NUMBER
2610  014124  016767  003344  003410           MOV     WRDCT,WORK      ;SET UP WORK
2611  014132  012701  017556                   MOV     #OUTBUF,R1      ;LOC. OF OUTBUFFER
2612  014136  022700  000034                   CMP     #34,R0          ;TEST FOR RANDOM DATA NUMBER
2613  014142  001423                           BEQ     RANDOM          ;GO GENERATE RANDOM DATA
2614  014144  022700  000032                   CMP     #32,R0          ;IS THIS PATTERN 15
2615  014150  001406                           BEQ     PATT32
2616  014152  016021  014556           FILDAT: MOV     PAT0(0),(1)+    ;FILL BUFFER
2617  014156  005367  003360                   DEC     WORK            ;DEC. WORK COUNT
2618  014162  001373                           BNE     FILDAT          ;LOAD NEXT WORD
2619  014164  000207                           RTS     PC              ;BUFFER FULL
2620  014166  012721  177777           PATT32: MOV     #177777,(1)+    ;INSERT ALL ONES PATTERN
2621  014172  005367  003344                   DEC     WORK
2622  014176  001404                           BEQ     1$
2623  014200  005021                           CLR     (1)+            ;LOAD ZERO PATTERN
2624  014202  005367  003334                   DEC     WORK            ;DECREMENT WORD COUNT
2625  014206  001367                           BNE     PATT32          ;LOOP IF NOT ZERO
2626  014210  000207                   1$:     RTS     PC              ;EXIT
2627                                    ;RANDOM DATA GENERATOR SUBROUTINE
2628  014212  016767  000134  000136  RANDOM: MOV     LONUN,LOSAV
2629  014220  016767  000130  000132          MOV     HINUN,HISAV
2630  014226  016700  000120           1$:     MOV     LONUN,R0        ;SET UP R0 WITH 5 DIGITS LOW
2631  014232  016704  000116                   MOV     HINUN,R4        ;SET UP R1 WITH 5 DIGITS HIGH
2632  014236  012703  000007                   MOV     #7,R3           ;SET UP SHIFT COUNT
2633  014242  005002                           CLR     R2              ;CLEAR R2
2634  014244  006300                   2$:     ASL     R0              ;SHIFT R0 LEFT AND
2635  014246  006104                           ROL     R4              ;ROTATE CARRY INTO LSB OF R1 INTO
2636  014250  006102                           ROL     R2              ;ROTATE CARRY OUT OF R1 INTO R2
2637  014252  005303                           DEC     R3              ;DECREMENT R3
2638  014254  001373                           BNE     2$              ;CONTINUE SHIFT LOOP
2639  014256  066702  000070                   ADD     LONUN,R2        ;ADDN IN NUMBER TO MAKE X 129
2640  014262  005504                           ADC     R4              ;PROPOGATE CARRY
```

```
2641  014264  066704  000064                    ADD     HINUN,R4        ;ADDN IN NUMBER TO MAKE X 129
2642  014270  005502                            ADC     R2              ;PROPOGATE CARRY
2643  014272  062700  001057                    ADD     #1057,R0        ;ADDN LOW CONSTANT
2644  014276  005504                            ADC     R4              ;PROPOGATE CARRIES
2645  014300  005502                            ADC     R2              ;PROPOGATE AGAIN
2646  014302  062704  047401                    ADD     #47401,R4       ;ADDN HIGH CONSTANT
2647  014306  005502                            ADC     R2              ;PROPOGATE CARRY
2648  014310  062702  000006                    ADD     #6,R2           ;ADDN HIGHEST CONSTANT
2649  014314  060200                            ADD     R2,R0           ;REPRIME R0 WITH HIGH DIGIT
2650  014316  005504                            ADC     R4              ;PROPOGATE CARRY
2651  014320  010067  000026                    MOV     R0,LONUN        ;PUT R0 BACK IN LONUM
2652  014324  010021                            MOV     R0,(1)+         ;HOLD LONUM FOR PROGRAM
2653  014326  005367  003210                    DEC     WORK
2654  014332  001406                            BEQ     EXGEN
2655  014334  010467  000014                    MOV     R4,HINUN        ;PUT R1 BACK IN HINUM
2656  014340  010421                            MOV     R4,(1)+         ;HOLD HINUM FOR PROGRAM
2657  014342  005367  003174                    DEC     WORK
2658  014346  001327                            BNE     1$
2659  014350  000207                  EXGEN:    RTS     PC              ;RETURN TO PROGRAM
2660  014352  000000                  LONUN:    0
2661  014354  000000                  HINUN:    0
2662  014356  000000                  LOSAV:    0
2663  014360  000000                  HISAV:    0
2664
2665
2666  014362  032767  000002  164652  MSG:      BIT     #B1,HLTCT$      ;TYPE ENTIRE MESSAGE
2667  014370  001033                            BNE     1$              ;BRANCH IF NO
2668  014372  004567  164666                    JSR     R5,PRINT$       ;PRINT MESSAGE
2669  014376  016273                            MES8
2670  014400  004567  164660                    JSR     R5,PRINT$       ;PRINT MESSAGE
2671  014404  016067                            MES2A
2672  014406  017767  003046  165146            MOV     @RPDS,TTY
2673  014414  004767  164724                    JSR     PC,PRINTR       ;TYPE LOCATION WITH LEADING ZEROS
2674  014420  004567  164640                    JSR     R5,PRINT$       ;PRINT MESSAGE
2675  014424  016045                            MES1A
2676  014426  017767  003024  165126            MOV     @RPER,TTY
2677  014434  004767  164704                    JSR     PC,PRINTR       ;TYPE LOCATION WITH LEADING ZEROS
2678  014440  004567  164620                    JSR     R5,PRINT$       ;PRINT MESSAGE
2679  014444  016056                            MES2
2680  014446  017767  002766  165106            MOV     @RPCS,TTY
2681  014454  004767  164664                    JSR     PC,PRINTR       ;TYPE LOCATION WITH LEADING ZEROS
2682  014460  032767  000001  164554  1$:       BIT     #B0,HLTCT$      ;TYPE EXP-REC
2683  014466  001001                            BNE     2$              ;BRANCH IF YES
2684  014470  000207                            RTS     PC
2685  014472  032767  000002  164542  2$:       BIT     #B1,HLTCT$
2686  014500  001403                            BEQ     3$
2687  014502  004567  164556                    JSR     R5,PRINT$       ;PRINT MESSAGE
2688  014506  016465                            MES17
2689  014510                            3$:
2690  014510  004567  164550                    JSR     R5,PRINT$       ;PRINT MESSAGE
2691  014514  016505                            MES18
2692  014516  016767  000030  165036            MOV     EXP$,TTY
2693  014524  004767  164614                    JSR     PC,PRINTR       ;TYPE LOCATION WITH LEADING ZEROS
2694  014530  004567  164530                    JSR     R5,PRINT$       ;PRINT MESSAGE
2695  014534  016521                            MES19
2696  014536  016767  000012  165016            MOV     REC$,TTY
```

```
 2697  014544  004767  164574                    JSR     PC,PRINTR       ;TYPE LOCATION WITH LEADING ZEROS
 2698  014550  000207                            RTS     PC
 2699  014552  000000                  EXP$:     0
 2700  014554  000000                  REC$:     0
 2701
 2702
 2703
 2704                                              .EVEN
 2705                                      ;RF11 DATA PATTERNS
 2706
 2707  014556  163126                      PAT0:     163126
 2708  014560  052525                      PAT1:     052525
 2709  014562  125252                      PAT2:     125252
 2710  014564  031463                      PAT3:     031463
 2711  014566  007417                      PAT4:     007417
 2712  014570  010421                      PAT5:     010421
 2713  014572  021042                      PAT6:     021042
 2714  014574  042104                      PAT7:     042104
 2715  014576  104210                      PAT10:    104210
 2716  014600  167356                      PAT11:    167356
 2717  014602  156735                      PAT12:    156735
 2718  014604  135673                      PAT13:    135673
 2719  014606  073567                      PAT14:    073567
 2720  014610  000001                      PAT15:    000001
 2721                                      ;PAT16  RANDOM DATA
 2722
 2723                                      ;THIS ROUTINE COMPARES THE DATA READ AGAINST THE DATA EXPECTED.
 2724                                      ;ALL ERRORS ARE REPORTED TO THE OPERATOR. IF BIT 5 OF THE SWITCH
 2725                                      ;REGISTER IS SET, THIS ROUTINE WILL CONTINUE COMPARING AFTER AN
 2726                                      ;ERROR HAS BEEN FOUND AND WILL REPORT UP TO 3 VERIFY ERRORS
 2727                                      ;WITHIN THE SAME INPUT OPERATION.
 2728  014612  012767  177775  002720  COMPAR: MOV     #-3,ERCOUNT     ;ERROR RETRY COUNTER
 2729  014620  016767  002650  002720           MOV     WRDCT,WORK2     ;GET THE WORD COUNT
 2730  014626  012767  017556  002656           MOV     #OUTBUF,SAVE    ;SET UP OUTBUFFER POINTER
 2731  014634  005067  002642                   CLR     SWITCH          ;CLEAR RANDOM PATTERN FLAG
 2732  014640  016767  177512  165034           MOV     LOSAV,LONUM     ;GET RANDOM BASE NOS.
 2733  014646  016767  177506  165024           MOV     HISAV,HINUM
 2734  014654  022767  000034  002622           CMP     #34,PATNU       ;IS THIS RANDOM PATTERN?
 2735  014662  001422                           BEQ     CMPLP           ;BRANCH IF YES
 2736  014664  022767  000032  002612           CMP     #32,PATNU       ;IS THIS SPECIAL PATTERN?
 2737  014672  001037                           BNE     CMPLP1          ;BRANCH IF NO
 2738  014674  005767  002602           CMPLP2: TST     SWITCH
 2739  014700  001006                           BNE     1$
 2740  014702  012767  177777  177642           MOV     #177777,EXP$    ;EXPECT ALL ONES
 2741  014710  010667  002566                   MOV     SP,SWITCH       ;SET THE FLAG
 2742  014714  000433                           BR      WRDCMP          ;GO COMPARE DATA
 2743  014716  005067  002560           1$:     CLR     SWITCH
 2744  014722  005067  177624                   CLR     EXP$            ;EXPECT ALL ZEROS
 2745  014726  000426                           BR      WRDCMP          ;GO COMPARE DATA
 2746  014730  005767  002546           CMPLP:  TST     SWITCH
 2747  014734  001010                           BNE     2$
 2748  014736  004767  164622                   JSR     PC,RAND$        ;GENERATE TWO RANDOM NOS.
 2749  014742  016767  164734  177602           MOV     LONUM,EXP$      ;GET EVEN RANDOM WORD
 2750  014750  010667  002526                   MOV     SP,SWITCH       ;SET RANDOM PATTERN FLAG
 2751  014754  000413                           BR      WRDCMP
 2752  014756  005067  002520           2$:     CLR     SWITCH
```

```
2753  014762  016767  164712  177562          MOV     HINUM,EXP$
2754  014770  000405                          BR      WRDCMP
2755  014772  016700  002506          CMPLP1: MOV     PATNU,R0
2756  014776  016067  014556  177546          MOV     PAT0(R0),EXP$
2757  015004  027767  002502  177540  WRDCMP: CMP     @SAVE,EXP$      ;COMPARE DATA
2758  015012  001021                          BNE     WDERR           ;WORD IN ERROR
2759  015014  005367  002526          WRDINC: DEC     WORK2           ;DECREMENT THE WORD COUNT
2760  015020  001415                          BEQ     ADAM            ;EXIT ROUTINE IF ZERO
2761  015022  062767  000002  002462  BLAD1:  ADD     #2,SAVE         ;UPDATE PATTERN ADDRESS
2762  015030  022767  000032  002446          CMP     #32,PATNU
2763  015036  101362                          BHI     WRDCMP          ;BRANCH IF STANDARD PATTERN
2764  015040  022767  000034  002436          CMP     #34,PATNU       ;IS THIS RANDOM PATTERN
2765  015046  001730                          BEQ     CMPLP           ;BRANCH IF YES
2766  015050  000711                          BR      CMPLP2          ;BRANCH IF YES
2767  015052  000754                          BR      WRDCMP          ;COMPARE NEXT WORD
2768  015054  000207          ADAM:   RTS     PC              ;EXIT THIS ROUTINE
2769  015056  005767  167226  WDERR:  TST     INTFLG          ;DID INTERRUPT OCCUR YET?
2770  015062  001750                          BEQ     WRDCMP          ;BRANCH IF NO
2771  015064  017767  002422  177462          MOV     @SAVE,REC$      ;GET GOOD DATA
2772  015072  010667  002436                  MOV     SP,INTERR       ;SET ERRORR FLAG
2773  015076  005767  002426                  TST     RDERR           ;IS THIS THE FIRST READ ERROR?
2774  015102  001404                          BEQ     3$              ;BRANCH IF YES
2775  015104  032737  000020  177570          BIT     #B4,@#SWR       ;PRINT ALL RETRY ERRORS?
2776  015112  001550                          BEQ     1$              ;BRANCH IF NO
2777  015114  104403          3$:     HLT     +3              ;DATA COMPARE ERROR
2778  015116  005067  002400                  CLR     BLOCK           ;CLEAR THE BLOCK COUNTER
2779  015122  016767  002346  002412          MOV     WRDCT,WORK      ;GET THE WORD COUNT
2780  015130  166767  002412  002404          SUB     WORK2,WORK      ;DETERMINE DISTANCE OF FAILURE INTO BUFFER
2781  015136  162767  000400  002376  2$:     SUB     #400,WORK
2782  015144  100403                          BMI     8$
2783  015146  005267  002350                  INC     BLOCK           ;UPDATE BLOCK COUNT FOR EACH 400 WORDS
2784  015152  000771                          BR      2$
2785  015154  062767  000400  002360  8$:     ADD     #400,WORK       ;RESTORE POSITIVE NUMBER
2786  015162  016767  002312  002354          MOV     DMA,WORK1       ;GET HEAD AND SECTOR ADDRESS
2787  015170  016767  002302  002352          MOV     CYLINDER,WORK3  ;GET CYLINDER ADDRESS
2788  015176  005767  002320          5$:     TST     BLOCK           ;IS THE BLOCK COUNT ZERO?
2789  015202  001427                          BEQ     7$              ;BRANCH IF YES
2790  015204  005367  002312                  DEC     BLOCK           ;DECREMENT BLOCK COUNT
2791  015210  122767  000011  002326          CMPB    #11,WORK1       ;DETERMINE THE CYLINDER, HEAD,
2792  015216  001403                          BEQ     4$              ;AND SECTOR ADDRESSES OF THE
2793  015220  005267  002320                  INC     WORK1           ;COMPARE ERROR
2794  015224  000764                          BR      5$
2795  015226  105067  002312          4$:     CLRB    WORK1
2796  015232  122767  000023  002305          CMPB    #23,WORK1+1
2797  015240  001403                          BEQ     6$
2798  015242  105267  002277                  INCB    WORK1+1
2799  015246  000753                          BR      5$
2800  015250  005067  002270          6$:     CLR     WORK1
2801  015254  005267  002270                  INC     WORK3
2802  015260  000746                          BR      5$
2803  015262                          7$:
2804  015262  004567  163776                  JSR     R5,PRINT$       ;PRINT MESSAGE
2805  015266  016424                          MES14                   ;GIVE CYL ADDR
2806  015270  016767  002254  164264          MOV     WORK3,TTY
2807  015276  004767  164054                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
2808  015302  005067  002224                  CLR     ACNVX
```

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 2809  015306  116767  002233  002216          MOVB    WORK1+1,ACNVX
 2810  015314  004567  163744                  JSR     R5,PRINT$       ;PRINT MESSAGE
 2811  015320  016441                          MES15                   ;GIVE HEAD ADDR
 2812  015322  016767  002204  164232          MOV     ACNVX,TTY
 2813  015330  004767  164022                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
 2814  015334  116767  002204  002170          MOVB    WORK1,ACNVX
 2815  015342  004567  163716                  JSR     R5,PRINT$       ;PRINT MESSAGE
 2816  015346  016452                          MES16                   ;GIVE SECTOR ADDR
 2817  015350  016767  002156  164204          MOV     ACNVX,TTY
 2818  015356  004767  163744                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
 2819  015362  004567  163676                  JSR     R5,PRINT$       ;PRINT MESSAGE
 2820  015366  016312                          MES9
 2821  015370  016767  002146  002134          MOV     WORK,ACNVX      ;GET WORD COUNT INTO SECTOR
 2822  015376  005267  002130                  INC     ACNVX
 2823  015402  016767  002124  164152          MOV     ACNVX,TTY
 2824  015410  004767  163742                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
 2825  015414  004567  163644                  JSR     R5,PRINT$       ;PRINT MESSAGE
 2826  015420  016410                          MES13
 2827  015422  016767  002102  164132          MOV     RDERR,TTY
 2828  015430  004767  163722                  JSR     PC,PRINTS       ;TYPE LOCATION-SUPRESS ZEROS
 2829  015434  032737  000040  177570  1$:     BIT     #B5,@#SWR       ;CONTINUE COMPARING?
 2830  015442  001604                          BEQ     ADAM            ;BRANCH IF NO
 2831  015444  005267  002070                  INC     ERCOUNT         ;UPDATE ERROR COUNTER
 2832  015450  001601                          BEQ     ADAM
 2833  015452  000167  177336                  JMP     WRDINC
 2834
 2835
 2836
 2837                                  ;EXTENDED MEMORY EXERCISER
 2838                                  ;THE PROGRAM DETERMINES HOW MUCH MEMORY
 2839                                  ;IS ON THE SYSTEM THEN IT
 2840                                  ;GENERATES A RANDOM BUFFER THAT SIZE
 2841                                  ;AND WRITES AND WRITE CHECKS THE DATA
 2842
 2843  015456  052777  000001  001754  EXTMEN: BIS     #B0,@RPCS       ;CLEAR THE DISK
 2844  015464  105777  001750                  TSTB    @RPCS
 2845  015470  100375                          BPL     .-4
 2846  015472  012737  000340  177776          MOV     #PRI7,@#PSW     ;LOCK UP PRIORITY LEVELS
 2847  015500  012767  015550  162276          MOV     #MAXREF,4       ;SET UP I/O BUS TRAP
 2848  015506  012767  000340  162272          MOV     #PRI7,6
 2849  015514  012767  017446  001770          MOV     #17446,SAVE     ;SET UP FOR 4K
 2850  015522  005777  001764          EXREF:  TST     @SAVE           ;REFERENCE MEMORY
 2851  015526  022767  157446  001756          CMP     #157446,SAVE    ;TEST FOR 28K
 2852  015534  001001                          BNE     1$              ;BRANCH IF LESS THAN 28K
 2853  015536  000407                          BR      MAXRF1          ;LAST REFERENCE MADE TO I/O REG.
 2854  015540  062767  020000  001744  1$:     ADD     #20000,SAVE     ;SET UP FOR NEXT MEMORY REF.
 2855  015546  000765                          BR      EXREF           ;GO REFERENCE MEMORY
 2856
 2857                                  ;ENTER HERE WHEN I/O BUS ERROR OCCURS
 2858
 2859  015550  162767  020000  001734  MAXREF: SUB     #20000.SAVE
 2860  015556  012767  000006  162220  MAXRF1: MOV     #6,4            ;RESTORE I/O BUS TRAP
 2861  015564  005067  162216                  CLR     6
 2862  015570  005737  000042                  TST     @#42            ;UNDER MONITOR CONTROL?
 2863  015574  001403                          BEQ     1$              ;BRANCH IF NO
 2864  015576  162767  005670  001706          SUB     #3000.,SAVE     ;ALLOW ROOM FOR THE MONITOR
```

```
 2865  015604  016767  001702  000070  1$:     MOV     SAVE,MEMSIZ     ;SAVE THE MAXIMUM MEMORY ADDRESS
 2866  015612  162767  017556  001672          SUB     #OUTBUF,SAVE    ;DETERMINE THE BUFFER SIZE
 2867  015620  000241                          CLC
 2868  015622  006067  001664                  ROR     SAVE            ;FORM WORD COUNT
 2869  015626  016767  001660  001640          MOV     SAVE,WRDCT      ;SAVE IT
 2870  015634  042767  000001  001650          BIC     #B0,SAVE        ;MAKE ADDRESS EVEN
 2871  015642  012767  017556  001656          MOV     #OUTBUF,INBUF   ;START OF INPUT BUFFER
 2872  015650  066767  001636  001650          ADD     SAVE,INBUF
 2873  015656  000241                          CLC
 2874  015660  042767  000377  001606          BIC     #377,WRDCT      ;DETERMINE MAXIMUM WORD COUNT
 2875  015666  016767  001602  001614          MOV     WRDCT,SWRDCT
 2876  015674  012706  000476                  MOV     #STKPTR-2,SP
 2877  015700  000205                          RTS     R5
 2878
 2879  015702  000000                  MEMSIZ: 0
 2880
 2881                                  ;BACKGROUND TEST FOR INTERRUPTS
 2882
 2883  015704  010667  000114          NPR:    MOV     SP,BCKFLG       ;SET BACKGROUND FLAG
 2884  015710  012767  030000  000102          MOV     #30000,NPRCNT   ;SETUP TIMEOUT COUNTER
 2885  015716  012701  016023                  MOV     #NPR1+1,R1
 2886  015722  112711  000200                  MOVB    #200,(R1)
 2887  015726                          2$:
 2888  015726  105421                          NEGB    (R1)+
 2889  015730  105441                          NEGB    -(R1)
 2890  015732  105421                          NEGB    (R1)+
 2891  015734  105441                          NEGB    -(R1)
 2892  015736  105421                          NEGB    (R1)+
 2893  015740  105441                          NEGB    -(R1)
 2894  015742  105421                          NEGB    (R1)+
 2895  015744  105441                          NEGB    -(R1)
 2896  015746  105421                          NEGB    (R1)+
 2897  015750  105441                          NEGB    -(R1)
 2898  015752  105421                          NEGB    (R1)+
 2899  015754  105441                          NEGB    -(R1)
 2900  015756  105421                          NEGB    (R1)+
 2901  015760  105441                          NEGB    -(R1)
 2902  015762  105421                          NEGB    (R1)+
 2903  015764  105441                          NEGB    -(R1)
 2904  015766  102401                          BVS     1$
 2905  015770  000000                          HALT                    ;ARITHMETIC OPERATION FAILED RUN DIAG
 2906  015772  005367  000022          1$:     DEC     NPRCNT
 2907  015776  001353                          BNE     2$
 2908  016000  104400                          HLT                     ;OPERATION TIMED OUT WAITING FOR INTERRUPT
 2909  016002  004567  163256                  JSR     R5,PRINT$       ;PRINT MESSAGE
 2910  016006  016562                          TIMO
 2911  016010  000000                          HALT
 2912
 2913  016012  005067  000006          NPRRET: CLR     BCKFLG
 2914  016016  000207                          RTS     PC
 2915  016020  000000                  NPRCNT: 0
 2916  016022  000000                  NPR1:   0
 2917  016024  000000                  BCKFLG: 0
 2918
 2919
 2920
```

```
                                        ;ERROR MESSAGE HEADERS

                                                .EVEN
016026  005015  047105  020104  MES1:   .ASCIZ  <15><12>/END OF PASS /
016034  043117  050040  051501
016042  020123     000
016046     015  051012  042520  MES1A:  .ASCIZ  <15><12>/RPER= /
016052  036522  000040

016056  005015  050122  051503  MES2:   .ASCIZ  <15><12>/RPCS= /
016064  020075     000

016067     015  051012  042120  MES2A:  .ASCIZ  <15><12>/RPDS= /
016074  036523  000040
016100  005015  047527  042122  MES3:   .ASCIZ  <15><12>/WORD COUNT ISSUED = /
016106  041440  052517  052116
016114  044440  051523  042525
016122  020104  020075     000

016127     015  046412  046505  MES4:   .ASCIZ  <15><12>/MEMORY ADDRESS= /
016134  051117  020131  042101
016142  051104  051505  036523
016150  000040

016152  005015  040527  052111  MES5:   .ASCIZ  <15><12>/WAIT 5 SECONDS AND TURN OFF PDP-11 POWER/
016160  032440  051440  041505
016166  047117  051504  040440
016174  042116  052040  051125
016202  020116  043117  020106
016210  042120  026520  030461
016216  050040  053517  051105
016224     000

016225     015  052012  051505  MES6:   .ASCIZ  <15><12>/TEST NO /
016232  020124  047516  000040

016240  005015  047524  040524  MES7:   .ASCIZ  <15><12>/TOTAL REREADS ON ERROR= /
016246  020114  042522  042522
016254  042101  020123  047117
016262  042440  051122  051117
016270  020075     000

016273     015  051412  040524  MES8:   .ASCIZ  <15><12>/STATUS ERROR/
016300  052524  020123  051105
016306  047522  000122

016312  005015  047527  042122  MES9:   .ASCIZ  <15><12>/WORD COUNT INTO SECTOR= /
016320  041440  052517  052116
016326  044440  052116  020117
016334  042523  052103  051117
016342  020075     000

016345     015  050012  052101  MES10:  .ASCIZ  <15><12>/PATTERN IN USE= /
016352  042524  047122  044440
```

```
2977  016360  020116  051525  036505
2978  016366  000040
2979
2980  016370  005015  047125  052111  MES11:  .ASCIZ  <15><12>/UNIT NO. /
2981  016376  047040  027117  000040
2982
2983  016404  054503  000114          MES12:  .ASCIZ  /CYL/
2984
2985  016410  005015  042522  042101  MES13:  .ASCIZ  <15><12>/READ NO. /
2986  016416  047040  027117  000040
2987
2988  016424  005015  054503  044514  MES14:  .ASCIZ  <15><12>/CYLINDER= /
2989  016432  042116  051105  020075
2990  016440     000
2991
2992  016441     015  044012  040505  MES15:  .ASCIZ  <15><12>/HEAD= /
2993  016446  036504  000040
2994
2995  016452  005015  042523  052103  MES16:  .ASCIZ  <15><12>/SECTOR= /
2996  016460  051117  020075     000
2997
2998  016465     015  041412  046517  MES17:  .ASCIZ  <15><12>/COMPARE ERROR/
2999  016472  040520  042522  042440
3000  016500  051122  051117     000
3001
3002  016505     015  042412  050130  MES18:  .ASCIZ  <15><12>/EXPECTED /
3003  016512  041505  042524  020104
3004  016520     000
3005
3006  016521     015  051012  041505  MES19:  .ASCIZ  <15><12>/RECEIVED /
3007  016526  044505  042526  020104
3008  016534     000
3009  016535     015  047012  020117  MES20:  .ASCIZ  <15><12>/NO UNITS AVAILABLE/
3010  016542  047125  052111  020123
3011  016550  053101  044501  040514
3012  016556  046102  000105
3013
3014  016562  005015  051120  041517  TIMO:   .ASCIZ <15><12>/PROCESSOR BACKGROUND TEST TIMED OUT/
3015  016570  051505  047523  020122
3016  016576  040502  045503  051107
3017  016604  052517  042116  052040
3018  016612  051505  020124  044524
3019  016620  042515  020104  052517
3020  016626  000124
3021
3022                          ;CONVERSATION TEXT
3023                          :
3024                          :
3025  016630  005015  052123  047101  SPECMES:       .ASCIZ  <15><12>/STANDARD WORDS TRANSFERRED=
3026  016636  040504  042122  053440
3027  016644  051117  051504  052040
3028  016652  040522  051516  042506
3029  016660  051122  042105  020075
3030  016666     000
3031
3032  016667     015  042012  052101  CON1:   .ASCIZ  <15><12>/DATA TEST ONLY? (Y OR N)
```

```
 3033  016674  020101  042524  052123
 3034  016702  047440  046116  037531
 3035  016710  024040  020131  051060
 3036  016716  047040  000051
 3037
 3038  016722  005015  052515  052114  CON2:   .ASCIZ  <15><12>/MULTI DRIVE MODE?(Y OR N)/
 3039  016730  020111  051104  053111
 3040  016736  020105  047515  042504
 3041  016744  024077  020131  051117
 3042  016752  047040  000051
 3043
 3044  016756  005015  052516  041115  CON3:   .ASCIZ  <15><12>/NUMBER OF DRIVES 1 TO 10 OCTAL?/
 3045  016764  051105  047440  020106
 3046  016772  051104  053111  051505
 3047  017000  030440  052040  020117
 3048  017006  030061  047440  052103
 3049  017014  046101  000077
 3050
 3051  017020  005015  044127  041511  CON4:   .ASCIZ  <15><12>/WHICH DRIVE?/
 3052  017026  020110  051104  053111
 3053  017034  037505     000
 3054
 3055  017037     015  047412  052120  CON5:   .ASCIZ  <15><12>/OPTIONAL WORD COUNT? (Y OR N)/
 3056  017044  047511  040516  020114
 3057  017052  047527  042122  041440
 3058  017060  052517  052116  020077
 3059  017066  054450  047440  020122
 3060  017074  024516     000
 3061
 3062  017077     015  046012  047105  CON6:   .ASCIZ  <15><12>/LENGTH? (1 TO SWRDCT)/
 3063  017104  052107  037510  024040
 3064  017112  020061  047524  051440
 3065  017120  051127  041504  024524
 3066  017126     000
 3067
 3068  017127     015  051412  040524  CON7:   .ASCIZ  <15><12>/STARTING HEAD?/
 3069  017134  052122  047111  020107
 3070  017142  042510  042101  000077
 3071
 3072  017150  005015  047504  054440  CON7A:  .ASCIZ  <15><12>/DO YOU WISH TO SELECT THE DISK TEST ADDR?(Y OR N)/
 3073  017156  052517  053440  051511
 3074  017164  020110  047524  051440
 3075  017172  046105  041505  020124
 3076  017200  044124  020105  044504
 3077  017206  045523  052040  051505
 3078  017214  020124  042101  051104
 3079  017222  024077  020131  051117
 3080  017230  047040  000051
 3081
 3082  017234  005015  052123  051101  CON7B:  .ASCIZ  <15><12>/STARTING SECTOR?/
 3083  017242  044524  043516  051440
 3084  017250  041505  047524  037522
 3085  017256     000
 3086
 3087  017257     015  051412  040524  CON7C:  .ASCIZ  <15><12>/STARTING CYLINDER?/
 3088  017264  052122  047111  020107
```

```
 3089  017272  054503  044514  042116
 3090  017300  051105  000077
 3091
 3092  017304  005015  050117  044524  CON8:   .ASCIZ  <15><12>/OPTIONAL DATA PATTERN NO.?/
 3093  017312  047117  046101  042040
 3094  017320  052101  020101  040520
 3095  017326  052124  051105  020116
 3096  017334  047516  037456     000
 3097
 3098  017341     015  053412  044522  CON9:   .ASCIZ  <15><12>/WRITE?(Y OR N)/
 3099  017346  042524  024077  020131
 3100  017354  051117  047040  000051
 3101
 3102  017362  005015  051127  052111  CON10:  .ASCIZ  <15><12>/WRITE CHECK?(Y OR N)/
 3103  017370  020105  044103  041505
 3104  017376  037513  054450  047440
 3105  017404  020122  024516     000
 3106
 3107  017411     015  051012  040505  CON11:  .ASCIZ  <15><12>/READ?(Y OR N)/
 3108  017416  037504  054450  047440
 3109  017424  020122  024516     000
 3110
 3111  017431     015  042412  042116  END:    .ASCIZ  <15><12>/END/
 3112  017436     000
 3113          017440                          .EVEN
```

```
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;DISK I/O REGISTERS
017440  176714                          RPCS:   176714                  ;DISK CONTROL REGISTER
017442  176715                          RPCS1:  176715                  ;UPPER BYTE OF CONTROL REGISTER
017444  176716                          RPWC:   176716                  ;WORD COUNT REGISTER
017446  176720                          RPBA:   176720                  ;CURRENT ADDR REGISTER
017450  176722                          RPCA:   176722                  ;CYLINDER ADDR REGISTER
017452  176724                          RPDA:   176724                  ;DISK ADDR REGISTER
017454  176725                          RPDA1:  176725          ;TRACK ADDRESS
017456  176712                          RPER:   176712                  ;ERROR REGISTER
017460  176710                          RPDS:   176710                  ;DEVICE STATUS REGISTER
017462  176723                          RPCA1:  176723


                                        ;DEDICATED REGISTERS

017464  000000                          FLAG:   0                       ;INTERNAL PROGRAM FLAG WORD
017466  000000                          SCYL:   0                       ;OPERATOR SELECTED CYLINDER
017470  000000                          SHED:   0                       ;OPERATOR SELECTED HEAD
017472  000000                          SSEC:   0                       ;OPERATOR SELECTED SECTOR
017474  000000                          WRDCT:  0                       ;WORKING WORD COUNT
017476  000000                          CYLINDER:       0               ;WORKING CYLINDER ADDR
017500  000000                          DMA:    0                       ;WORKING DISK ADDR
017502  000000                          SWITCH: 0
017504  000000                          PATNU:  0                       ;DATA PATTERN INDEX
017506  000000                          BUF:    0                       ;WORKING DATA BUFFER
017510  000000                          SWRDCT: 0                       ;STANDARD WORD COUNT
017512  000000                          SAVE:   0
017514  000000                          SAV1:   0
017516  000000                          PASS:   0
017520  000000                          DSKNOR: 0               ;MAXIMUM UNIT NUMBER
017522  000000                          BLOCK:  0
017524  000000                          PASSC:  0
017526  000000                          INBUF:  0                       ;CONTAINS START OF INPUT BUFFER
017530  000000                          RDERR:  0               ;READ RETRY COUNTER
017532  000000                          ACNVX:  0
017534  000000                          INTERR: 0
017536  000000                          TESTNO: 0
017540  000000                          ERCOUNT:        0
017542  000000                          WORK:   0
017544  000000                          WORK1:  0
017546  000000                          WORK2:  0
017550  000000                          WORK3:  0
017552  000000                          WORK4:  0
017554  000000                          CYLA:   0


017556  000000                          CUTBUF:0

        000001                                  .END
```

```
ACNVX   017532          1204* 1205* 1206* 1207* 1208. 2808* 2809* 2812  2814* 2817  2821* 2822* 2823
                        3153*
ADAM    015054          2760  2768* 2830  2832
ADERC   005240          1469  1481*
ADERC1  005256          1482  1484*
ADERR   005250          1473  1483*
ADHGT   005164          1461  1464  1466*
ADHGT1  005170          1467* 1480
ADTER1  005300          1465  1478  1487  1490*
ADTST   003354          1044  1179* 2262
ADT1    003632          1218  1221  1240*
ADT2    004312          1222  1320  1340*
ADT3    005370          1223  1503  1513*
ADT32   005610          1550* 1572  1579  1584
ASKWC   002666          1078  1090*
ATTN    014106          1286  2591* 2593* 2597*
ATTNB   014110          2593  2598*
BCKFLG  016024          2442  2883* 2913* 2917*
BELL    001250           825   846*
BLAD1   015022          2761*
BLOCK   017522          2474  2480* 2573* 2575  2577  2578* 2579  2581* 2778* 2783* 2788  2790* 3149*
BLSZ    013776          2473  2573*
BUF     017506          1372* 1523* 1550* 1610* 1756* 1846* 1889* 1927* 2036* 2169* 2289* 2369  3143*
BUFEXI  013414          2472  2493  2503*
BUFINX  013446          2502  2509*
B0    = 000001           704* 2403  2682  2843  2870
B1    = 000002           703* 1784  2391  2666  2685
B10   = 002000           694* 1056  1217  1265  1319  1502  1585  1813  2002  2133  2228  2435
B11   = 004000           693*  822  1062  1192  1200  1300  1434  1491  1537  1565  2240
B12   = 010000           692* 1167  2042  2056  2065  2074  2172  2181  2192
B13   = 020000           691*  826   852   870   873  1174  2051
B14   = 040000           690*  786  1160  1463  1722  1869  1898  2037  2199
B15   = 100000           689*  839  1150  1313  1578  1679  1788  1902  2298
B2    = 000004           702* 1894
B3    = 000010           701* 1210  1654
B4    = 000020           700* 1937  1950  2388  2775
B5    = 000040           699* 1115  1972  1992  2122  2456  2470  2829
B6    = 000100           698*
B7    = 000200           697*
B8    = 000400           696* 1041
B9    = 001000           695* 2072  2197  2432
C     = 000001           654*
CHKMOD  003344        1173  1175*
CMDAE   013406        2481  2501*
CMPLP   014730        2735  2746* 2765
CMPLP1  014772        2737  2755*
CMPLP2  014674        2738* 2766
COMPAR  014612        2095  2201  2728*
CON1    016667        1052  3032*
CON10   017362        1170  3102*
CON11   017411        1163  3107*
CON2    016722        1058  3038*
CON3    016756        1065  3044*
CON4    017020        1081  3051*
CON5    017037        1092  3055*
CON6    017077        1098  3062*
```

```
CON7    017127          1126    3068#
CON7A   017150          1111    3072#
CON7B   017234          1134    3082#
CON7C   017257          1118    3087#
CON8    017304          1143    3092#
CON9    017341          1156    3098#
CYLA    017554          1273*   1274*   1275*   1276*   1358*   1359*   1360*   1361*   3162#
CYLIND  017476          1038*   1248*   1253    1290    1292    1312*   1315*   1374*   1377    1423    1468    1481    1521*
                        1524    1533    1535*   1546*   1559    1561    1577*   1582*   1606*   1754*   1[illegible]*   1794*   1848*
                        2029*   2160*   2239*   2286*   2368    2459*   2491*   2492    2504*   2511    2[illegible]    3139#
DATAT   010332          1219    1226    2003    2020#
DATP    010434          2035#   2124
DATTES  002620          1061    1079#   1085
DECBLK  013314          2480#   2489    2494
DECCY   013000          2410    2414#
DECTK   012754          2406    2409#
DELMES  012700          2392    2399#
DISBUF  013240          1443    1500    2049    2063    2120    2470#
DISPLA= 177570           683#
DKINT   012602          2033    2381#   2565
DKI1    013112          2389    2432#
DMA     017500          1039*   1373*   1379    1382    1384*   1386*   1410    1472    1477    1479*   1483    1490*   1520*
                        1607*   1753*   1772*   1773*   1793*   1847*   2030*   2168*   2238*   2287*   2367    2460*   2461*
                        2475    2479*   2483*   2484    2488*   2490*   2503*   2510    2786    3140#
DREAD   010606          2052    2065#
DSKDR   002526          1063#   1069    1072
DSKNOR  017520          1037*   1073*   1074*   1076*   1077*   1181*   1183    1186*   1188*   1190*   1191*   1193    2244
                        3148#
DSKNOS  013650          1247    1345    1519    1605    2279    2366    2546#
DSKRD   010626          2069#   2104    2110
EMTVEC= 000030           673#
END     017431          2346    3111#
EOPTST  006700          1753#   1811
ERCOUN  017540          2728*   2831*   3156#
ERRFLG  001240           788     790*    839*    842#
ERROR   001112           819#   2561
ERRORS  001246           840*    845#
ERRPC   001252           829     847#
ERRVEC= 000004           668#
ESH     010616          2067#   2118    2121
EXGEN   014350          2654    2659#
EXMFLG  003546          1201    1210#
EXP$    014552          1292*   1406*   1410*   1411    1413*   1416*   1417    1423*   1426*   1427    1429*   1430    1481*
                        1483*   1561*   1727*   1739*   1806*   1880*   1956*   1988*   2326*   2337*   2692    2699#   2740*
                        2744*   2749*   2753*   2756*   2757
EXREF   015522          2850#   2855
EXTDR   013646          2508    2515    2541#
EXTEND  010260          1999#   2010
EXTMEN  015456          1034    2843#
EXTPP   012070          2249    2256    2262#
EXTRP   010306          1916    1998    2006#
EXTTRP  010312          1911    2007#
EXTTST  007620          1911#
EXTTI   010100          1961#
FILDAT  014152          2616#   2618
FLAG    017464          1036*   1043*   1056*   1062*   1089*   1115*   1150*   1154*   1160*   1167*   1174*   1175    1192*
```

```
MES14   016424           2418    2805    2988*
MES15   016441           2424    2811    2992*
MES16   016452           2429    2816    2995*
MES17   016465           2688    2998*
MES18   016505           2691    3002*
MES19   016521           2695    3006*
MES2    016056           2679    2931*
MES2A   016067           2671    2934*
MES20   016535           1196    3009*
MES3    016100           2936*
MES4    016127           2341    2941*
MES5    016152           2304    2946*
MES6    016225           1242    1342    1515    1601    1829    2022    2142    2955*
MES7    016240           2114    2218    2958*
MES8    016273           2669    2965*
MES9    016312           2820    2969*
MEXIT   012060            769    1199    2258*
MSG     014362            835    2666*
MSTR    011076           2066    2122*
MULCHK  011740           2127    2229    2238*
N     = 000010            657*
NONEX   007516           1888*   1905
NPR     015704           2044    2058    2076    2174    2183    2194    2883*
NPRCNT  016020           2884*   2906*   2915*
NPRRET  015012           2444    2913*
NPR1    016022           2885    2916*
NUM$    002334            975*    983*    989*    995*   1000*   1008*   1024*   1068    1070    1071    1073    1084    1087*
                         1088*   1089    1101    1105    1107    1121    1123    1129    1131    1137    1139    1146    1148
                         1151
OPDAR   003022           1116*   1122
OPDA1   003056           1124*   1130
OPDA2   003112           1132*   1138
OPDSEL  013202           2039    2053    2068    2456*
OPPAT   003146           1114    1141*   1147
OPRD    003264           1159    1161*
OPWCK   003314           1166    1168*
OPWRT   003226           1149    1154*   1176
OUTBUF  017556           1372    1375    1451    1466    1523    1524*   1610    1613*   1634    1640*   1646*   1691    1725
                         1728    1731    1756    1758*   1776*   1803    1835    1840    1841    1846    1858    1872    2036
                         2082    2151    2169    2282    2289    2331    2611    2730    2866    2871    3165*
PACK$   002062            973*   1067    1083    1100    1120    1128    1136    1145
PAC$    002302            982     984     990     996    1001    1015*
PASEL   014120           2035    2609*
PASS    017516           3147*
PASSC   017524           1832*   1999*   2147*   2224*   3150*
PATFIL  006432           1680    1691*   1743
PATNU   017504           1040*   1151*   1153*   2025    2128*   2129    2132*   2146*   2227*   2609    2734    2736    2755
                         2762    2764    3142*
PATT32  014166           2615    2620*   2625
PAT0    014556           2616    2707*   2756
PAT1    014560           2708*
PAT10   014576           2715*
PAT11   014600           2716*
PAT12   014602           2717*
PAT13   014604           2718*
PAT14   014606           2719*
```

```
PAT15   014610          2720#
PAT2    014562          2709#
PAT3    014564          2710#
PAT4    014566          2711#
PAT5    014570          2712#
PAT6    014572          2713#
PAT7    014574          2714#
PC    =%000007           651#   774#   803#   814#   834#   835#   872#   875#   908#   912#   936#   937#   964#
                         974#   982#   984#   990#   996#  1001#  1012#  1013#  1021#  1033#  1050#  1053#  1059#
                        1066#  1067#  1082#  1083#  1093#  1099#  1100#  1112#  1119#  1120#  1127#  1128#  1135#
                        1136#  1144#  1145#  1157#  1164#  1171#  1209#  1244#  1285#  1344#  1443#  1500#  1517#
                        1518#  1603#  1604#  1635#  1660#  1831#  1833#  2024#  2035#  2039#  2044#  2049#  2053#
                        2058#  2063#  2068#  2076#  2095#  2116#  2120#  2144#  2145#  2152#  2154#  2174#  2183#
                        2194#  2201#  2220#  2254#  2258#  2343#  2396#  2420#  2426#  2431#  2458#  2462#  2473#
                        2541#  2568#  2582#  2594#  2619#  2626#  2659#  2673#  2677#  2681#  2684#  2693#  2697#
                        2698#  2748#  2768#  2807#  2813#  2818#  2824#  2828#  2914#
PFD     012470          2277   2351#  2352
PFTST   012074          1228   2276#  2301
PFTI    012276          2314#  2323   2359
PFU     012500          2351   2356#
PFVEC = 000024           672#
PKEX$   002270          1010#  1016
PKEX1$  002274          1009   1011#
PK$     002332           983    986#   987#   988#   989    992#   993#   994#   995    997#   999#  1000   1002#
                        1004#  1005#  1006#  1007#  1008   1017#  1018#  1020#  1023#
PRINTA  001370           871    876#
PRINTB  001400           874    878#  1050   1209
PRINTR  001344           834    870#  1635   1660   2343   2673   2677   2681   2693   2697
PRINTS  001356           873#  1244   1344   1517   1603   1831   2024   2116   2144   2220   2254   2396   2420
                        2426   2431   2807   2813   2818   2824   2828
PRINT$  001264           828    852#   905    952    961   1195   1241   1341   1488   1514   1600   1632   1657
                        1828   2021   2113   2141   2217   2251   2303   2340   2345   2393   2417   2423   2428
                        2668   2670   2674   2678   2687   2690   2694   2804   2810   2815   2819   2825   2909
PRI1  = 000040           665#
PRI2  = 000100           664#
PRI3  = 000140           663#
PRI4  = 000200           662#  1251   2031   2148
PRI5  = 000240           661#
PRI6  = 000300           660#
PRI7  = 000340           659#  1912   2278   2562   2564   2566   2567   2846   2848
PRNTF$  001302           824    853    856#  1047   1051   1057   1064   1080   1091   1097   1110   1117   1125
                        1133   1142   1155   1162   1169   1202
PSW   = 177776           677#  1251*  2031*  2148*  2567*  2846*
RADT1   003656          1245#  1321
RADT2   004340          1345#  1504
RADT3   005416          1518#  1587
RANDOM  014212          2152   2613   2628#
RAND$   001564           911#  2154   2748
RANEX   011166          1227   2134   2140#
RANLOP  011402          2169#  2177
RDATAT  010360          2025#  2131   2135
RDERR   017530          2067#  2100#  2101   2103   2111   2115   2117#  2188#  2204#  2205   2207   2215   2219
                        2221#  2386   2395   2773   2827   3152#
RDSECT  005110          1451#  1498   1501
READL$  002060           962    968#
READM$  002054           953    967#
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READ$   001704   941* 1053 1059 1066 1082 1093 1099 1112 1119 1127 1135 1144 1157
                 1164 1171
REC$    014554   1293* 1294* 1402* 1403* 1404 1409* 1417 1421* 1422* 1430 1484* 1562* 1728*
                 1738* 1803* 1804 1881* 1957* 1989* 2327* 2328* 2338* 2696 2700* 2771*
REDAC   013012   2404 2408 2413 2416*
REPOEN  012024   2241 2247 2250*
REST$   001064   807* 936 1012
RESVEC= 000010   669*
RMEMT   007254   1833* 2001 2004
RORBLK  014042   2576 2580*
RPBA    017446   2369* 3123*
RPCA    017450   1253* 1422 2280* 2368* 2400 3124*
RPCA1   017462   1290 1294 2324 2328 3129*
RPCS    017440   1182* 1254* 1259 1297 1302* 1303 1346* 1350 1366 1391 1397 1436* 1437
                 1446* 1447 1458 1460 1463 1493* 1494 1527 1529 1539* 1540 1553 1555
                 1567* 1568 1619 1621 1627 1629 1652 1662 1699 1701 1708 1710 1717
                 1719 1722 1764 1766 1782 1788 1797 1799 1851 1853 1964 1866 1869
                 1892 1898 1902 1931 1933 1937 1944 1946 1950 1966 1968 1972 1980
                 1982 1992 2096 2105* 2106 2199 2209* 2210 2281* 2290 2296 2298 2307
                 2314* 2321* 2374* 2382 2391 2437* 2438 2552* 2680 2843* 2844 3120*
RPCS1   017442   1183* 3121*
RPDA    017452   1402 2367* 2401 3125*
RPDA1   017454   1409 3126*
RPDS    017460   1184 1252* 1265 1271 1286 1300 1305 1356 1434 1439 1449 1491 1496
                 1537 1542 1565 1570 2108 2212 2292 2322 2432 2435 2440 2553 2672
                 3128*
RPER    017456   1654 1784 1894 2403 2676 3127*
RPWC    017444   2370* 2371* 3122*
RRANEX  011214   2145* 2230
RW    = 000006   717* 1920 1921 1922
RWRCK   006052   1604* 1815
R0    =%000000   644* 802 808* 913* 917* 926* 932* 934 976* 977 979* 981* 1015
                 1018 1019* 1212* 1213* 1215* 1216 1256* 1257* 1269* 1270* 1277 1347* 1348*
                 1354* 1355* 1362 1375* 1377* 1379* 1389* 1390* 1393 1451* 1453* 1466* 1608*
                 1637 1668 1674* 1692* 1694 1731* 1733 1738 1834* 1835* 1837* 1838* 1939
                 1857* 1860* 2025* 2027* 2028 2080* 2093* 2282* 2283* 2284 2331* 2332 2334
                 2338 2342 2609* 2612 2614 2630* 2634* 2643* 2649* 2651 2652 2755* 2756
R1    =%000001   645* 801 809* 914* 918* 923* 924* 927* 929* 933* 935 1197* 1376*
                 1378* 1380* 1452* 1454* 1467* 1471* 1475* 1486 1609* 1613 1659 1671* 1675*
                 1678* 1679* 1691* 1694* 1732* 1735* 1757* 1758* 1759 1760 1775* 1776* 1777
                 1778 1858* 1859* 2082* 2083* 2084* 2085* 2086* 2087* 2088* 2089* 2090* 2091*
                 2092* 2151* 2255* 2258 2588* 2589* 2590* 2592* 2593 2611* 2885* 2886* 2889*
                 2889* 2890* 2891* 2892* 2893* 2894* 2895* 2896* 2897* 2898* 2899* 2900* 2901*
                 2902* 2903*
R2    =%000002   646* 800 810* 916* 919* 922* 925* 928* 930* 931* 932 1612* 1613*
                 1614 1615 1639* 1640* 1641 1642 1645* 1646* 1647 1648 1693* 1695* 1774*
                 1776 1840* 1842* 1844 1872* 1873 1874 1877 1881 1924* 1925* 1941* 1954
                 1957 1962* 1963* 1977* 1986 1989 2081* 2093 2633* 2636* 2639* 2642* 2645*
                 2647* 2648* 2649
R3    =%000003   647* 799 811* 915* 920* 941 942* 943 963* 1841* 1842 1843 1873*
                 1874 1876 1880 2632* 2637*
R4    =%000004   648* 798 812* 880 881* 882* 884* 901 907* 2631* 2635* 2640* 2641*
                 2644* 2646* 2650* 2655 2656
R5    =%000005   649* 797 813* 824* 828* 854* 855* 858 860* 861 863* 864* 865
                 905* 952* 961* 1034* 1047* 1051* 1057* 1064* 1080* 1091* 1097* 1110* 1117*
                 1125* 1133* 1142* 1155* 1162* 1169* 1195* 1202* 1241* 1247* 1341* 1345* 1387*
```

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                        2779*   2780*   2781*   2785*   2821    3157#
WORK1   017544          2156*   2161*   2162    2164*   2165    2167*   2168    2474*   2514*   2786*   2791    2793*   2795*
                        2796    2798*   2800*   2809    2914    3158#
WORK2   017546          1249*   1263    1311*   1312    1317    1547*   1577    1580*   1583    2509*   2513*   2530    2729*
                        2759*   2780    3159#
WORK3   017550          1250*   1309    1313*   1316*   1548*   1576*   1582    2511*   2526    2528*   2787*   2801*   2806
                        3160#
WORK4   017552          1549*   1574    1578*   1581*   3161#
WRCK    006024          1224    1586    1599#
WRCYL   005452          1524#   1536    1544
WRDCMP  015004          2742    2745    2751    2754    2757#   2763    2767    2770
WRDCT   017474          1108*   1371*   1445*   1522*   1611*   1705*   1714*   1755*   1770*   1792*   1839*   1857    1888*
                        1926*   2032*   2080    2149*   2150    2288*   2370    2507*   2530*   2532*   2533*   2534*   2535*
                        2536*   2537*   2538*   2539*   2574    2610    2729    2779    2869*   2874*   2875    3138#
WRDINC  015014          2759#   2833
WRICK   010526          2038    2051#
WRLG    011242          2149*   2226
XINCSE  013474          2513*   2519    2524    2529
XINCSU  013524          2517    2520*
Z       = 000004         656#
.       = 017560         768*    770*    773*    775*    849*    857     867     877     894     897     902     909*    946
                         957     966*   1055    1304    1306    1438    1440    1448    1450    1459    1495    1497    1528
                        1541    1543    1554    1569    1571    1620    1628    1653    1700    1709    1718    1765    1783
                        1798    1852    1865    1893    1932    1945    1967    1981    2097    2107    2109    2211    2213
                        2291    2293    2297    2308    2433    2439    2441    2457    2471    2845    3113#
.PR     001536          876*    878*    879*    881     885     895*    896     899*    901     906     909*
.PRF    001452          883     886     891#
.PRL    001424          884*    900
.PTIT   001412          880*
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CROSS REFERENCE TABLE -- MACRO NAMES

DZRPFB.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

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        2090  2091  2092  2117  2132  2188  2189  2221  2227  2239  2239  2287  2326  2327  2357
        2391  2399  2421  2490  2503  2504  2509  2525  2591  2623  2633  2731  2743  2744  2752
        2778  2800  2808  2861  2913
CLRB     892   884   904   960  1386  1490  2520  2795
CMP      901   943  1071  1084  1105  1121  1129  1137  1146  1148  1317  1427  1430  1468  1472
        1486  1533  1559  1615  1642  1648  1725  1760  1778  1844  1874  1877  1954  1986  2101
        2103  2129  2158  2205  2207  2244  2284  2332  2334  2477  2492  2526  2612  2614  2734
        2736  2757  2762  2764  2851
CMPB     949   958  1054  1060  1094  1113  1158  1165  1172  1290  1382  1411  1417  1477  2162
        2165  2486  2516  2521  2791  2796
DEC      981  1019  1188  1257  1274  1276  1348  1359  1361  1378  1380  1454  1471  1475  1580
        1695  1735  1860  2407  2415  2480  2514  2617  2621  2624  2637  2653  2657  2759  2790
        2906
DECB    2411
EMT      724
HALT     768   821   838  2347  2434  2905  2911
INC      840   920   979  1104  1186  1270  1273  1275  1311  1355  1358  1360  1384  1390  1416
        1426  1479  1535  1576  1999  2100  2204  2224  2250  2479  2491  2513  2518  2528  2578
        2783  2793  2801  2822  2831
INCB     895   899  2488  2523  2798
JMP     1044  1199  1216  1219  1321  1504  1587  1673  1676  1681  1815  2001  2004  2124  2127
        2131  2135  2226  2230  2262  2384  2833
JSR      824   828   834   835   905   912   936   952   961   974   982   984   990   996  1001
        1012  1033  1034  1047  1050  1051  1053  1057  1059  1064  1066  1067  1080  1082  1083
        1091  1093  1097  1099  1100  1110  1112  1117  1119  1120  1125  1127  1128  1133  1135
        1136  1142  1144  1145  1155  1157  1162  1164  1169  1171  1195  1202  1209  1241  1244
        1247  1285  1341  1344  1345  1387  1443  1456  1488  1500  1514  1517  1518  1519  1525
        1551  1600  1603  1604  1605  1617  1625  1632  1635  1650  1657  1660  1697  1706  1715
        1762  1780  1795  1828  1831  1833  1849  1862  1890  1928  1942  1964  1978  2021  2024
        2035  2039  2040  2044  2049  2053  2054  2058  2063  2068  2070  2076  2095  2113  2116
        2120  2141  2144  2145  2152  2154  2170  2174  2179  2183  2190  2194  2201  2217  2220
        2251  2254  2258  2279  2294  2303  2305  2340  2343  2345  2366  2393  2396  2417  2420
        2423  2426  2428  2431  2473  2668  2670  2673  2674  2677  2678  2681  2687  2690  2693
        2694  2697  2748  2804  2807  2810  2813  2815  2818  2819  2924  2825  2828  2909
MOV      774   792   796   797   798   799   800   801   802   903   807   808   809   810   911
         812   813   814   830   833   858   860   863   880   881   907   913   914   915   934
         935   941   942   955   963   983  1032  1049  1073  1103  1107  1108  1123  1131  1139
        1151  1182  1197  1204  1208  1212  1243  1245  1246  1251  1256  1292  1307  1312  1324
        1340  1343  1347  1369  1371  1372  1375  1376  1377  1379  1402  1414  1423  1441  1445
        1451  1452  1466  1467  1481  1483  1484  1498  1513  1516  1522  1523  1524  1544  1547
        1550  1561  1562  1572  1577  1582  1599  1602  1609  1610  1611  1613  1634  1640  1659
        1666  1674  1675  1691  1692  1693  1694  1705  1714  1727  1728  1731  1732  1738  1743
        1755  1756  1770  1772  1774  1776  1792  1803  1811  1827  1830  1832  1834  1839  1840
        1841  1842  1846  1857  1858  1872  1873  1880  1881  1883  1898  1889  1905  1911  1912
        1916  1917  1919  1920  1921  1922  1923  1924  1925  1926  1956  1957  1959  1961  1962
        1963  1988  1989  1996  2007  2008  2020  2023  2025  2028  2031  2032  2033  2034  2036
        2047  2061  2080  2081  2082  2115  2118  2140  2143  2146  2147  2148  2149  2150  2151
        2155  2156  2160  2168  2169  2177  2186  2219  2222  2242  2253  2255  2276  2277  2278
        2282  2283  2286  2288  2289  2301  2314  2315  2321  2331  2337  2338  2342  2351  2356
        2358  2367  2369  2370  2372  2385  2395  2397  2401  2414  2419  2425  2430  2444  2445
        2459  2460  2474  2475  2484  2507  2510  2511  2530  2546  2552  2561  2562  2563  2564
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        2631  2632  2651  2652  2655  2656  2672  2676  2680  2692  2696  2728  2729  2730  2732
        2733  2740  2741  2749  2750  2753  2755  2756  2771  2772  2779  2786  2787  2806  2812
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        2884  2885
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CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

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MOVB     832   865   876   879   903   947  1018  1183  1253  1294  1302  1409  1410  1422  1436
        1493  1539  1567  1771  1773  2105  2209  2280  2328  2368  2374  2400  2422  2427  2437
        2461  2593  2809  2814  2886
NEG     2371
NEGB    2888  2889  2890  2891  2892  2893  2894  2895  2896  2897  2898  2999  2900  2901  2902
        2903
NOP     2259  2260  2261
RESET   1031  2257
ROL      887   889   891   918   919   986   987   989   999  1004  1005  1006  1007  1076  1077
        1087  1088  1153  1190  1191  1215  1671  2532  2533  2534  2535  2536  2537  2538  2539
        2635  2636
ROLB     888   890   892
ROR      993   994  1205  1206  1837  2027  2317  2318  2547  2548  2589  2590  2868
RTI      791   793   841  1325  2446
RTS      855   864   872   875   908   937   964  1013  1021  2375  2458  2462  2541  2556  2568
        2582  2594  2619  2626  2659  2684  2698  2768  2877  2914
SUB      831  1070  1835  2093  2780  2781  2859  2864  2866
SWAB     992   997  1002  2319  2550  2580
TRAP     722
TST      788   819   836  1015  1068  1101  1179  1184  1193  1263  1271  1277  1281  1297  1305
        1309  1356  1362  1366  1393  1397  1404  1424  1439  1449  1460  1470  1474  1496  1529
        1542  1555  1570  1574  1583  1614  1621  1629  1637  1641  1647  1662  1668  1701  1710
        1719  1733  1759  1766  1777  1799  1804  1843  1853  1866  1876  1913  1933  1946  1968
        1982  2098  2108  2111  2125  2202  2212  2215  2292  2322  2382  2386  2440  2442  2553
        2738  2746  2769  2773  2788  2850  2862
TSTB     856   861   866   893   896   945   956   977  1259  1303  1350  1391  1437  1447  1458
        1494  1527  1540  1553  1568  1619  1627  1652  1699  1708  1717  1764  1782  1797  1851
        1884  1892  1931  1944  1966  1980  2096  2106  2210  2290  2296  2307  2324  2438  2501
        2944
WAIT    2046  2060  2078  2176  2185  2196
.ABS     637
.ASCIZ   846   947   967   968  2925  2928  2931  2934  2936  2941  2946  2955  2958  3965  2969
        2975  2980  2983  2985  2988  2992  2995  2998  3002  3006  3009  3014  3025  3032  3038
        3044  3051  3055  3062  3068  3072  3082  3087  3092  3098  3102  3107  3111
.BLKW    909   966
.BYTE   2598
.ENABL  1025
.END    3167
.ENDC    836
.EVEN    849  2601  2704  2924  3113
.IF      835
.LIST    635   768   772  1025
.MACR    720   751   752   753   754   755   756   757   758   759   760   762   763   764   765
        766
.MACRO   761
.NLIST   636   768  1025
.PAGE   1816  2265  2361
.REM      19
.REPT    768  2887
.SBTTL  1232  1328  1505  1589  1816  2011  2136  2265  2361
.TITLE   638  1025
.WORD   1388  1457  1526  1552  1618  1626  1651  1698  1707  1716  1763  1781  1796  1850  1963
        1891  1929  1943  1965  1979  2041  2055  2071  2171  2180  2191  2295  2306
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RP11C RELIABILITY TEST  MACY11 27(732)  16-SEP-76  16:12  PAGE 86
DZRPFB.P11      CROSS REFERENCE TABLE -- PERMANENT SYMBOLS


 ERRORS DETECTED:  0
 DEFAULT GLOBALS GENERATED:  0

 *.DZRPFB.SEQ/SOL/CRF/PAGNUM=DZRPFB
 RUN-TIME: 10 20 4 SECONDS
 RUN-TIME RATIO: 192/36=5.2
 CORE USED:  10K  (19 PAGES)
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