RF11

DATA TEST

MD-11-DZRFB-B

EP-DZRFB-B-DL

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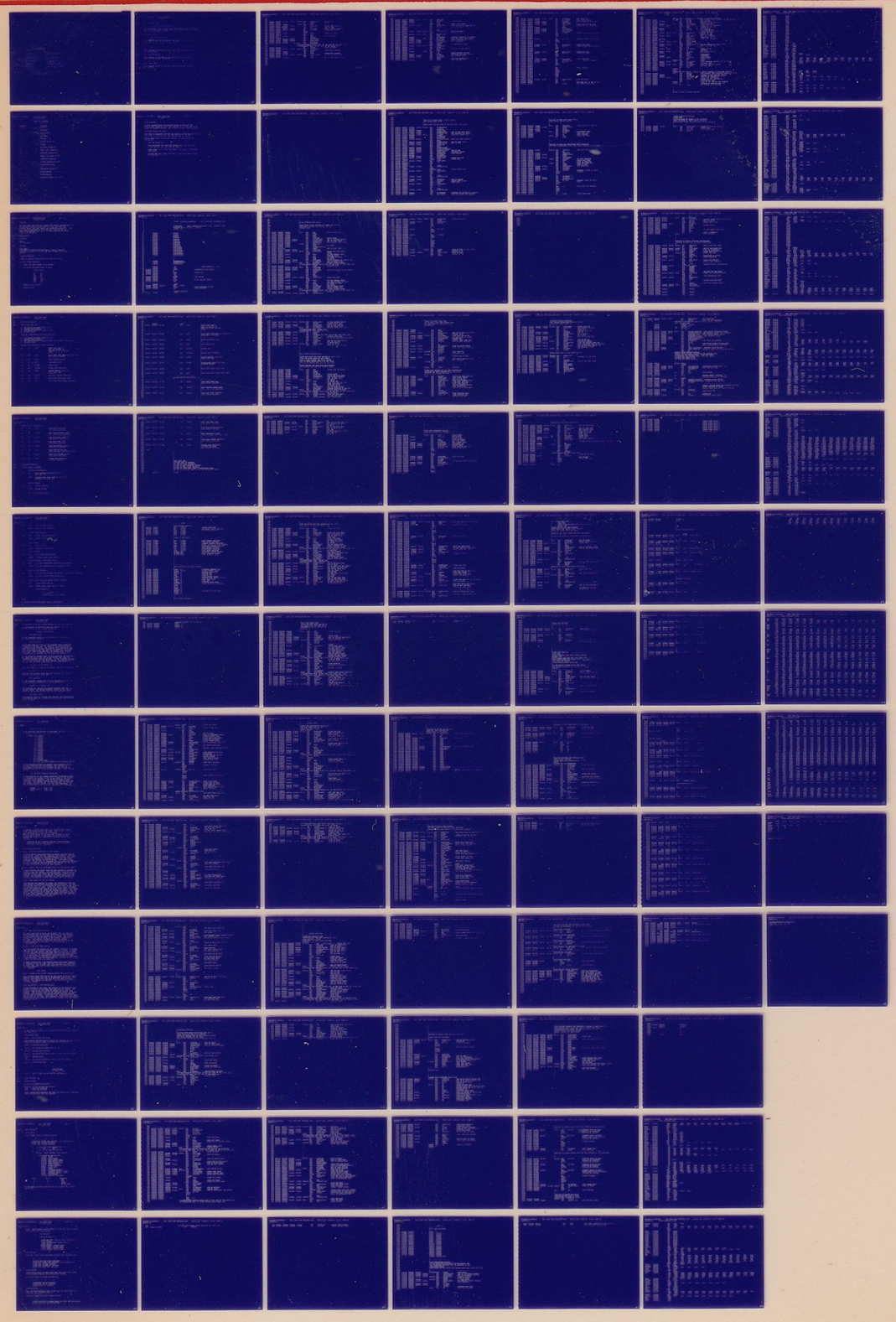
MADE IN USA



IDENTIFICATION

PRODUCT CODE: MAIADEC-11-DZHFH-A-D

PRODUCT NAME: RF11 DATA TEST

DATE CREATED: SEPTEMBER, 1973

MAINTAINED: DIAGNOSTIC GROUP

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1. ABSTRACT

THE RF11 DISK DATA TEST IS A SERIES OF STATIC, ADDRESS AND DATA RELIABILITY ROUTINES WHICH VERIFY TO THE USER THE DISK CONTROL (RF11) AND DISK (RS11) ARE OPERATING CORRECTLY. THIS TEST USED IN CONJUNCTION WITH THE RF11 DISKLESS AND RF11 MULTI DISK ASSURES THE USER OF AN ERROR FREE SYSTEM, WHEN USED IN ITS ENTIRETY.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11
RF11 AND RS11

2.2 STORAGE

DATA TEST
MAIN BODY OF PROGRAM OCCUPIES ALL OF MEMORY (MINIMUM REQUIRES 4K WORDS) THE WRITE AND READ BUFFERS FLOAT THRU MEMORY.

3. LOADING PROCEDURE

3.1 METHOD OF LOADING BOTH STATIC AND DATA TEST TAPES

PROGRAM FORMAT ABSOLUTE

A. VERIFY THE BOOT LOADER IS IN MEMORY.

B. SET SWITCH REGISTER EQUAL TO #500

MEMORY SIZE	#
4K	17
8K	37
12K	57
16K	77
20K	117
24K	137
28K	157

C. DEPRESS LOAD ADDRESS.

D. DEPRESS START.

4. STARTING PROCEDURE

4.1 WORST CASE DISK TEST

A) SET SWITCH REGISTER EQUAL TO 200
B) DEPRESS LOAD ADDRESS
C) SET SWITCH REGISTER EQUAL TO ZERO
D) DEPRESS START

4.2 OPERATOR INTERVENTION FOR DATA TEST ONLY.

A) SET SWITCH REGISTER EQUAL TO 200
B) DEPRESS LOAD ADDRESS
C) SET SWITCH REGISTER EQUAL TO MODE OF OPERATION (REF. SEC5.)
D) DEPRESS START.

4.3 ADDRESS ENTRY POINTS FOR TEST ROUTINES

600	JMP	ADT2	CHECK THAT WHEN A WORD IS WRITTEN IT DOES NOT ALTER ADJACENT WORDS
604	JMP	ADT3	WRITE EACH WORD ADDR ON ITSELF AND READ BACK TO COMPARE
610	JMP	ADT4	TRACK SELECTION TEST
614	JMP	ADT5	LOOK AHEAD TEST
620	JMP	SPIRAL	SPIRAL TEST
624	JMP	XSPIRAL	SPIRAL TEST EXTENSION
630	JMP	RANEX	RANDOM ADDRESS, DATA AND WORD COUNT TEST
634	JMP	EXTMEM	DISK EXT. MEMORY EXERCISER
640	JMP	PFT1	DISK WRITE POWER FAIL TEST
644	JMP	PFT2	DISK WRITE CHECK POWER FAIL TEST

(4.3 CONT'D)

MAINTENANCE ROUTINES

650	JMP	SELWC	LOAD WORD COUNT REG. WITH SWITCH REGISTER
654	JMP	SELCMA	LOAD CURRENT MEMORY ADDR REG. WITH SWITCH REGISTER
660	JMP	SELDAR	LOAD DISK ADDR. REGISTER WITH SWITCH REGISTER
664	JMP	SELDAE	LOAD DISK ADDR. EXT. WITH SWITCH REGISTER
670	JMP	SELDBR	LOAD DATA BUFFER REGISTER WITH SWITCH REGISTER
674	JMP	MOVLK	MOVE CONTENTS OF LOOK AHEAD REGISTER INTO DATA LIGHTS
700	JMP	SELDCS	LOAD DISK CONTROL REGISTER WITH SWITCH REGISTER
704	JMP	STAMP	ENABLE HEAD AMPLIFIERS TO TRACK SELECTED

5. OPERATING PROCEDURE

5.1 CONTROL SWITCH SETTINGS

PROGRAM CONVERSATION *

SW15 SET ENTER PROGRAM CONVERSATION MODE
REF. SEC. 5.2

RESET OPERATE WORSE CASE TEST ON ALL DRIVES
BEGINNING AT DRIVE ZERO

DELETE TYPEOUT

SW14 SET DELETE TYPEOUTS

RESET REPORT MESSAGE

HALT ON COMPLETION FLAG *

(5.1 CONT'D)

```
        SW13    SET     HALT ON FLAG (READY)
                RESET   EXECUTE NEXT OPERATION

                DELETE COMPARISIONS *
        SW12    SET     DELETE DATA COMPARISONS
                RESET   COMPARE DATA BUFFERS

                LOOP ON TEST
        SW11    SET     LOOP ON TEST
                RESET   CONTINUE TO NEXT TEST
                HALT ON ERROR
        SW10    SET     HALT AFTER ERROR REPORT
                RESET   CONTINUE AFTER ERROR REPORT
                ENTER INTERRUPT BACKGROUND TEST *
        SW9     SET     WAIT FOR INTERRUPTS USING WAIT INSTRUCTION
                RESET   WAIT FOR INTERRUPTS WITH BACKGROUND TEST

                LOOP ON DISK ADDRESS *
        SW8     SET     LOOP ON DISK ADDRESS (SPECIFIED BY WORD COUNT AND DAR)
                RESET   CONTINUE TO NEXT DISK BUFFER AREA.

                SELECT TRACK FROM SR (DURING DYNAMIC TESTING)
        SW7     SET     SELECT TRACK FROM SR
                RESET   SELECT TRACK UNDER PROGRAM CONTROL
                        TRACK SELECTION
                6       5       4       3       2       1       0
                                SELECT ONE OF 177(8) TRACKS
```

NOTE:

* SWITCH SETTING APPLICABLE ONLY IN DATA TEST

5.2 CONVERSATION MODE FOR PROGRAM PARAMETERS FOR DATA TEST ONLY

IN THE PROGRAM CONVERSATION MODE THE OPERATOR CAN SPECIFY ANY ONE OR ALL OF THE PROGRAM PARAMETERS.

PROGRAM CONVERSATION

DATA TEST ONLY?

IF THE OPERATOR ANSWER YES THE PROGRAM WILL ENTER ONLY THE DATA PORTION OF TEST.

MULTI DK MODE?

MULTI DISK MODE IS A MODE IN THE PROGRAM WHICH ALLOWS THE OPERATOR TO EXECISE, ALL THE DISKS ON THE SYSTEM WITHOUT RE-STARTING THE PROGRAM. THE PROGRAM AFTER EXERCISING ONE DISK WILL REPORT A MESSAGE TELLING THE OPERATOR WHICH DISK WILL BE SELECTED NEXT, AND THEN THE PROGRAM WILL EXERCISE THAT DISK. WHEN A COMPLETE PASS IS ACCOMPLISHED, A PASS COMPLETE WILL BE REPORTED AND THE TEST WILL RECYCLE.

IF THE OPERATOR ANSWERS "YES" TO THIS QUESTION, HE WILL THEN BE ASKED HOW MANY DISKS ARE ON THE SYSTEM, AND THEN THE PRECEDING QUESTION WILL BE SKIPPED. IF THE OPERATOR ANSWERS "NO" TO THIS QUESTION, THE NEXT QUESTION WILL BE SKIPPED, AND HE WILL THEN BE ASKED WHICH DISK IS TO BE EXERCISED.

OF DKS 1 TO 10 OCTAL? X

TYPE THE NUMBER OF DISKS ON THE SYSTEM, FOR MULTI DISK MODE.

EX. DK? X

WHEN NOT IN THE MULTI DISK MODE THE OPERATOR WILL HAVE TO SPECIFY WHAT DISK IS TO BE USED.

OPT. WRD CNT?

IF THE OPERATOR ANSWERS "NO" TO THIS QUESTION THE NEXT TWO QUESTIONS WILL BE DELETED FROM THE CONVERSATION.

LENGTH (1 TO 1000)? XXX

THE OPERATOR CAN SPECIFY ANY LENGTH TRANSFER FROM 1(8) TO 1000(8) WORDS. THE NORMAL TRANSFER LENGTH IS N(8) WORDS WHERE IS THE MAXIMUM BUFFER SIZE FOR THE AVAILABLE CORE.

WRD ADDR? XXXX

THE OPERATOR MUST NOW SPECIFY THE STARTING WORD ADDRESS-THIS BEING ONE OF 2048(10). ADDRESS ENTRY MUST BE MADE IN OCTAL (0 TO 3777(8)).

(5.2 CONT'D)

OPT. DATA PAT. #?

IF NO OPTIONAL DATA PATTERN IS REQUESTED THE PROGRAM WILL EXECUTE THE FOLLOWING LIST OF DATA PATTERNS.

```
PATTERN  0 = 000000
    "    1 = 177777
    "    2 = 134510
    "    3 = 043267
    "    4 = 100000
    "    5 = 107070
    "    6 = 070707
    "    7 = 052525
    "   10 = 125252
    "   11 = 177737
    "   12 = 004102
    "   13 = 136363
    "   14 = 063636
    "   15 = 000001
    "   16 = 100005
    "   17 = 000520
    "   20 = 030303
    "   21 = RANDOM DATA
    "   22 = RUN ALL DATA PATTERNS UNDER PROGRAM CONTROL
```

IF THE OPERATOR DECIDES TO OPERATE UNDER PROGRAM CONTROL, THE NEXT QUESTION WILL BE SKIPPED. THE OPERATOR BY REQUESTING AN OPTIONAL DATA PATTERN HAS THE ABILITY OF SELECTING ANY ONE OF THE 21(8) DATA PATTERNS. DATA PATTERN NO. XX

DISK PROGRAM FUNCTION PARAMETERS

IN THIS SECTION OF THE PROGRAM PARAMETER CONVERSATION MODE, THE OPERATOR CAN SELECT ANYONE OR ALL THREE OF THE CONTROL FUNCTIONS TO BE EXECUTED. THE NORMAL SEQUENCE OF DISK FUNCTIONS UNDER PROGRAM CONTROL IS WRITE, WRITE CHECK, AND THEN READ. BY ENTERING THE CONVERSATION MODE THE OPERATOR HAS GAINED COMPLETE CONTROL OVER THE DISK FUNCTIONS. HE MUST SPECIFY YES OR NO TO ALL OF THE FOLLOWING QUESTIONS.

```
WRITE?          (YES - NO)
WRITE CHECK?    (YES - NO)
READ?           (YES - NO)
```

(5.2 CONT'D)

TO PERFORM A WRITE CHECK ONLY, THE OPERATOR MUST FIRST WRITE SOME KNOWN DATA ON THE DISK. THIS COURSE OF ACTION ALSO PREVAILS FOR A READ ONLY OPERATION.

- IF AN ERROR OCCURS IN THE LINE THE OPERATOR IS TYPING, DEPRESS THE RUB-OUT. THIS CAUSES THE QUESTION TO BE RETYPED AND ALLOWS THE OPERATOR TO PROPERLY ANSWER THE QUESTION.

- INDICATES TO THE OPERATOR THAT THE CARRIAGE-RETURN SHOULD BE TYPED AT THE INDICATED PLACE TO TERMINATE THE LINE OF TYPED CHARACTERS.

5.3 SUBROUTINE ABSTRACTS

ADT2 - TEST FOR ALTERATION OF WORD ADDRESS

IN THIS ADDRESS TEST, TRACK ZERO IS LOADED WITH ALL ONES IN BLOCK OF 2K. THEN THE TEST STARTING WITH ADDRESS 0 AND PROGRESSING UP THROUGH AND INCLUDING ADDRESS 3777(8), THE OCTAL VALUE OF THE ADDRESS, IS WRITTEN ON ITSELF AND ALL OTHER ADDRESSES ARE CHECKED FOR MODIFICATION. THEY SHOULD EQUAL ALL ONES. AFTER CHECK IS COMPLETED AND ALL ERRORS ARE REPORTED IF ANY, THE ROUTINE THEN RE-WRITES THE ADDRESS WITH ALL ONES AND THEN CONTINUES ON WITH THE NEXT ADDRESS.

ADT3 - VERIFY THAT ALL ADDRESSES EXIST ON DISK SURFACE TRACK

IN THIS ROUTINE THE OCTAL VALUE OF EACH ADDRESS IS WRITTEN ON ITSELF IN 2K WORD BLOCKS. THE ROUTINE THEN READS THE DISK AND VERIFIES THAT ALL ADDRESSES CAN BE ACCESSED. ERRORS MAY BE REPORTED IN THIS TEST WHICH ARE NOT ADDRESS ERRORS BUT DATA ERRORS. THE OPERATOR IS CAUTIONED TO CAREFULLY EXAMINE THE ERRORS TO DISTINGUISH BETWEEN THE ADDRESS AND DATA ERRORS.

ADT4 - TEST TRACK "X" AND "Y" MATRIX

THIS ROUTINE WAS DESIGNED TO ENABLE THE OPERATOR AN EASY AND SURE METHOD OF DETECTING DEFECTIVE MATRIX SWITCHES. IN THIS ROUTINE THE FIRST AND LAST LOCATION OF EACH TRACK (0 AND 3777(8)) ARE WRITTEN WITH ALL ONES. AFTER THE INITIAL WRITE HAS TAKEN PLACE, THE ROUTINE THEN STARTS WITH THE FIRST WORD OF THE ABOVE INDICATED LOCATION AND WRITES THE ADDRESS ON ITSELF. THE NEXT STEP OF THE ROUTINE IS TO CHECK ALL OTHER ADDRESSES TO SEE IF THEY HAVE BEEN ALTERED. AFTER ALL ERRORS HAVE BEEN REPORTED, IF ANY, THE ROUTINE RE-WRITES THE ADDRESS WITH ALL ONES AND CONTINUES ON WITH THE NEXT ADDRESS.

(5.3 CONT'D)

ADTS - TEST LOOK AHEAD FEATURE

THE DISK LOOK AHEAD FEATURE WAS DESIGNED FOR THE USER WHO WANTED OPTIMUM USE OF THE DISK, BY KNOWING AT WHAT ADDRESS THE DISK READ HEADS ARE LOCATED AT ALL TIMES. THE ADDRESS LOADED INTO THE ADS REGISTER IS THE PHYSICAL ADDRESS OF THE DISK. THE PROGRAM LOCATES THE PHYSICAL ADDRESS BY WRITE A WORD AND UPON RECEIVING THE COMPLETION FLAG THE PROGRAM READS THE ADS REGISTER. THE ADDRESS MAY BE UP TO 2 ADDRESSES OFF.

SPIRAL - TEST DISK TRACK SPIRAL

IN THIS ROUTINE THE ABILITY OF THE CONTROL (RF09/15) TO SPIRAL FROM ONE TRACK TO ANOTHER DURING A READ AND A WRITE. IN ORDER TO CHECK THE READ SPIRAL, THE LAST ADDRESS (3777(8)) OF TRACK ZERO IS WRITTEN WITH PRE-DETERMINED DATA AND THE FIRST ADDRESS (0) OF TRACK ONE, IS ALSO WRITTEN WITH PRE-DETERMINED DATA. THEN A TWO WORD READ STARTING AT LOCATION 3777(8) OF TRACK ZERO IS ACCOMPLISHED. THE TWO WORDS THEN ARE COMPARED TO THE DATA WRITTEN AND ANY ERRORS ARE REPORTED.

TO CHECK WRITE SPIRAL, THE ROUTINE WRITES TWO WORDS STARTING AT ADDRESS 3777(8) OF TRACK ZERO AND TERMINATES AT LOCATION 0 OF TRACK ONE. THE ROUTINE THEN READS THE TWO LOCATIONS WITH ONE WORD TRANSFERS, AND VERIFIES THE CORRECT DATA WAS STORED IN EACH LOCATION.

DATA TESTS

RANEX - RANDOM DATA, RANDOM ADDRESS RANDOM WORD COUNT TEST

THIS ROUTINES TESTS THE ABILITY OF THE SYSTEM TO ACCESS RANDOM ADDRESS WITH RANDOM DATA AND AN INCREMENTAL WORD COUNT. THE DATA IS FIRST WRITTEN ON THE DISK AND THEN DATA IS WRITE-CHECKED. ALL ERRORS ARE REPORTED. THE WORD COUNT RUNS FROM 1 TO 1000(8) WORDS.

DATA RELIABILITY - DATA PATTERN TEST

IN THIS PORTION OF THE TEST, THE ABILITY OF THE COMPLETE DISK SURFACE TO WRITE, WRITE-CHECK, AND READ DATA IS TESTED. THE ROUTINE FIRST WRITES THE COMPLETE SURFACE WITH A SET DATA PATTERN, THEN A WRITE CHECK OF THE COMPLETE SURFACE IS ACCOMPLISHED, THUS REPORTING ALL ERRORS BETWEEN THE DATA WRITTEN AND THE DATA IN MEMORY. THREE READS ARE ACCOMPLISHED FOR EACH BUFFER AREA ON THE DISK. THE OPERATOR AT THIS POINT HAS SEVERAL OPTIONS AS TO WHAT COURSE OF ACTION THE PROGRAM WILL TAKE NEXT. (REF. SEC. 5.1)

(5.3 CONT'D)

IN THE DATA RELIABILITY, ALL PROGRAM PARAMETERS CAN BE CHANGED.
REF. SEC. 5.2

MAINTENANCE TOOL

STAMP - STATIC TRACK SELECTION

THIS ROUTINE WAS DESIGNED TO ENABLE THE OPERATOR TO HAVE A QUICK METHOD OF SELECTING TRACKS FOR AMPLITUDE ADJUSTMENTS.

STAMP - OPERATING PROCEDURE

STEP A. SET SWITCH REGISTER EQUAL TO 704

STEP B. DEPRESS LOAD ADDRESS

STEP C. SET SWITCH REGISTER 9 THRU 7 EQUAL TO DISK #0 THRU 7

STEP D. DEPRESS START

STEP E. SET SWITCH REGISTER 6 THRU 0 EQUAL TO TRACK #

STEP F. DEPRESS CONTINUE

6 5 4 3 2 1 0

TRACK NUMBER
(0 THRU 177(8))

STEP G. TRACK NUMBER CAN BE CHANGED ARBITRARILY.

6. ERROR REPORTS

6.1 ADDRESS ERROR

XX ERR CNT XXXXXXWRD1XXXXWRD2

ERRCNT = IS THE TAG FOR THE LISTING
WRD1 = WHAT WAS EXPECTED
WRD2 = WHAT WAS RECEIVED

WHEN A REPORT ONLY CONTAINS ONE WORD THE PROGRAM WAS EXPECTING ZEROS BUT RECEIVED WHAT WAS REPORTED.

K1

6.2 ERROR REPORTS

STATUS ERROR

STATUS ERROR XXDAE XXXXXYDAR XXXXXXDCS

A B C

A=THE DISK NUMBER AND EXTENDED DISK ADDRESS BITS.
B=THE DISK ADDRESS REGISTER
C=THE DISK CONTROL REGISTER

LAYOUT OF DISK ADDRESS BITS
DAE DAR
XXX XXX XXX XXX XXX XXX XXX

DISK NO. TRACK ADDRESS WORD ADDRESS

BIT LAYOUT OF DCS REGISTER
BIT15= ERROR
BIT14= DISK FREEZE
BIT13= WRITE CHECK ERROR
BIT12= DATA PARITY ERROR
BIT11= NON-EXISTENT DISK
BIT10= WRITE LOCKOUT
BIT9= MISSED TRANSFER
BIT8= DISK CLEAR
BIT7= READY
BIT6= INTERRUPT ENABLE
BIT5= EXTENDED MEMORY 1 (XM1)
BIT4= EXTENDED MEMORY 0 (XM0)
BIT3= MAINTENANCE
BIT2-1= FUNCTION REGISTER

BIT 2	BIT 1	OPERATION
0	0	NOP
1	0	READ
0	1	WRITE
1	1	WRITE CHECK

IF THE ERROR OCCURRED WHEN READING THE PROGRAM WILL REPORT WHICH READ.

(6.2 CONT'D)

NOTE: WHEN A FREEZE ERROR OCCURS AN ADDITIONAL ERROR MESSAGE WILL BE REPORTED, AS FOLLOWS:

```
XXX HRD ERR

LAYOUT OF BITS 0 - 7

  BIT0= CMA INH. (NOT AN ERROR CONDITION)
  BIT1= UNUSED
  BIT2= NON-EXISTENT MEMORY ERROR
  BIT3= UNUSED
  BIT4= TRACK C TIMING ERROR
  BIT5= TRACK B TIMING ERROR
  BIT6= TRACK A TIMING ERROR
  BIT7= ADDRESS PARITY ERROR
```

6.3 DATA ERRORS

```
DATA ERR 1 READ XXDAE XXXXXXDAR XXXXXXGL DATA XXXXXXRD DATA

        A       B       C         D             E

        A=WHICH READ THE ERROR OCCURRED
        B=THE DISK NUMBER AND EXTENDED DISK ADDRESS BITS
        C=THE DISK ADDRESS REGISTER
        D=THE DATA WRITTEN ON THE DISK
        E=THE DATA READ FROM THE DISK
```

6.4 RANEX ERRORS

ERRORS WHICH OCCUR IN RANEX ALSO HAVE THE WORD COUNT REPORT WITH THE ERROR MESSAGE IN THE FOLLOWING MANNER.

```
RANEX ERR XXDAE XXXXXXDAR XXXXWRD CNT.

           A          B         C

        A=STARTING DAE OF TRANSFER
        B=STARTING DAR OF TRANSFER
        C=WORD COUNT OF TRANSFER
```

6.5 OVERFLOW ERROR

WHEN THE DISK TRANSFERS MORE WORDS THEN ITS WORD COUNT WAS EQUAL TO, THE PROGRAM FLAGS IT.

```
EXTRA BKS XXXXXX WRD ADDR XXXXXX BD DATA

            A                B

        A=THE LOCATION IN MEMORY WHERE THE DATA WAS TRANSFERRED
        B=THE DATA THAT WAS TRANSFERRED
```

M1

6.6 DISK ADDRESS ERROR

DK ADDR ERR XXDAFXXXXXXDAR

THE TERMINATING DISK ADDRESS AFTER THE TRANSFER WAS NOT CORRECT THE DAE AND DAR SHOULD EQUAL WHAT WAS REPORTED. CHECK THE RF11 PANEL FOR THE ERROR ADDRESS.

6.7 PROCESSOR TIME OUT

CPU BKGRND TIMED OUT

THIS MESSAGE WILL BE REPORTED IF THE DISK FAILS TO RAISE A BR REQUEST AFTER EXTENDED PERIOD OF TIME.

6.8 END

END

THIS MESSAGE IS REPORTED AT THE END OF ONE COMPLETE PASS OF THE DISK SYSTEM.

6.9 MEMORY PARITY ERROR

THIS MESSAGE IS REPORTED IF THE PROGRAM DETECTS A PARITY ERROR DURING PROGRAM EXECUTION.

6.10 POWER HAS FAILED

THIS MESSAGE INDICATES THAT THE POWER HAS FAILED AND THE TEST RESTORED.

A2

7. MISCELLANEOUS

IN SOME ADDRESS TESTS THE PROGRAM DEPENS ON WRITTING AND READING DATA CORRECTLY FROM THE DISK,AND IF IT DOES NOT IT MAY REPORT AN ADDRESS FAILURE, WHEN IN FACT IT WAS A DATA FAILURE.

7.1 SUGGESTED POWER FAIL TEST

THIS TEST IS SUGGESTED SO THAT THE ABILITY OF THE DISK TO RETAIN DATA AFTER A POWER FAILURE HAS OCCURRED MAY BE TESTED.

FOLLOW THESE STEPS IF NO ERROR OCCURS, ONE PASS SHOULD BE SUFFICIENT:

A) LOAD AND START PFT1

B) UPON RECEIVING "OK" FROM THE PROGRAM TURN OFF THE POWER TO THE MACHINE AND THEN BACK ON AGAIN.

C) THERE SHOULD BE AT MOST ONE ERROR. ANY MORE IS CONSIDERED UNRELIABLE.

D) PERFORM THE SAME STEPS WITH PFT2. THIS TIME THERE SHOULD BE NO ERRORS.

```
                                        .TITLE  MAINDEC-11-DZRFB-B      RF11 DATA TEST REPLACES D50A

                                        ;COPYRIGHT      1973, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
                                        ;PROGRAM BY E. HAIGHT/C. CASWELL
                                        .ENABL  ABS

                 000001                 BIT0=1
                 000002                 BIT1=2
                 000004                 BIT2=4
                 000010                 BIT3=10
                 000020                 BIT4=20
                 000040                 BIT5=40
                 000100                 BIT6=100
                 000200                 BIT7=200
                 000400                 BIT8=400
                 001000                 BIT9=1000
                 002000                 BIT10=2000
                 004000                 BIT11=4000
                 010000                 BIT12=10000
                 020000                 BIT13=20000
                 040000                 BIT14=40000
                 100000                 BIT15=100000
                                        ;
                                        ;
                                        ;
                 104403                 WRITE=TRAP+3
                 104407                 WRCHECK=TRAP+7
                 104405                 READ=TRAP+5

                 000000                 .=0                             ;TRAP CATCHER 0 - 776
                 000020                 .=20
000020           011052                 XWAIT                   ;BACKGROUND TEST VECTOR
000022           000000                 0
000024           011376                 DOWN                    ;POWER FAIL
000026           000340                 340
                 000030                 .=30
000030           012464                 EMTRP                   ;TTY VECTOR
000032           000340                 340
000034           006344                 DISK                    ;DISK CALLING VECTOR
000036           000340                 340

                 000200                 .=200
000200           000167  000712         JMP     START
000204           006436                 DKINT                   ;DISK INTERRUPT VECTOR
000206           000200                 200                     ;DISK PRIORITY

                                        ;STATIC ROUTINES
                 000300                 .=300
```

```
                                                
                                                
        000600                          .=600
000600  000167  001344                  JMP     ADT2            ;CHECK THAT WHEN A
                                                                ;WORD IS WRITTEN IT
                                                                ;DOES NOT ALTER ADJACENT
                                                                ;WORDS
                                                                ;
                                                                ;
000604  000167  002204                  JMP     ADT3            ;WRITE EACH WORD ADDR ON ITSELF AND
                                                                ;READ BACK TO COMPARE
                                                                ;
                                                                ;
000610  000167  002554                  JMP     ADT4            ;TRACK SELECTION TEST
                                                                ;
                                                                ;
000614  000167  003176                  JMP     ADT5            ;LOOK AHEAD TEST
                                                                ;
                                                                ;
000620  000167  003406                  JMP     SPIRAL          ;SPIRAL TEST
                                                                ;
                                                                ;
000624  000167  003752                  JMP     XSPIRAL         ;SPIRAL TEST EXTENSION
                                                                ;
                                                                ;
000630  000167  004730                  JMP     RANEX           ;RANDOM ADDRESS, DATA AND
                                                                ;WORD COUNT TEST
                                                                ;
                                                                ;
000634  000167  007774                  JMP     EXTMEM          ;WRITE/WRITE CHECK DISK WITH
                                                                ;EXTENDED MEMORY
                                                                ;
                                                                ;
000640  000167  010340                  JMP     PFT1            ;DISK WRITE POWER FAIL TEST
                                                                ;
                                                                ;
000644  000167  010572                  JMP     PFT2            ;DISK WRITE CHECK POWER FAIL TEST
                                                                ;
                                                                ;
                                ;***MAINTENANCE ROUTINES***
                                ;
                                                                ;
000650  000167  011130                  JMP     SELWC           ;LOAD WORD COUNT REG.
                                                                ;WITH SWITCH REGISTER
                                                                ;
                                                                ;
000654  000167  011134                  JMP     SELCMA          ;LOAD CURRENT MEMORY ADDR
                                                                ;REG. WITH SWITCH REGISTER
                                                                ;
                                                                ;
000660  000167  011140                  JMP     SELDAR          ;LOAD DISK ADDR. REGISTER
                                                                ;WITH SWITCH REGISTER
                                                                ;
                                                                ;
```

D2

```
000664  000167  011144                JMP     SELDAE          ;LOAD DISK ADDR. EXT.
                                                              ;WITH SWITCH REGISTER
                                                              ;
                                                              ;
000670  000167  011150                JMP     SELDBR          ;LOAD DATA BUFFER REGISTER
                                                              ;WITH SWITCH REGISTER
                                                              ;
                                                              ;
000674  000167  011154                JMP     MOVLK           ;MOVE CONTENTS OF LOOK
                                                              ;AHEAD REGISTER INTO DATA LIGHTS
                                                              ;
                                                              ;
000700  000167  011162                JMP     SELDCS          ;LOAD DISK CONTROL REGISTER
                                                              ;WITH SWITCH REGISTER
                                                              ;
                                                              ;
000704  000167  011226                JMP     STAMP           ;ENABLE READ AMPLIFIERS
                                                              ;TO TRACK SELECTED
                                                              ;FROM SWITCH REGISTER
                                                              ;
                                                              ;
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;RF11 DATA TEST
                                ;VECTORS USED IN PROGRAM
                                ;#1 LOC 204 DISK INTERRUPT
                                ;#2 LOC 30 EMT (TELETYPE OUTPUT)
                                ;#3 LOC 34 TRAP (DISK HANDLERS)
                                ;#4 LOC 14 TRACE TRAP (USED IN BACKGROUND TEST)
                                ;#5 LOC 20 IOT TRAP (USED IN CALLING BACKGROUND TEST)

        001000                  .=1000
```

E2

```
                                        .EVEN
                                ;
                                ;I/O ADDRESS POINTERS
001000  177570                  SWR:    177570                  ;SWITCH REGIISTER
001002  177776                  PS:     177776                  ;PROCESSOR STATUS REGISTER
001004  177566                  TPB:    177566                  ;TELETYPE REGISTERS
001006  177562                  TKB:    177562
001010  177564                  TPS:    177564
001012  177560                  TKS:    177560
                                ;
                                ;DISK I/O REGISTERS
                                ;
001014  177460                  DCS:    177460                  ;DISK CONTROL REGISTER
001016  177462                  WC:     177462                  ;WORD COUNT REGISTER
001020  177464                  CMA:    177464                  ;CURRENT ADDRESS REGISTER
001022  177466                  DAR:    177466                  ;LOWER 16 BITS OF DISK ADDRESS
001024  177470                  DAE:    177470                  ;EXTENSION ADDRESS REGISTER
001026  177472                  DBR:    177472                  ;DATA BUFFER REGISTER
001030  177474                  MA:     177474                  ;MAINTENANCE REGISTER
001032  177476                  ADS:    177476                  ;LOOK AHEAD REGISTER
001034  000204                  VECTOR: 204                     ;INTERRUPT VECTOR ADDRESS
001036  000206                  STATUS: 206                     ;DISK INTERRUPT STATUS
001040  000200                  PRIORITY:BIT7                   ;DISK PRIORITY LEVEL

                                ;
                                ;
                                ;
                                ;
                                ;RF11 DEDICATE REGISTERS (MEMORY)
                                ;
001042  000000                  FLAG:   0                       ;INTERNAL PROGRAM FLAG
001044  146723                  RANNU:  146723                  ;RANDOM NUMBER PRIME
001046  000000                  WRDCT:  0                       ;WORKING WORD COUNT
001050  000000                  TRACK:  0                       ;WORKING DAE
001052  000000                  DMA:    0                       ;WORKING DAR
001054  000000                  PATNU:  0                       ;DATA PATTERN INDEX
001056  000000                  BUF:    0                       ;WORKING DATA BUFFER (OUT-IN)
001060  000000                  TWRDCT: 0                       ;TEMP WORD COUNT
001062  000000                  TDMA:   0                       ;TEMP DAR
001064  000000                  SWRDCT: 0                       ;STANDARD WORD COUNT
001066  000000                  ERCOUNT:0                       ;ERROR COUNT FOR MESSAGES.
001070  000000                  SAVE:   0
001072  000000                  SAV1:   0
001074  000000                  PASS:   0
001076  000000                  DSKNOR: 0
001100  000000                  HRDER:  0                       ;POINTER FOR HARD ERROR
001102  000000                  PASSC:  0
001104  000000                  INPUT:  0

                                ;
                                ;RF11 WORK REGISTERS
```

F2

```
                                        ;(CAN BE CHANGED IN ANY ROUTINE)
001106  000000                          WORK:   0
001110  000000                          WORK1:  0
001112  000000                          WORK2:  0
001114  000000                          WORK3:  0
```

```
001116  000005                  START:  RESET                   ;CLEAR THE WORLD
001120  012767  000010  177760          MOV     #10,WORK
001126  012700  013426          CLRTAB: MOV     #TABLE,%0       ;CLEAR ERROR TABLE
001132  005020                          CLR     (0)+
001134  005367  177746                  DEC     WORK
001140  001372                          BNE     CLRTAB
001142  012706  001000                  MOV     #1000,%6        ;SET UP STACK
001146  012777  000340  177626          MOV     #340,@PS        ;LOCK UP INTERRUPT LEVELS
001154  005067  177662                  CLR     FLAG            ;CLEAR PROGRAM FLAG
001160  005067  177664                  CLR     TRACK           ;CLEAR TRACK REGISTERS
001164  005067  177662                  CLR     DMA             ;CLEAR DAR REGISTERS
001170  005067  177660                  CLR     PATNU           ;CLEAR PATTER COUNT
001174  012767  000400  177662          MOV     #400,SWRDCT     ;SET UP STANDARD WORD COUNT
001202  016767  177656  177636          MOV     SWRDCT,WRDCT
001210  004767  012012                  JSR     7,MAMF          ;SET PARITY SWITCHES
001214  005777  177560                  TST     @SWR
001220  100464                          BMI     CONM            ;OPERATE UNDER PROGRAM CONTROL
001222  052767  070000  177612          BIS     #70000,FLAG
001230  005067  012212                  CLR     TEXBUF
001234  032777  004000  177552  SPECOR: BIT     #BIT11,@DCS     ;TEST NON-EXISTENT DISK
001242  001013                          BNE     RCNODV          ;NO DEVICE!
001244  022767  000010  012174          CMP     #10,TEXBUF      ;TESTED FOR ALL DEVICES?
001252  001407                          BEQ     RCNODV          ;REPORT NUMBER
001254  062767  000001  012164          ADD     #1,TEXBUF       ;INC. DEVICE COUNT
001262  062777  000004  177534          ADD     #4,@DAE         ;ADDRESS NEXT DISK
001270  000761                          BR      SPECOR
001272  005767  012150          RCNODV: TST     TEXBUF          ;TEST FOR 0 DEVICES
001276  001003                          BNE     REPDRV
001300  104001                          EMT+1                   ;REPORT 0 DEVICES
001302  014417                          NODRV
001304  000000                          HALT
001306  004567  011422          REPDRV: JSR     %5,CONV         ;CONVERT TO ASCII
001312  013446                          TEXBUF
001314  014444                          RKNUM
001316  000001                          1
001320  104000                          EMT+0                   ;TYPE NUMBER OF DEVICES
001322  013534                          HED5A
001324  014444                          RKNUM
001326  177777                          -1
001330  016767  012112  177540          MOV     TEXBUF,DSKNOR   ;SAVE # OF DISKS
001336  162767  000001  177532          SUB     #1,DSKNOR       ;FIRST DISK IS ZERO
001344  006167  177526                  ROL     DSKNOR          ;SHIFT LEFT TO MATCH
001350  006167  177522                  ROL     DSKNOR          ;FLAG POSITION
001354  052767  004000  177460          BIS     #BIT11,FLAG     ;SET PROGRAM MODE IN FLAG
001362  005077  177436                  CLR     @DAE            ;RESET TO DISK 0
001366  000167  000464                  JMP     ADTST
                                ;ENTER OPERATOR CONVERSATION MODE
001372  104001                  CONM:   EMT     +1              ;ASK ABOUT DATA TEST ONLY
001374  014062                          CON1
001376  004767  011424                  JSR     %7,ALPHA        ;GO WAIT FOR ANSWER
001402  022767  000153  012036          CMP     #153,TEXBUF     ;TEST FOR YES
001410  001003                          BNE     .+10            ;BRANCH IF NO
001412  052767  002000  177422          BIS     #BIT10,FLAG
```

H2

```
001420  104001                          EMT     +1
001422  014104                          CON2                    ;ASK ABOUT MULTI DISK MODE
001424  004767  011376                  JSR     %7,ALPHA        ;GO WAIT FOR ANSWER
001430  022767  000153  012010          CMP     #153,TEXBUF     ;TEST FOR YES
001436  001026                          BNE     DATTES          ;DO NOT ENTER STATIC TEST
001440  052767  004000  177374          BIS     #BIT11,FLAG     ;SET FLAG TO ENTER STATIC TEST
001446  104001                  DSKDR:  EMT     +1
001450  014124                          CON3
001452  004767  011340                  JSR     %7,NOCHA
001456  162767  000001  011762          SUB     #1,TEXBUF
001464  022767  000010  011754          CMP     #10,TEXBUF
001472  101765                          BLOS    DSKDR
001474  016767  011746  177374          MOV     TEXBUF,DSKNOR
001502  006167  177370                  ROL     DSKNOR
001506  006167  177364                  ROL     DSKNOR
001512  000420                          BR      ASKWC
001514  104001                  DATTES: EMT     +1
001516  014155                          CON4                    ;ASK UNIT NUMBER
001520  004767  011272                  JSR     %7,NOCHA        ;WAIT FOR NO.
001524  022767  000010  011714          CMP     #10,TEXBUF      ;IS NO = 0>10
001532  101770                          BLOS    DATTES          ;NO
001534  000241                          CLC
001536  006167  011704                  ROL     TEXBUF
001542  006167  011700                  ROL     TEXBUF
001546  056767  011674  177266          BIS     TEXBUF,FLAG
001554  104001                  ASKWC:  EMT     +1
001556  014166                          CON5                    ;ASK ABOUT OPTIONAL WORD COUNT
001560  004767  011242                  JSR     %7,ALPHA        ;WAIT FOR ANSWER
001564  022767  000153  011654          CMP     #153,TEXBUF
001572  001021                          BNE     OPDAR           ;ASK ABOUT OPTIONAL DAR
001574  104001                  WCCON:  EMT     +1
001576  014205                          CON6                    ;ASK LENGTH OF WC
001600  004767  011212                  JSR     %7,NOCHA
001604  005767  011636                  TST     TEXBUF
001610  001771                          BEQ     WCCON
001612  022767  001001  011626          CMP     #1001,TEXBUF    ;IS WORD COUNT>1000
001620  101765                          BLOS    WCCON           ;YES ASK FOR COUNT AGAIN
001622  016767  011620  177234          MOV     TEXBUF,SWRDCT   ;OPERATING WORD COUNT
001630  016767  177230  177210          MOV     SWRDCT,WRDCT
001636  104001                  OPDAR:  EMT     +1
001640  014232                          CON7                    ;ASK ABOUT OPTIONAL DAR
001642  004767  011150                  JSR     %7,NOCHA
001646  022767  004000  011572          CMP     #4000,TEXBUF    ;3777 MAX DAR ADDR
001654  101770                          BLOS    OPDAR
001656  016767  011564  177166          MOV     TEXBUF, DMA     ;TEMP DAR REGISTER
```

```
001664  104001                  OPPAT:  EMT     +1
001666  014245                          CON8                    ;ASK ABOUT DATA PATTERNS
001670  004767  011122                  JSR     %7,NOCHA
001674  022767  000023  011544          CMP     #23,TEXBUF      ;TEST FOR CORRECT NO
001702  101770                          BLOS    OPPAT           ;ASK AGAIN
001704  022767  000022  011534          CMP     #22,TEXBUF
001712  001414                          BEQ     OPWRT           ;DATA PATTERN UNDER PROGRAM CONTROL
001714  052767  100000  177120          BIS     #BIT15,FLAG     ;SET PROGRAM FLAG
001722  016767  011520  177124          MOV     TEXBUF, PATNU   ;OPERATOR WANTS TO SELECT DATA
001730  000241                          CLC
001732  006167  177116                  ROL     PATNU
001736  042767  070000  177076          BIC     #70000,FLAG     ;CLEAR OP MODE BITS IN FLAG
001744  104001                  OPWRT:  EMT     +1
001746  014270                          CON9                    ;ASK ABOUT WRITE
001750  004767  011052                  JSR     %7,ALPHA
001754  022767  000153  011464          CMP     #153,TEXBUF     ;TEST FOR YES
001762  001003                          BNE     OPWCK           ;ASK ABOUT WRITE CHECK
001764  052767  040000  177050          BIS     #BIT14,FLAG     ;YES SET FLAG BIT
001772  104001                  OPWCK:  EMT     +1
001774  014300                          CON10                   ;ASK ABOUT WRITE CHECK
001776  004767  011024                  JSR     %7,ALPHA
002002  022767  000153  011436          CMP     #153,TEXBUF     ;TEST FOR YES ANSWER
002010  001003                          BNE     OPRD            ;GO ASK ABOUT READ
002012  052767  020000  177022          BIS     #BIT13,FLAG     ;YES SET FLAG BIT
002020  104001                  OPRD:   EMT     +1
002022  014316                          CON11                   ;ASK ABOUT READ
002024  004767  010776                  JSR     %7,ALPHA
002030  022767  000153  011410          CMP     #153,TEXBUF     ;TEST FOR YES ANSWER
002036  001003                          BNE     CHKFLG
002040  052767  010000  176774          BIS     #BIT12,FLAG     ;SET FLAG TO READ
002046  032767  070000  176766  CHKFLG: BIT     #70000,FLAG
002054  001733                          BEQ     OPWRT
                                ;
                                ;
                                ;
002056  032767  004000  176756  ADTST:  BIT     #BIT11,FLAG     ;ARE WE IN MULTI DISK MODE
002064  001423                          BEQ     EXMFLG          ;BRANCH IF NO.
002066  104001                          EMT     +1
002070  014002                          MES11
002072  016767  176744  010714          MOV     FLAG,ACNVX
002100  006067  010710                  ROR     ACNVX
002104  006067  010704                  ROR     ACNVX
002110  042767  177770  010676          BIC     #177770,ACNVX   ;FETCH DISK #
002116  004567  010612                  JSR     %5,CONV
002122  013014                          ACNVX
002124  014014                          MES12
002126  000001                          1
002130  104001                          EMT     +1
002132  014014                          MES12
002134  032767  002000  176700  EXMFLG: BIT     #BIT10,FLAG     ;TEST FOR DATA TEST ONLY
002142  001402                          BEQ     .+6             ;DO COMPLETE TEST
002144  000167  003020                  JMP     DATAT           ;DO DATA TEST ONLY
```

```
                                        ;***ADDRESS ADT2***
                                        ;
                                        ;IN THIS TEST WRITE TRACK ZERO WITH ZERO'S
                                        ;THEN WRITE ALL ONES IN AN ADDRESS
                                        ;CHECK IF WRITING ONES IN THAT ADDRESS ALTERED
                                        ;ANY OTHER ADDRESS IN THE TRACK
                                        ;FOLLOW THIS PROCEDURE FOR ADDRESSES 0 TO 3777
                                        ;
                                        ;
002150  012706  001000          ADT2:   MOV     #1000,%6        ;SET UP STACK
002154  012767  001000  176664          MOV     #1000,WRDCT     ;SET UP WORD COUNT
002162  012767  014466  176666          MOV     #OUTBUF,BUF     ;SET UP CURRENT ADDRESS
002170  016767  176660  176672          MOV     PATNU,SAVE
002176  005067  176652                  CLR     PATNU
002202  005067  176642                  CLR     TRACK
002206  005067  176640                  CLR     DMA
002212  004567  005402                  JSR     %5,PASEL        ;SET UP DATA BUFFER
002216  016767  176646  176630          MOV     SAVE,PATNU
                                        ;****WRITE DISK ADDR. 0 TO 3777 WITH ZEROES ****
002224  052777  000400  176562  RFADT:  BIS     #BIT8,@DCS
002232  104403                          WRITE
002234  105777  176554                  TSTB    @DCS            ;TEST FOR READY
002240  100375                          BPL     .-4
002242  005777  176546                  TST     @DCS            ;TEST FOR ERROR
002246  100016                          BPL     RDMORE
002250  012767  000001  176610          MOV     #1,ERCOUNT      ;ERROR OCCURRED
002256  017767  176532  176624          MOV     @DCS,WORK1      ;FETCH DCS REGISTER
002264  017767  176532  176614          MOV     @DAR,WORK
002272  005367  176610                  DEC     WORK
002276  004567  010070          ER1:    JSR     %5,STAER1       ;REPORT ERROR OCURRED
                                        ;****WRD1=CONTROL STATUS REG. AT THE THE TIME OF THE ERROR ****
                                        ;****WRD2=DISK ADDR. AT THE TIME OF THE ERROR ****
002302  000750                          BR      RFADT           ;LOOP ON ERROR
002304  022767  003000  176540  RDMORE: CMP     #3000,DMA
002312  001404                          BEQ     RFRD-4
002314  062767  001000  176530          ADD     #1000,DMA
002322  000740                          BR      RFADT
002324  005067  176542                  CLR     SAV1
002330  005067  176534          RFRD:   CLR     SAVE
```

K2

```
002334  012727  177777  177777  WONWD:  MOV     #-1,#-1
002342  012767  002340  176506          MOV     #WONWD+4,BUF
002350  012767  000001  176470          MOV     #1,WRDCT
002356  016767  176510  176466          MOV     SAV1,DMA
002364  052777  000400  176422          BIS     #BIT8,@DCS
002372  104403                          WRITE
002374  105777  176414                  TSTB    @DCS            ;TEST FOR READY
002400  100375                          BPL     .-4
002402  005777  176406                  TST     @DCS            ;TEST FOR ERROR
002406  100014                          BPL     SUADB           ;BRANCH IF NO CONTROL ERROR
002410  017767  176400  176472          MOV     @DCS,WORK1
002416  016767  176450  176462          MOV     SAV1,WORK
002424  012767  000003  176434          MOV     #3,ERCOUNT      ;SETUP ERROR COUNT
002432  004567  007734          ER3:    JSR     %5,STAER1       ;REPORT ERROR
                                ;****WRD1=DISK CONTROL STATUS AT THE TIME OF THE ERROR****
                                ;****WRD2=DISK ADDR. IN ERROR WHEN TRYING TO WRITE ALL ONES ****
002436  000736                          BR      WONWD           ;RE-WRITE WORD
002440  016767  176426  176440  SUADB:  MOV     SAV1,WORK
002446  042767  000777  176432          BIC     #777,WORK       ;MASK TO BLOCKS
002454  016700  176412                  MOV     SAV1,%0
002460  006100                          ROL     %0
002462  042700  176001                  BIC     #176001,%0      ;MASK TO BUFFER SIZE
002466  026767  176376  176412          CMP     SAVE,WORK
002474  001407                          BEQ     18              ;TEST WORD IN THIS BLOCK
002476  005060  014466  -               CLR     OUTBUF(0)       ;NOT IN BLOCK-CLEAR
002502  022767  004000  176360          CMP     #4000,SAVE      ;WRITTEN ALL TRACKS?
002510  001463                          BEQ     ZEROAD
002512  000403                          BR      WRCADT
002514  012760  177777  014466  18:     MOV     #-1,OUTBUF(0)   ;SET BUFFER WD TO-1
002522  052777  000400  176264  WRCADT: BIS     #BIT8,@DCS
002530  012767  001000  176310          MOV     #1000,WRDCT     ;SETUP WORD COUNT
002536  012767  014466  176312          MOV     #OUTBUF,BUF     ;SETUP CURRENT ADDR
002544  016767  176320  176300          MOV     SAVE,DMA        ;SETUP DISK ADDRESS
002552  104407                          WRCHECK
002554  105777  176234                  TSTB    @DCS            ;CHECK FOR READY
002560  100375                          BPL     .-4
002562  005777  176226                  TST     @DCS            ;TEST FOR ERROR
002566  100030                          BPL     CHKBUF          ;BRANCH NO DISK ERROR
002570  017767  176220  176312          MOV     @DCS,WORK1
002576  016767  176270  176302          MOV     SAV1,WORK
002604  005367  176276                  DEC     WORK
002610  012767  000004  176250          MOV     #4,ERCOUNT      ;SET UP ERCOUNT
002616  004567  007550          ER4:    JSR     %5,STAER1       ;REPORT ERROR
002622  017767  176174  010164          MOV     @DAR,ACNVX      ;SET UP DISK ADDR. FOR REPORT
002630  004567  010100                  JSR     %5,CONV
002634  013014                          ACNVX
002636  013663                          MES4
002640  000006                          6
002642  104001                          EMT     +1
002644  013663                          MES4
                                ;****WRD1=DISK CONTROL STATUS REG. AT THE TIME OF THE ERROR ****
                                ;****WRD2=DISK ADDR. IN ERROR DURING WRITE CHECK ****
```

```
450                                     ;****WRD ADDR.=ADDR. WHICH CONTAINS ALL ONES ****
451  002646  000725                             BR      WRCADT
```

```
002650  062767  001000  176212  CHKBUF: ADD     #1000,SAVE      ;GO TO NEXT
002656  000670                          BR      SUADR           ;BLOCK
002660  005067  176204          ZERQAD: CLR     SAVE            ;
002664  016767  176202  176160          MOV     SAV1,DMA        ;SETUP DISK ADDRESS
002672  005027  000000                  CLR     #0              ;SET UP DATA
002676  012767  002074  176152          MOV     #.-2,BUF        ;SETUP CURRENT ADDRESS
002704  012767  000001  176134          MOV     #1,WRDCT        ;SETUP WORD COUNT
002712  104403                          WRITE
002714  105777  176074                  TSTB    @DCS            ;CHECK FOR READY
002720  100375                          BPL     .-4
002722  005777  176066                  TST     @DCS            ;TEST FOR ERROR
002726  100014                          BPL     INDADT
002730  012767  000005  176130          MOV     #5,ERCOUNT
002736  017767  176052  176144          MOV     @DCS,WORK1
002744  017767  176052  176134          MOV     @DAR,WORK
002752  004567  007414          ER5:    JSR     %5,STAER1
                                ;****WRD1=CONTROL STATUS REG. AT THE TIME OF THE ERROR ****
                                ;****WRD2=DISK ADDR. AT THE TIME OF THE ERROR ****
002756  000740                          BR      ZERQAD          ;LOOP ON ERROR
002760  022767  003777  176104  INDADT: CMP     #3777,SAV1
002766  001404                          BEQ     LP2ADT          ;LAST ADDR. CHECKED
002770  005267  176076                  INC     SAV1
002774  000167  177330                  JMP     RERD            ;CHECK NEXT ADDRESS
003000  032777  004000  175772  LP2ADT: BIT     #BIT11,@SWR     ;IS BIT 11 SET IN SWR
003006  001402                          BEQ     .+6
003010  000167  177134                  JMP     ADT2            ;BIT 11 SET LOOP ON TEST
                                ;
                                ;
                                ;
```

A3

485

```
                                        ;
                                        ;***** ADDRESS TEST *****
                                        ;
                                        ;WRITE EACH UNIQUE ADDRESS ON ITSELF FOR TRACK 0
                                        ;THEN READ IT BACK AND COMPARE FOR THE
                                        ;CORRECT DATA
                                        ;
                                        ;
003014  005067  176032          ADT3:   CLR     DMA             ;CLEAR ACTIVE REG
003020  005067  176024                  CLR     TRACK
003024  005067  176056                  CLR     WORK
003030  005067  176054                  CLR     WORK1
003034  012706  001000                  MOV     #1000,%6        ;SETUP STACK
003040  012767  014466  176010          MOV     #OUTBUF,BUF     ;SET UP CURRENT ADDRESS
003046  012767  001000  175772          MOV     #1000,WRDCT     ;SET UP WORD COUNT
003054  012700  014466                  MOV     #OUTBUF,%0      ;FILL BUFFER WITH COUNT
003060  016720  176022          INADB:  MOV     WORK,(0)+
003064  005267  176016                  INC     WORK            ;+1 COUNT
003070  022700  016466                  CMP     #OUTBUF+2000,%0
003074  001371                          BNE     INADB           ;SET UP NEXT WORD
003076  016767  176004  175764          MOV     WORK,SAVE
003104  052777  000400  175702  WRABF:  BIS     #BIT8,@DCS      ;CLEAR THE DISK WORLD
003112  104403                          WRITE                   ;WRITE
003114  105777  175674                  TSTB    @DCS            ;IS THE CONTROL READY
003120  100375                          BPL     .-4             ;CONTROL READY
003122  005777  175666                  TST     @DCS            ;IS THERE AN ERROR
003126  100011                          BPL     TFBL            ;NO ERROR
003130  017767  175660  175750          MOV     @DCS,WORK       ;FETCH CONTENTS OF CONTROL REG
003136  012767  000006  175722          MOV     #6,ERCOUNT      ;SET UP ERROR COUNT
003144  004567  007154          ER6:    JSR     %5,STAER        ;REPORT CONTROL ERROR
                                        ;****WRD1=DISK CONTROL STATUS REG, AT THE TIME OF THE ERROR ****
003150  000755                          BR      WRABF           ;RE-WRITE DATA
003152  016767  175712  175726  TFBL:   MOV     SAVE,WORK
003160  062767  001000  175664          ADD     #1000,DMA
003166  022767  004000  175712          CMP     #4000,WORK      ;HAVE WE WRITTEN ALL OF TRACK 0
003174  001327                          BNE     INADB-4
003176  005067  175704                  CLR     WORK
003202  005067  175644                  CLR     DMA
003206  005067  175676                  CLR     WORK1
003212  052777  000400  175574  RDTDN:  BIS     #BIT8,@DCS      ;CLEAR THE DISK
003220  104405                          READ
003222  105777  175566                  TSTB    @DCS            ;IS THE CONTROL READY
003226  100375                          BPL     .-4             ;YES THE CONTROL IS READY
003230  005777  175560                  TST     @DCS            ;IS THERE AN ERROR
003234  100011                          BPL     ADRCMP          ;NO ERROR
003236  012767  000007  175622          MOV     #7,ERCOUNT      ;SET UP ERROR COUNT
003244  017767  175544  175634          MOV     @DCS,WORK       ;FETCH CONTROL REG.
003252  004567  007046          ER7:    JSR     %5,STAER        ;REPORT CONTROL ERROR
                                        ;****WRD1=DISK CONTROL STATUS REG, AT THE TIME OF THE ERROR ****
003256  000755                          BR      RDTDN           ;RE-READ
003260  012767  014466  175602  ADRCMP: MOV     #OUTBUF,SAVE
```

C3

```
003266  027767  175576  175614  CMPNEX: CMP     @SAVE,WORK1       ;IS THE ADDRESS CORRECT
003274  001410                          BEQ     INCCMP            ;COMPARE NEXT WORD
003276  017767  175566  175602          MOV     @SAVE,WORK        ;FETCH LOAD ADDRESS
003304  012767  000010  175554          MOV     #10,ERCOUNT       ;SET UP ERROR COUNT
003312  004567  007054          ER10:   JSR     %5,STAER1         ;REPORT COMPARISON ERROR
                                ;****WRD1=DISK ADDR. WANTED ****
                                ;****WRD2=DISK ADDR. RECEIVED ****
003316  062767  000002  175544  INCCMP: ADD     #2,SAVE
003324  005267  175560                  INC     WORK1
003330  022767  016466  175532          CMP     #OUTBUF+2000,SAVE ;IS IT THE LAST ADDR INBUF
003336  001353                          BNE     CMPNEX            ;COMPARE NEXT WORD
003340  022767  004000  175542          CMP     #4000,WORK1       ;IS IT THE LAST ADDR. OF TRACK
003346  001404                          BEQ     LPADT3
003350  062767  001000  175474          ADD     #1000,DMA         ;SET UP FOR NEXT BUFFER
003356  000715                          BR      RDTDN             ;GO READ BUFFER
003360  032777  004000  175412  LPADT3: BIT     #BIT11,@SWR       ;LOOP ON TEST?
003366  001212                          BNE     ADT3              ;YES BIT 11 SET IN SWR
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;RF11 TRACK SELECTION TEST
                                ;
                                ;WRITE THE FIRST AND LAST ADDRESS OF EACH TRACK
                                ;WITH THE OCTAL VALUE OF EACH TRACK
                                ;BITS 0 THRU 6 EQUAL THE TRACK NUMBER
                                ;BIT 15 RESET EQUALS ADDR 0 OF THE TRACK
                                ;BIT 15 SET EQUALS ADDR 3777 OF THE TRACK
                                ;
                                ;AFTER WRITING THE DISK READ EACH ADDRESS
                                ;AND COMPARE DATA FOR THE CORRECT VALUE
                                ;
003370  005067  175456          ADT4:   CLR     DMA               ;CLEAR WORK REGISTERS
003374  005067  175450                  CLR     TRACK
003400  005067  011062                  CLR     OUTBUF
003404  012706  001000                  MOV     #1000,%6          ;SETUP STACK
003410  052777  000400  175376          BIS     #BIT8,@DCS        ;CLEAR THE DISK WORLD
003416  012767  014466  175432          MOV     #OUTBUF,BUF       ;SET CURRENT ADDRESS
003424  012767  000001  175414          MOV     #1,WRDCT          ;SET UP WORD COUNT
003432  104403                  INSWT:  WRITE                     ;GO WRITE
003434  105777  175354                  TSTB    @DCS              ;IS READY SET
003440  100375                          BPL     .-4               ;YES! WAIT FOR NOT BUSY
003442  005777  175346                  TST     @DCS              ;TEST FOR ERROR
003446  100011                          BPL     TSTTK             ;NO ERROR GO ON
003450  012767  000011  175410          MOV     #11,ERCOUNT       ;SET UP ERROR COUNT
003456  017767  175332  175422          MOV     @DCS,WORK         ;REPORT CONTENTS OF DCS REG
003464  004567  006634          ER11:   JSR     %5,STAER          ;REPORT ERROR OCCURRED
                                ;****WRD1=DISK CONTROL STATUS REG. AT THE TIME OF THE ERROR ****
003470  000760                          BR      INSWT             ;GO RE-WRITE
003472  022767  100177  010766  TSTTK:  CMP     #100177,OUTBUF    ;TEST FOR LAST ADDR.
003500  001427                          BEQ     INSRD             ;GO READ THE DATA
003502  032767  100000  010756          BIT     #BIT15,OUTBUF     ;IS IT ADDR ZERO
```

```
003510  001007                          BNE     MVNEM           ;NO
003512  052767  100000  010746          BIS     #BIT15,OUTBUF   ;YES! SET UP FOR LAST ALDR
003520  062767  003777  175324          ADD     #3777,DMA       ;SET UP FOR LAST ADDR
003526  000741                          BR      INSWT           ;GO WRITE
003530  042767  100000  010730  MVNEM:  BIC     #BIT15,OUTBUF   ;SET UP FOR ADDR ZERO
003536  005267  010724                  INC     OUTBUF          ;INC. TO NEXT TRACK
003542  062767  000001  175302          ADD     #1,DMA          ;INC. BAR
003550  103330                          BCC     INSWT           ;GO WRITE NO CARRY TO DAE
003552  005267  175272                  INC     TRACK           ;INC. DAE REG.
003556  000725                          BR      INSWT           ;GO WRITE
```

```
                                        ;
                                        ;READ THE FIRST AND LAST ADDRESS OF EACH TRACK
                                        ;AND VERIFY IT HAS THE CORRECT DATA

003560  005067  175266          INSRD:  CLR     DMA             ;CLEAR WORK REG.
003564  005067  175260                  CLR     TRACK
003570  005067  175274                  CLR     SAVE
003574  052777  000400  175212          BIS     #BIT8,@DCS      ;CLEAR THE DISK WORLD
003602  012767  015070  175246          MOV     #INBUF,BUF      ;SET UP CURRENT ADDR
003610  012767  000001  175230          MOV     #1,WRDCT        ;SET UP WORD COUNT
003616  104405                  RDTKS:  READ                    ;READ DATA
003620  105777  175170                  TSTB    @DCS            ;CHECK FOR READY
003624  100375                          BPL     .-4             ;CONTROL NOT READY
003626  005777  175162                  TST     @DCS            ;IS THERE AN ERROR
003632  100011                          BPL     CMPDTK          ;NO ERROR
003634  012767  000012  175224          MOV     #12,ERCOUNT     ;SET UP ERROR COUNT
003642  017767  175146  175236          MOV     @DCS,WORK       ;FETCH CONTENTS OF DCS
003650  004567  006450          ER12:   JSR     %5,STAER        ;REPORT CONTROL ERROR
                                        ;****WRD1=DISK CONTROL STATUS REG. AT THE TIME OF THE ERROR ****
003654  000760                          BR      RDTKS           ;GO RE-READ
003656  026767  175206  011204  CMPDTK: CMP     SAVE,INBUF      ;IS DATA CORRECT
003664  001413                          BEQ     CMNETK          ;YES SETUP FOR NEXT WORD
003666  016767  175176  175214          MOV     SAVE,WORK1      ;CORRECT ADDRESS
003674  016767  011170  175204          MOV     INBUF,WORK      ;INCORRECT DATA
003702  012767  000013  175156          MOV     #13,ERCOUNT     ;SET UP ERROR COUNT
003710  004567  006456          ER13:   JSR     %5,STAER1       ;REPORT SELECTION ERROR
                                        ;****WRD1=TRACK ADDR. WANTED ****
                                        ;****WRD2=TRACK ADDR. RECEIVED ****
003714  022767  100177  175146  CMNETK: CMP     #100177,SAVE    ;IS IT THE LAST ADDR
003722  001427                          BEQ     LPTSK           ;END OF TEST
003724  032767  100000  175136          BIT     #BIT15,SAVE     ;IS IT ADDR 0 OF THE TRACK
003732  001414                          BEQ     ZRBIT           ;NO! SETUP FOR LAST ADDR
003734  042767  100000  175126          BIC     #BIT15,SAVE     ;SET UP FOR ADDR ZERO
003742  005267  175122                  INC     SAVE            ;INC FOR TRACK NO.
003746  062767  000001  175076          ADD     #1,DMA          ;SET UP DAR
003754  103320                          BCC     RDTKS           ;GO READ NEXT TRACK ADDR
003756  005267  175066                  INC     TRACK           ;INC TRACK
003762  000715                          BR      RDTKS           ;GO READ
003764  052767  100000  175076  ZRBIT:  BIS     #BIT15,SAVE     ;SET UP FOR LAST ADDR
003772  062767  003777  175052          ADD     #3777,DMA       ;SET UP FOR LAST WORD
004000  000706                          BR      RDTKS           ;GO READ LAST ADDR OF TK
004002  032777  004000  174770  LPTSK:  BIT     #BIT11,@SWR     ;IS BIT 11 SET IN SWR
004010  001402                          BEQ     .+6             ;YES LOOP ON TEST
004012  000167  177352                  JMP     ADT4
```

```
                                        ;
                                        ;RF11 LOOK AHEAD TEST
                                        ;WRITE ONE WORD UPON RECEIPT OF
                                        ;NOT READY READ THE LOOK AHEAD
                                        ;REGISTER IT SHOULD CONTAIN THE
                                        ;ADDRESS +1
                                        ;
004016  005067  175030                  ADT5:   CLR     DMA             ;CLEAR REGISTERS
004022  005067  175022                          CLR     TRACK
004026  005067  175036                          CLR     SAVE
004032  012706  001000                          MOV     #1000,%6        ;SETUP STACK
004036  012767  000001  175002                  MOV     #1,WRDCT        ;SET UP FOR ONE WORD X-FER
004044  012767  014466  175004                  MOV     #OUTBUF,BUF     ;SET UP CURRENT ADDRESS
004052  052777  000400  174734  WRADT5:         BIS     #BIT8,@DCS      ;CLEAR THE DISK
004060  016700  174746                          MOV     ADS,%0
004064  016701  174724                          MOV     DCS,%1
004070  104403                                  WRITE                   ;WRITE
004072  011037  001106                  1$:     MOV     (0),@#WORK      ;FETCH LOOK AHEAD
004076  105711                                  TSTB    (1)             ;IS THE CONTROL BUSY
004100  100374                                  BPL     1$              ;CONTROL STILL BUSY
004102  005777  174706                          TST     @DCS            ;IS THERE AN ERROR
004106  100011                                  BPL     LPADT5          ;NO DISK ERRORS
004110  012767  000014  174750                  MOV     #14,ERCOUNT     ;SET UP ERROR COUNT
004116  017767  174672  174762                  MOV     @DCS,WORK       ;FETCH DCS FOR REPORT
004124  004567  006174                  ER14:   JSR     %5,STAER        ;REPROT CONTROL ERROR
                                        ;****WRD1=DISK CONTROL REG AT THE TIME OF THE ERROR ****
004130  000750                                  BR      WRADT5          ;LOOP ON ERROR
004132  016767  174714  174750  LPADT5: MOV     DMA,WORK1       ;IS LOOK AHEAD CORRECT
004140  026767  174744  174740                  CMP     WORK1,WORK
004146  001416                                  BEQ     INCADS          ;LOOK AHEAD OK
004150  005367  174732                          DEC     WORK            ;COMPARE FOR ADDRESS+1
004154  026767  174730  174724                  CMP     WORK1,WORK      ;
004162  001410                                  BEQ     INCADS          ;BRANCH IF EQUAL
004164  005267  174716                          INC     WORK
004170  012767  000015  174670                  MOV     #15,ERCOUNT
004176  004567  006170                  ER15:   JSR     %5,STAER1       ;REPORT LOOK AHEAD INCORRECT
                                        ;****WRD1=DISK ADDR. WANTED FROM LOOK AHEAD REG. ****
                                        ;****WRD2=DISK ADDR. RECEIVED FROM DISK LOOK AHEAD REG. ****
004202  000723                                  BR      WRADT5          ;LOOP ON ERROR
004204  022767  003777  174640  INCADS: CMP     #3777,DMA       ;IS IT THE LAST ADDR.
004212  001403                                  BEQ     XLPADT5         ;LAST ADDRESS EXIT
004214  005267  174632                          INC     DMA             ;+1 DMA
004220  000714                                  BR      WRADT5          ;CHECK NEXT ADDRESS
004222  032777  004000  174550  XLPADT5:BIT     #BIT11,@SWR     ;LOOP ON TEST
004230  001272                                  BNE     ADT5            ;YES LOOP ON TEST BIT 11 SET
```

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```
                                        ;       SPIRAL TESTS
                                        ;
                                        ;WRITE THE LAST WORD OF TRACK ZERO
                                        ;AND THE FIRST WORD OF TRACK ONE
                                        ;USING ONE WORD X-FERS
                                        ;DATE = 52525
004232  052777  000400  174554  SPIRAL: BIS     #BIT8,@DCS       ;CLEAR THE DISK
004240  012777  000340  174534          MOV     #340,@PS         ;LOCK UP PROCESSING
004246  012706  001000                  MOV     #1000,%6         ;SETUP STACK
004252  012767  000001  174566          MOV     #1,WRDCT         ;SET WORD COUNT TO 1
004260  005067  174564                  CLR     TRACK
004264  012767  003777  174560          MOV     #3777,DMA        ;LAST WORD OF TRACK ZERO
004272  012767  052525  010166          MOV     #52525,OUTBUF    ;SET UP DATA
004300  012767  014466  174550          MOV     #OUTBUF,BUF
004306  104403                          WRITE                    ;WRITE LAST ADDR TK ZERO
004310  105777  174500                  TSTB    @DCS             ;TEST FOR READY
004314  100375                          BPL     .-4              ;CONTROL STILL BUSY
004316  005777  174472                  TST     @DCS
004322  100011                          BPL     SPIL1
004324  012767  000016  174534          MOV     #16,ERCOUNT
004332  017767  174456  174546          MOV     @DCS,WORK
004340  004567  005760          ER16:   JSR     %5,STAER
                                        ;****WRD1=DISK CONTROL STATUS REG, AT THE TIME OF THE ERROR ****
004344  000732                          BR      SPIRAL
004346  005267  174500          SPIL1:  INC DMA
004352  104403                          WRITE                    ;WRITE FIRST ADDR, TK 1
004354  105777  174434                  TSTB    @DCS             ;WAIT FOR READY
004360  100375                          BPL     .-4              ;CONTROL STILL BUSY
004362  005777  174426                  TST     @DCS
004366  100011                          BPL     SPIL2
004370  012767  000017  174470          MOV     #17,ERCOUNT
004376  017767  174412  174502          MOV     @DCS,WORK
004404  004567  005714          ER17:   JSR     %5,STAER
                                        ;****WRD1=DISK CONTROL STATUS REG, AT THE TIME OF THE ERROR ****
004410  000710                          BR      SPIRAL
004412  005267  174430          SPIL2:  INC     WRDCT            ;SET UP FOR TWO WORD X-FER
004416  012767  003777  174426          MOV     #3777,DMA        ;START AT ADDR 3777
004424  012767  015070  174424          MOV     #INBUF,BUF       ;
004432  104405                          READ                     ;READ DATA
004434  105777  174354                  TSTB    @DCS             ;TEST FOR READY
004440  100375                          BPL     .-4              ;CONTROL STILL BUSY
004442  005777  174346                  TST     @DCS
004446  100011                          BPL     SPIL3
004450  012767  000020  174410          MOV     #20,ERCOUNT
004456  017767  174332  174422          MOV     @DCS,WORK
004464  004567  005634          ER20:   JSR     %5,STAER
                                        ;****WRD1=DISK CONTROL STATUS REG, AT THE TIME OF THE ERROR ****
004470  000660                          BR      SPIRAL
004472  022767  052525  010370  SPIL3:  CMP     #52525,INBUF     ;CMP ADDR DAR 3777
004500  001414                          BEQ     CMPX1            ;COMPARE SECOND WORD
004502  012767  000021  174356          MOV     #21,ERCOUNT      ;SETUP ERROR COUNT
004510  016767  010354  174370          MOV     INBUF,WORK       ;INCORRECT DATA
004516  012767  052525  174364          MOV     #52525,WORK1     ;CORRECT DATA
004524  004567  005642          ER21:   JSR     %5,STAER1        ;REPORT ADDR 377 HAE BAD DATA
```

H 3

```
                                        ;****WRD1=THE DATA THAT SHOULD HAVE BEEN IN ADDR, 3777****
                                        ;****WRD2=THE DATA READ FROM ADDR, 3777****
004530  000640                                  BR      SPIRAL          ;LOOP ON ERROR
004532  022767  052525  010332  CMPX1:  CMP     #52525,INBUF+2  ;COMPARE NEXT WORD
004540  001414                                  BEQ     LPSPI1          ;BRANCH IF DATA OK
004542  012767  000022  174316          MOV     #22,ERCOUNT     ;SETUP ERROR COUNT
004550  012767  052525  174332          MOV     #52525,WORK1    ;CORRECT DATA
004556  016767  010310  174322          MOV     INBUF+2,WORK    ;DATA READ FROM ADDR0 TK1
004564  004567  005602          ER22:   JSR     %5,STAER1       ;REPORT ERROR
                                        ;****WRD1=THE DATA THAT SHOULD BE IN ADDR, 0 OF TRACK 1 ****
                                        ;****WDR2=THE DATA READ FROMADDR,0 OF TRACK 1 ****
004570  000620                                  BR      SPIRAL          ;LOOP ON ERROR
004572  032777  004000  174200  LPSPI1: BIT     #BIT11,@SWR     ;LOOP ON TEST?
004600  001214                                  BNE     SPIRAL          ;YES BIT 11 SET IN SWR
```

```
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;       SPIRAL TEST EXT.
                                        ;
                                        ;WRITE TWO WORDS OF DATA
                                        ;STARTING WITH THE LAST ADDRESS OF TRACK0
                                        ;DATA PATTERN = 25252
                                        ;THEN READ THE DATA DOING ONE WORD
                                        ;X-FERS
004602  052777  000400  174204  XSPIRAL:        BIS     #BIT8,@DCS      ;CLEAR THE DISK
004610  012777  000340  174164          MOV     #340,@PS        ;LOCK UP PROCESSING
004616  012706  001000                  MOV     #1000,%6        ;SET UP STACK
004622  012767  025252  007636          MOV     #25252,OUTBUF   ;SET UP DATA WORD 1
004630  012767  025252  007632          MOV     #25252,OUTBUF+2 ;SET UP DATA WORD 2
004636  012767  000002  174202          MOV     #2,WRDCT        ;SET UP WORD COUNT
004644  012767  014466  174204          MOV     #OUTBUF,BUF     ;SET UP CMA
004652  005067  174172                  CLR     TRACK           ;SET UP DISK ADDR.
004656  012767  003777  174166          MOV     #3777,DMA
004664  104403                          WRITE                   ;WRITE DATA
004666  105777  174122                  TSTB    @DCS            ;TEST FOR READY
004672  100375                          BPL     .-4             ;CONTROL STILL BUSY
004674  005777  174114                  TST     @DCS            ;TEST FOR ERROR
004700  100011                          BPL     X1SPIL          ;BRANCH IF NO ERROR
004702  017767  174106  174176          MOV     @DCS,WORK
004710  012767  000023  174150          MOV     #23,ERCOUNT     ;SET UP ERROR COUNT
004716  004567  005402          ER23:   JSR     %5,STAER        ;REPORT CONTROL ERROR
                                        ;****WRD1=DISK CONTROL STATUS REG. AT THE TIME OF THE ERROR ****
004722  000727                          BR      XSPIRAL
004724  005367  174116          X1SPIL: DEC     WRDCT           ;SET UP FOR 1 WORD X-FER
004730  012767  003777  174114          MOV     #3777,DMA       ;SET UP DAR
004736  012767  015070  174112          MOV     #INBUF,BUF      ;SET UP CMA
004744  104405                          READ                    ;READ DAR 3777
004746  105777  174042                  TSTB    @DCS            ;TEST FOR NOT READY
004752  100375                          BPL     .-4             ;CONTROL STILL BUSY
004754  005777  174034                  TST     @DCS            ;TEST FOR ERROR
004760  100011                          BPL     X2SPIL          ;BRANCH IF NO ERROR
004762  012767  000024  174076          MOV     #24,ERCOUNT     ;SET UP ERROR COUNT
004770  017767  174020  174110          MOV     @DCS,WORK       ;REPORT CONTROL REG
004776  004567  005322          ER24:   JSR     %5,STAER
                                        ;****WRD1=DISK CONTROL STATUS REG. AT THE TIME OF THE THE ERROR ****
005002  000677                          BR      XSPIRAL         ;LOOP ON ERROR
005004  022767  025252  010056  X2SPIL: CMP     #25252,INBUF    ;IS ADDR 3777 CORRECT
005012  001414                          BEQ     X3SPIL          ;BRANCH IF NOT EQUAL
005014  012767  000025  174044          MOV     #25,ERCOUNT     ;SET UP ERROR COUNT
005022  012767  025252  174060          MOV     #25252,WORK1    ;GOOD DATA
005030  016767  010034  174050          MOV     INBUF,WORK      ;DATA DATA
005036  004567  005330          ER25:   JSR     %5,STAER1       ;REPORT ERROR
                                        ;****WRD1=THE DATA THAT SHOULD BE IN ADDR.3777 OF TRACK 0 ****
                                        ;****WRD2=THE DATA THAT WAS READ FROM ADDR. 3777 OF TRACK 0 ****
005042  000657                          BR      XSPIRAL         ;LOOP ON ERROR
```

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005044  005267  174002          X3SPIL: INC     DMA             ;SET UP TO READ ADDR 4000
005050  104405                          READ                    ;READ DATA
005052  105777  173736                  TSTB    @DCS            ;TEST FOR READY
005056  100375                          BPL     .-4             ;CONTROL STILL BUSY
005060  005777  173730                  TST     @DCS            ;TEST FOR ERROR
005064  100011                          BPL     X4SPIL          ;BRANCH IF NO ERROR
005066  012767  000026  173772          MOV     #26,ERCOUNT     ;SET UP ERROR COUNT
005074  017767  173714  174004          MOV     @DCS,WORK       ;REPORT CONTROL REG.
005102  004567  005216          ER26:   JSR     %5,STAER        ;REPORT ERROR
                                ;****WRD1=DISK CONTROL STATUS REG. AT THE TIME OF THE ERROR ****
005106  000635                          BR      XSPIRAL         ;LOOP ON ERROR
```

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```
005110  022767  025252  007752  X4SPIL: CMP     #25252,INBUF     ;CMP DATA
005116  001414                          BEQ     LPXSPIL          ;BRANCH IF DATA OK
005120  012767  000027  173740          MOV     #27,ERCOUNT      ;SET UP ERROR COUNT
005126  012767  025252  173754          MOV     #25252,WORK1     ;GOOD DATA
005134  016767  007730  173744          MOV     INBUF,WORK       ;DATA DATA
005142  004567  005224          ER27:   JSR     %5,STAER1        ;REPORT ERROR
                                ;****WRD1=THE DATA THAT SHOULD BE IN ADDR. 0 OF TRACK 1 ****
                                ;****WRD2=THE DATA THAT WAS READ FROM ADDR. 0 OF TRACK 1 ****
005146  000615                          BR      XSPIRAL          ;LOOP ON ERROR
005150  032777  004000  173622  LPXSPIL:BIT     #BIT11,@SWR      ;LOOP ON TEST?
005156  001211                          BNE     XSPIRAL          ;YES BIT11 SET IN SWR,
005160  005067  173666          CLRREG: CLR     DMA              ;CLEAR WORD ADDRESS
005164  005067  173660                  CLR     TRACK            ;CLEAR TRACK ADDRESS
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;
005170  012706  001000          DATAT:  MOV     #1000,%6         ;SET UP STACK
005174  012777  000340  173600          MOV     #340,@PS         ;LOCK UP PROCESSOR
005202  004567  003426                  JSR     %5,EXTMEM        ;SET UP BUFFER SIZES
005206  016767  173652  173632          MOV     SWRDCT,WRDCT
005214  012767  005234  173656          MOV     #LDAT,HRDER      ;SETUP FOR HARD ERROR
005222  012777  000340  173552          MOV     #340,@PS         ;LOCK UP PROCESSOR PRIORITY
005230  004567  002364                  JSR     %5,PASEL         ;SET UP DATA BUFFERS
005234  004567  001614          LDAT:   JSR     %5,OPDSEL        ;SET UP DISK ADDRESS
005240  032767  040000  173574          BIT     #BIT14,FLAG      ;TEST FOR WRITE
005246  001416                          BEQ     SLH              ;TEST FOR WRITE CHECK
005250  012767  014466  173600          MOV     #OUTBUF,BUF      ;SETUP OUTPUT BUFFER
005256  104503                          WRITE   +100             ;WRITE WITH INT. ENABLED
005260  032777  001000  173512          BIT     #BIT9,@SWR       ;FIND OUT HOW TO WAIT FOR INT
005266  001002                          BNE     WRWAIT           ;WAIT WITH WAIT INSTRUCTION
005270  000004                          IOT                      ;WAIT IN BACKGROUND TEST
005272  000404                          BR      SLH
005274  016777  173540  173500  WRWAIT: MOV     PRIORITY,@PS
005302  000001                          WAIT                     ;WAIT FOR FLAG
005304  032767  020000  173530  SLH:    BIT     #BIT13,FLAG      ;TEST FOR WRITE CHECK
005312  001421                          BEQ     ESH              ;TEST FOR READ
005314  012767  014466  173534          MOV     #OUTBUF,BUF      ;SETUP  OUTPUT BUFFER
005322  012777  000340  173452          MOV     #340,@PS
005330  104507                          WRCHECK +100             ;WRITE CHECK WITH INT. ENABLE
005332  032777  001000  173440          BIT     #BIT9,@SWR       ;FINDOUT HOW TO WAIT FOR INT.
005340  001002                          BNE     WCWAIT           ;WAIT WITH WAIT INSTRUCTION
005342  000004                          IOT                      ;WAIT IN BACKGROUND TEST
005344  000404                          BR      ESH
005346  016777  173466  173426  WCWAIT: MOV     PRIORITY,@PS
005354  000001                          WAIT                     ;WAIT FOR FLAG
005356  032767  010000  173456  ESH:    BIT     #BIT12,FLAG      ;TEST FOR READ
005364  001452                          BEQ     REH              ;CHECK BUFFER
```

```
879  005366  016767  173512  173462          MOV     INPUT,BUF        ;SETUP INPUT BUFFER
880  005374  042767  000003  173440          BIC     #3,FLAG          ;CLEAR RE-READ COUNT
```

```
881
882  005402  012777  000340  173372  DSKRD:  MOV     #340,@PS
883  005410  004567  003014                  JSR     %5,ZBUF          ;CLEAR BUFFER
884  005414  005267  173422                  INC     FLAG
885  005420  104505                          READ    +100             ;READ + INT ENABLE
886  005422  032777  001000  173350          BIT     #BIT9,@SWR       ;FIND OUT HOW TO WAIT FOR INT.
887  005430  001002                          BNE     RDWAIT           ;WAIT WITH WAIT INSTRUCTION
888  005432  000004                          IOT
889  005434  000404                          BR      FLH
890  005436  016777  173376  173336  RDWAIT: MOV     PRIORITY,@PS     ;SET UP PRIORITY
891  005444  000001                          WAIT                     ;WAIT FOR FLAG
892  005446  032777  010000  173324  ELH:    BIT     #BIT12,@SWR
893  005454  001002                          BNE     ADRD
894  005456  004567  002430                  JSR     %5,COMPARE       ;COMPARE OUTBUFFER TO INBUFFER
895  005462  004567  003000          ADRD:   JSR     %5,OVRFLO        ;TEST FOR EXTRA DATE BREAKS
896  005466  016767  173350  173412          MOV     FLAG,WORK        ;CHECK DISK RE-READ COUNT
897  005474  042767  177774  173404          BIC     #177774,WORK     ;DO 3 RE-READS.
898  005502  022767  000003  173376          CMP     #3,WORK
899  005510  001334                          BNE     DSKRD            ;DO ANOTHER RE-READ
900  005512  032777  000400  173260  REH:    BIT     #BIT8,@SWR
901  005520  001223                          BNE     DATAT
902  005522  004767  001514                  JSR     %7,DISBUF        ;GO SET UP DISK BUFFER.
903  005526  000642                          BR      LDAT
904  005530  005767  173306          MSTR:   TST     FLAG
905  005534  100002                          BPL     .+6              ;UNDER PROGRAM CONTROL
906  005536  000167  000576                  JMP     EXTPP            ;OPERATOR SELECTED PATTERN
907  005542  062767  000002  173304          ADD     #2,PATNU         ;INC PATTERN INDEX
908  005550  022767  000044  173276          CMP     #44,PATNU
909  005556  001204                          BNE     DATAT            ;NOT LAST PATTERN EXIT
910  005560  005067  173270                  CLR     PATNU            ;LAST PATTERN EXIT
```

```
                                        ;
                                        ;THIS IS A RANDOM DATA, RANDOM ADDRESS
                                        ;AND RANDOM WORD COUNT
                                        ;
                                        ;WORD COUNT CAN BE EQUAL TO OR LESS THAN 1000 WORDS
                                        ;
005564  012767  177000  173310  RANEX:  MOV     #-1000,PASSC
005572  012706  001000                  MOV     #1000,%6
005576  042767  001000  173236          BIC     #BIT9,FLAG
005604  012767  006072  173266          MOV     #RANER,HRDER    ;SET UP FOR HARD ERROR
005612  016777  173222  173162          MOV     PRIORITY,@PS    ;SET PRIORITY TO LEVEL 5
005620  012767  000003  173260  WRLG:   MOV     #3,WORK         ;GENERATE RANDOM WORD
005626  012701  014466                  MOV     #OUTBUF,%1
005632  004567  002062                  JSR     %5,RANDOM
005636  042767  177000  006622          BIC     #177000,OUTBUF  ;MASK FOR WORD LENGTH=1K
005644  001765                          BEQ     WRLG
005646  016767  006614  173172          MOV     OUTBUF,WRDCT    ;SET UP WORD COUNT
005654  016767  006610  173170          MOV     OUTBUF+2,DMA    ;SET UP DAR
005662  066767  173160  173162          ADD     WRDCT,DMA
005670  103753                          BCS     WRLG
005672  016767  006572  173152          MOV     OUTBUF+2,DMA
005700  042767  177774  006564          BIC     #177774,OUTBUF+4
005706  016767  006560  173134          MOV     OUTBUF+4,TRACK  ;SET UP DAE
005714  016767  173126  173164          MOV     WRDCT,WORK      ;GENERATE RANDOM
005722  012701  014466                  MOV     #OUTBUF,%1      ;DATA BUFFER
005726  004567  001766                  JSR     %5,RANDOM
005732  012767  014466  173116          MOV     #OUTBUF,BUF
005740  052777  000400  173046          BIS     #BIT8,@DCS      ;CLEAR THE DISK
005746  104503                          WRITE   +100            ;WRITE DATA
005750  032777  001000  173022          BIT     #BIT9,@SWR
005756  001002                          BNE     .+6
005760  000004                          IOT
005762  000404                          BR      .+12
005764  016777  173050  173010          MOV     PRIORITY,@PS
005772  000001                          WAIT
005774  104507                          WRCHECK +100            ;WRITE CHECK DATA
005776  032777  001000  172774          BIT     #BIT9,@SWR
006004  001002                          BNE     .+6
006006  000004                          IOT
006010  000404                          BR      .+12
006012  016777  173022  172762          MOV     PRIORITY,@PS
006020  000001                          WAIT
006022  016767  173056  173026          MOV     INPUT,BUF       ;SET UP BUFFER
006030  004567  002374                  JSR     %5,ZBUF         ;CLEAR BUFFER AREA
006034  104505                          READ    +100            ;READ DATA
006036  032777  001000  172734          BIT     #BIT9,@SWR
006044  001002                          BNE     .+6
006046  000004                          IOT
006050  000404                          BR      .+12
006052  016777  172762  172722          MOV     PRIORITY,@PS
006060  000001                          WAIT
006062  004567  002024                  JSR     %5,COMPARE      ;COMPARE OUT BUFFER TO IN BUFFER
006066  004567  002374                  JSR     %5,OVRFLO       ;TEST FOR EXTRA DATA BREAKS
```

```
006072  032767  001000  172742  RANER:  BIT     #BIT9,FLAG      ;CHECK FOR ERROR
006100  001430                          BEQ     EXRAX
006102  042767  001000  172732          BIC     #BIT9,FLAG
006110  004567  004620                  JSR     %5,CONV
006114  001052                          DMA
006116  013567                          MES1
006120  000006                          6
006122  004567  004606                  JSR     %5,CONV
006126  001050                          TRACK
006130  013603                          MES1A
006132  000002                          2
006134  004567  004574                  JSR     %5,CONV
006140  001046                          WRDCT
006142  013646                          MES3
006144  000004                          4
006146  104000                          EMT+0
006150  013553                          MED6
006152  013603                          MES1A
006154  013567                          MES1
006156  013646                          MES3
006160  177777                          -1
006162  005267  172714          EXRAX:  INC     PASSC           ;HAVE WE DONE IT 1000 TIMES
006166  001214                          BNE     WRLG            ;BRANCH IF NO
006170  032777  004000  172602          BIT     #BIT11,@SWR     ;LOOP ON TEST
006176  001402                          BEQ     .+6             ;BRANCH IF YES
006200  000167  177360                  JMP     RANEX
```

```
                                        ;
                                        ;CHECK FOR MULTI DISK MODE
                                        ;IF IN MULTI DISK MODE REPORT "END"
                                        ;IF LAST DISK ON SYSTEM HAS BEEN
                                        ;EXERCISED.
                                        ;
                                        ;
006204  005067  172642                          CLR     DMA
006210  005067  172634                          CLR     TRACK
006214  032767  004000  172620                  BIT     #BIT11,FLAG     ;ARE WE IN MULTI DISK MODE
006222  001432                                  BEQ     REPOEN          ;REPORT "END"
006224  016767  172612  172654  CHKDOS:        MOV     FLAG,WORK       ;WHAT DISK ARE WE ON
006232  042767  177743  172646                  BIC     #177743,WORK    ;IF LAST DISK ON SYSTEM
006240  026767  172642  172630                  CMP     WORK,DSKNOR     ;REPORT END
006246  001420                                  BEQ     REPOEN          ;REPORT "END" LAST DISK
006250  016703  172632                          MOV     WORK,%3         ;SET UP INDEX POINTER
006254  000241                                  CLC
006256  006003                                  ROR     %3
006260  022763  000020  013426                  CMP     #20,TABLE(3)    ;WHAT IS ERROR COUNT?
006266  101004                                  BHI     DRVEROK         ;LESS THAN 20(8)-CONTINUE
006270  062767  000004  172544                  ADD     #4,FLAG
006276  000752                                  BR      CHKDOS
006300  062767  000004  172534  DRVEROK:        ADD     #4,FLAG         ;INC. DISK NO.
006306  000414                                  BR      EXTPP           ;EXERCISE DISK
006310  104001                          REPOEN: EMT     +1
006312  014347                                  END                     ;REPORT END OF PASS
006314  042767  000034  172520                  BIC     #34,FLAG
006322  013700  000042                          MOV     @#42,%0         ;WAS THIS A MONITOR LOAD?
006326  001404                                  BEQ     EXTPP           ;NO - RECYCLE
006330  004710                          LOGICAL: JSR    %7,(0)
006332  000240                                  NOP
006334  000240                                  NOP
006336  000240                                  NOP
006340  000167  173512                  EXTPP:  JMP     ADTST           ;RECYCLE
                                        ;
                                        ;ENTER DISK HANDLER BY THE TRAP INSTRUCTION
                                        ;ARGUMENT TO TRAP INSTRUCTION IS TWO ORDER
                                        ;BYTE OF THE CONTROL REGISTER.
                                        ;
006344  016705  172456                  DISK:   MOV     DBR,%5          ;SET UP TO LOAD DISK REG
006350  016745  172474                          MOV     TRACK,-(5)      ;LOAD TRACK NUMBER
006354  016767  172462  172524                  MOV     FLAG,WORK       ;SET UP DISK NO.
006362  042767  177743  172516                  BIC     #177743,WORK    ;MASK FORM PROGRAM FLAG
006370  056715  172512                          BIS     WORK,(5)        ;LOAD UNIT INTO DAE
006374  016745  172452                          MOV     DMA,-(5)        ;LOAD WORD ADDRESS
006400  016745  172452                          MOV     BUF,-(5)        ;SET UP CURRENT ADDRESS
006404  016745  172436                          MOV     WRDCT,-(5)      ;LOAD WORD COUNT
006410  005115                                  COM     (5)             ;SET UP TWO'S COMPLEMENT
006412  005215                                  INC     (5)
006414  011604                                  MOV     (6),%4
006416  014467  172464                          MOV     -(4),WORK       ;
006422  042767  177600  172456                  BIC     #177600,WORK    ;MASK FUNCTION BITS
006430  016745  172452                          MOV     WORK,-(5)       ;LOAD FUNCTION REG.
006434  000002                                  RTI                     ;RETURN FROM TRAP
```

```
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;RF11 DISK INTERRUPT HANDLER
                                        ;ROUTINE CONTINUES ON ERRORS
                                        ;
006436  005046                          DKINT:  CLR     -(6)            ;CLEAR STACK
006440  012746  006446                          MOV     #18,-(6)        ;SET RETURN
006444  000002                                  RTI                     ;CLEAR T BIT
006446  005777  172342                  18:     TST     @DCS            ;TEST FOR ERROR
006452  100164                                  BPL     INTEXT          ;BR IF NO ERROR.
006454  004767  004724                          JSR     %7,INCTAB       ;INC. ERROR COUNT
006460  052767  001000  172354                  BIS     #BIT9,FLAG      ;SET ERROR BIT
006466  017767  172332  172412                  MOV     @DAE,WORK       ;REPORT ERROR
006474  042767  177700  172404                  BIC     #177700,WORK    ;MASK ADDRESS EXT. BITS.
006502  004567  004226                          JSR     %5,CONV         ;CONVERT TO ASCII
006506  001106                                  WORK
006510  013603                                  MES1A
006512  000002                                  2
006514  104001                                  EMT+1
006516  013465                                  MED2
006520  017767  172270  172360                  MOV     @DCS,WORK       ;TEST FOR READ
006526  042767  177770  172352                  BIC     #177770,WORK
006534  022767  000004  172344                  CMP     #4,WORK
006542  001015                                  BNE     DELMES          ;IF READING REPORT WHICH HEAD
006544  016767  172272  172334                  MOV     FLAG,WORK
006552  042767  177774  172326                  BIC     #177774,WORK
006560  004567  004150                          JSR     %5,CONV
006564  001106                                  WORK
006566  014017                                  MES13
006570  000001                                  1
006572  104001                                  EMT+1
006574  014017                                  MES13
```

E4

```
006576  017767  172220  172302  DELMES: MOV     @DAR,WORK       ;SET UP LOWER 16 BITS OF ADDR.
006604  005367  172276                  DEC     WORK
006610  004567  004120                  JSR     %5,CONV         ;CONVERT TO ASCII
006614  001106                          WORK
006616  013567                          MES1
006620  000006                          6
006622  104000                          EMT+0
006624  013603                          MES1A
006626  013567                          MES1
006630  177777                          -1
006632  017767  172156  172246          MOV     @DCS,WORK       ;SET UP STATUS
006640  004567  004070                  JSR     %5,CONV
006644  001106                          WORK
006646  013613                          MES2
006650  000006                          6
006652  104001                          EMT+1
006654  013613                          MES2
006656  032777  040000  172130          BIT     #BIT14,@DCS     ;TEST FOR HARD ERROR
006664  001435                          BEQ     SOFTER          ;GO AND CONTINUE SOFT ERROR
006666  017767  172132  172212          MOV     @DAE,WORK       ;FETCH ERROR EXT. BITS
006674  000367  172206                  SWAB    WORK
006700  042767  177400  172200          BIC     #177400,WORK
006706  004567  004022                  JSR     %5,CONV         ;CONVERT TO ASCII
006712  001106                          WORK
006714  013627                          MES2A
006716  000003                          3
006720  104000                          EMT+0
006722  013534                          MED5A
006724  013627                          MES2A
006726  177777                          -1
006730  052777  000400  172056          BIS     #BIT8,@DCS      ;CLEAR THE DISK
006736  012706  001000                  MOV     #1000,%6
006742  032777  002000  172030          BIT     #BIT10,@SWR     ;HALT ON ERROR
006750  001401                          BEQ     .+4
006752  000000                          HALT                    ;YES HALT BIT 10 SET IN SWR
006754  000177  172120                  JMP     @HRDER          ;EXIT HARD ERROR
006760  005777  172032          SOFTER: TST     @WC             ;CHECK FOR X-FER DONE
006764  001417                          BEQ     INTEXT          ;EXIT FROM ROUTINE
006766  032777  001000  172004          BIT     #BIT9,@SWR
006774  001402                          BEQ     .+6
006776  162716  000002                  SUB     #2,(6)          ;X-FER NOT DONE SET UP FOR RETURN
007002  032777  002000  171770          BIT     #BIT10,@SWR     ;HALT ON ERROR
007010  001401                          BEQ     .+4
007012  000000                          HALT                    ;YES HALT BIT10 SET IN SWR
007014  052777  000001  171772          BIS     #BIT0,@DCS      ;SET GO AND CONTINUE
007022  000002                          RTI                     ;RETURN TO WAIT INSTR.
                                ;
                                ;
007024  032777  020000  171746  INTEXT: BIT     #BIT13,@SWR     ;HALT ON COMPLETION FLAG
007032  001401                          BEQ     .+4
007034  000000                          HALT                    ;YES BIT 13 SET IN SWR HALT
007036  032777  001000  171734          BIT     #BIT9,@SWR
007044  001002                          BNE     .+6
```

```
  1136  007046  012706  000774                    MOV     #774,%6          ;RESET STACK
  1137  007052  000002                            RTI                      ;EXIT
```

```
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;ROUTINE TO SET UP DAR AND DAE
                                        ;FROM SWR AND CONVERSATION
                                        ;ENTER FROM JSR %5,OPDSEL
007054  032777  000200  171716  OPDSEL: BIT     #BIT7,@SWR        ;DOES SWR CONTAIN TRACK 0
007062  001001                          BNE     .+4
007064  000205                          RTS     %5
007066  017767  171706  172012          MOV     @SWR,WORK         ;FETCH SWR
007074  006067  172006                  ROR     WORK
007100  006067  172002                  ROR     WORK
007104  006067  171776                  ROR     WORK
007110  006067  171772                  ROR     WORK
007114  006067  171766                  ROR     WORK
007120  042767  177774  171760          BIC     #177774,WORK      ;MASK AIGL ORDER 2 BITS
007126  016767  171754  171714          MOV     WORK,TRACK
007134  017767  171640  171744          MOV     @SWR,WORK
007142  006167  171740                  ROL     WORK
007146  006167  171734                  ROL     WORK
007152  006167  171730                  ROL     WORK
007156  006167  171724                  ROL     WORK
007162  006167  171720                  ROL     WORK
007166  006167  171714                  ROL     WORK
007172  006167  171710                  ROL     WORK
007176  006167  171704                  ROL     WORK
007202  006167  171700                  ROL     WORK
007206  006167  171674                  ROL     WORK
007212  006167  171670                  ROL     WORK
007216  042767  003777  171662          BIC     #003777,WORK
007224  042767  174000  171620          BIC     #174000,DMA
007232  066767  171650  171612          ADD     WORK,DMA          ;SET UP LOWER 16 BITS OF ADDRESS
007240  000205                          RTS     %5                ;EXIT
```

```
                                        ;
                                        ;ROUTINE TO SETUP DISK BUFFERS
                                        ;ADD WORD COUNT TO STARTING DISK ADDRESSES
                                        ;COMPARE CALCULATED ADDRESS TO TERMINATING ADDRESS
                                        ;
007242  066767  171600  171602  DISBUF: ADD     WRDCT,DMA        ;ADD WORD COUNT TO LOWER 16 BITS
007250  103002                          BCC     COMDAR
007252  005267  171572                  INC     TRACK            ;OVERFLOW ADD ONE TO TRACK
007256  026777  171570  171536  COMDAR: CMP     DMA,@DAR         ;COMPARE LOWER 16 BITS
007264  001403                          BEQ     CMDAE
007266  052767  000100  171546          BIS     #BIT6,FLAG
                                        ;
007274  017767  171524  171606  CMDAE:  MOV     @DAE,WORK1       ;FETCH EXT. ADDR BITS
007302  042767  177740  171600          BIC     #177740,WORK1    ;MASK TRACK AND DISK ADDR
007310  016767  171526  171570          MOV     FLAG,WORK        ;SET UP DISK ADDRESS
007316  042767  177743  171562          BIC     #177743,WORK
007324  066767  171520  171554          ADD     TRACK,WORK
007332  042767  177740  171546          BIC     #177740,WORK
007340  026767  171542  171542          CMP     WORK,WORK1       ;ARE THEY EQUAL
007346  001066                          BNE     ERADR            ;ERROR IN DAE REG
007350  105767  171466                  TSTB    FLAG             ;CHECK FOR LAST DISK BUFFER
007354  100015                          BPL     EXTCME
007356  005067  171470                  CLR     DMA              ;CLEAR LOWER 16 BITS
007362  005067  171462                  CLR     TRACK            ;CLEAR EXT. ADDR. BITS.
007366  042767  000200  171446          BIC     #200,FLAG
007374  062716  000002                  ADD     #2,(6)           ;INC STOCK POINTER
007400  016767  171460  171440          MOV     SWRDCT,WRDCT
007406  000445                          BR      EXTDR            ;EXIT
007410  042767  177774  171472  EXTCME: BIC     #177774,WORK1    ;MASK EXT. TRACK BITS
007416  022767  000003  171464          CMP     #3,WORK1         ;COMPARE FOR LAST TRACK
007424  001021                          BNE     AKH              ;NOT LAST TRACK EXIT
007426  017767  171370  171452          MOV     @DAR,WORK        ;FETCH LOWER 16 BITS OF ADDRESS
007434  066767  171406  171444          ADD     WRDCT,WORK       ;WILL DISK OVERFLOW
007442  103012                          BCC     AKH
007444  052767  000200  171370          BIS     #200,FLAG
007452  017767  171344  171366          MOV     @DAR,WRDCT       ;DISK WILL OVERFLOW
007460  005167  171362                  COM     WRDCT            ;SET UP NEW WORD COUNT
007464  005267  171356                  INC     WRDCT            ;MAKE TWO'S COMP.
007470  017767  171330  171352  AKH:   MOV     @DAE,TRACK
007476  042767  177774  171344          BIC     #177774,TRACK    ;MASK TRACK BITS
007504  017767  171312  171340          MOV     @DAR,DMA         ;LOWER 16 BITS OF ADDRESS
007512  032767  000100  171322          BIT     #BIT6,FLAG       ;REPORT ADDRESS ERROR
007520  001001                          BNE     .+4
007522  000207                  EXTDR:  RTS     %7               ;EXIT
007524  004567  003204          ERADR:  JSR     %5,CONV          ;CONVERT DMA REG COUNT TO ASCII
007530  001052                          DMA
007532  013567                          MES1
007534  000006                          6
007536  004567  003172                  JSR     %5,CONV          ;CONVERT TRACK REG COUNT TO ASCII
007542  001110                          WORK1
007544  013603                          MES1A
007546  000002                          2
007550  104000                          EMT     +0               ;REPORT ERROR
```

```
  007552  013516                          HED4
  007554  013603                          MES1A
  007556  013567                          MES1
  007560  177777                          -1
  007562  004767  003616                  JSR     %7,INCTAB       ;INC ERROR COUNT
  007566  042767  000100  171246          BIC     #BIT6,FLAG
  007574  005067  171252                  CLR     DMA             ;DISK ADDRESS ERROR RE-START PROG.
  007600  005067  171244                  CLR     TRACK
  007604  032777  002000  171166          BIT     #BIT10,@SWR     ;HALT ON ERROR
  007612  001401                          BEQ     .+4
  007614  000000                          HALT                    ;SWITCH 10 SET IN SWR HALT
  007616  000207                          RTS     %7
```

```
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;ROUTINE TO SELECT DATA PATTERNS FOR TEST
                                        ;
                                        ;ENTER FROM JSR %5 PASEL
                                        ;
007620  016767  171230  003166  PASEL:  MOV     PATNU,ACNVX     ;SET UP PATTERN NUMBER
007626  006067  003162                  ROR     ACNVX           ;NORMALIZE
007632  004567  003076                  JSR     %5,CONV         ;CONVERT TO ASCII
007636  013014                          ACNVX
007640  014401                          PATMES
007642  000002                          2                       ;PRINT CURRENT PATTERN
007644  104000                          EMT+0
007646  014405                          PATHED
007650  014401                          PATMES
007652  177777                          -1
007654  016700  171174                  MOV     PATNU,%0
007660  016767  171162  171220          MOV     WRDCT,WORK      ;SET UP WORK
007666  012701  014466                  MOV     #OUTBUF,%1      ;LOC. OF OUTBUFFER
007672  022700  000042                  CMP     #42,%0          ;TEST FOR RANDOM DATA NUMBER
007676  001410                          BEQ     RANDOM          ;GO GENERATE RANDOM DATA
007700  016021  010050          FILDAT: MOV     PAT0(0),(1)+    ;FILL BUFFER
007704  005367  171176                  DEC     WORK            ;DEC. WORK COUNT
007710  005767  171172                  TST     WORK            ;TEST FOR LAST WORK
007714  001371                          BNE     FILDAT          ;LOAD NEXT WORD
007716  000205                          RTS     %5              ;BUFFER FULL
                                        ;
                                        ;RANDOM DATA
                                        ;
                                        ;
                                        ;
                                        ;RANDOM DATA GENERATOR SUBROUTINE
007720  016700  000120          RANDOM: MOV     LONUM,%0        ;SET UP R0 WITH 5 DIGITS LOW
007724  016704  000116                  MOV     HINUM,%4        ;SET UP R1 WITH 5 DIGITS HIGH
007730  012703  000007                  MOV     #7,%3           ;SET UP SHIFT COUNT
007734  005002                          CLR     %2              ;CLEAR R2
007736  006300                  SHIFT:  ASL     %0              ;SHIFT R0 LEFT AND
007740  006104                          ROL     %4              ;ROTATE CARRY INTO LSB OF R1 INTO
007742  006102                          ROL     %2              ;ROTATE CARRY OUT OF R1 INTO R2
007744  005303                          DEC     %3              ;DECREMENT R3
007746  001373                          BNE     SHIFT           ;CONTINUE SHIFT LOOP
007750  066700  000070                  ADD     LONUM,%0        ;ADDN IN NUMBER TO MAKE X 129
007754  005504                          ADC     %4              ;PROPOGATE CARRY
007756  066704  000064                  ADD     HINUM,%4        ;ADDN IN NUMBER TO MAKE X 129
007762  005502                          ADC     %2              ;PROPOGATE CARRY
007764  062700  001057                  ADD     #1057,%0        ;ADDN LOW CONSTANT
007770  005504                          ADC     %4              ;PROPOGATE CARRIES
007772  005502                          ADC     %2              ;PROPOGATE AGAN
```

K 4

```
007774  062704  047401                  ADD     #47401,%4       ;ADDN HIGH CONSTANT
010000  005502                          ADC     %2              ;PROPOGATE CARRY
010002  062702  000006                  ADD     #6,%2           ;ADDN HIGHEST CONSTANT
010006  060200                          ADD     %2,%0           ;REPRIME R0 WITH HIGH DIGIT
010010  005504                          ADC     %4              ;PROPOGATE CARRY
010012  010067  000026                  MOV     %0,LONUM        ;PUT R0 BACK IN LONUM

010016  010021                          MOV     %0,(1)+         ;HOLD LONUM FOR PROGRAM
010020  005367  171062                  DEC     WORK
010024  001406                          BEQ     EXGEN
010026  010467  000014                  MOV     %4,HINUM        ;PUT R1 BACK IN HINUM
010032  010421                          MOV     %4,(1)+         ;HOLD HINUM FOR PROGRAM
010034  005367  171046                  DEC     WORK
010040  001327                          BNE     RANDOM
010042  000205                  EXGEN:  RTS     %5              ;RETURN T PROGRAM
010044  000000                  LONUM:  0
010046  000000                  HINUM:  0
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;
```

```
                                                        .EVEN
                                                ;
                                                ;RF11 DATA PATTERNS
                                                ;
010050  000000                                  PAT0:   0
010052  177777                                  PAT1:   177777
010054  134510                                  PAT2:   134510
010056  043267                                  PAT3:   043267
010060  100000                                  PAT4:   100000
010062  107070                                  PAT5:   107070
010064  070707                                  PAT6:   070707
010066  052525                                  PAT7:   052525
010070  125252                                  PAT10:  125252
010072  177737                                  PAT11:  177737
010074  004102                                  PAT12:  004102
010076  136363                                  PAT13:  136363
010100  063636                                  PAT14:  063636
010102  000001                                  PAT15:  000001
010104  100005                                  PAT16:  100005
010106  000520                                  PAT17:  000520
010110  030303                                  PAT20:  030303
                                                ;PAT21  RANDOM DATA
                                                ;
                                                ;
                                                ;
                                                ;DATA COMPARISON ROUTINE
                                                ;IF AN ERROR OCCURS BETWEEN THE OUT-BUFFER AND
                                                ;THE IN-BUFFER AN ERROR WILL BE REPORTED IN THE
                                                ;FOLLOWING MANNER
                                                ;DATA ERROR XX DAE XXXXXX DAR XXXXXX GOOD DATA XXXXXX BAD DATA
                                                ;
                                                ;
010112  005067  170774                          COMPARE:CLR     WORK2           ;WORD COUNT
010116  012767  014466  170744                          MOV     @OUTBUF,SAVE    ;SET UP OUTBUFFER POINTER
010124  016767  170754  170740                          MOV     INPUT,SAV1      ;SET UP IN BUFFER POINTER
010132  027777  170732  170732                  WRDCMP: CMP     @SAVE,@SAV1     ;COMPARE BUFFERS
010140  001016                                          BNE     WDERR           ;WORD IN ERROR
010142  005267  170744                          WRDINC: INC     WORK2           ;+1 WORD COUNT
010146  026767  170674  170736                          CMP     WRDCT,WORK2     ;IS COMPLETE BUFFER CHECKED
010154  001407                                          BEQ     ADAM            ;EXIT ROUTINE
010156  062767  000002  170704                          ADD     #2,SAVE
010164  062767  000002  170700                          ADD     #2,SAV1
010172  000757                                          BR      WRDCMP          ;COMPARE NEXT WORD
010174  000205                                  ADAM:   RTS     R5              ;EXIT THIS ROUTINE
                                                ;
```

M4

```
010176  052767  001000  170636  WDERR:  BIS     #BIT9,FLAG      ;SET ERROR BIT
010204  004767  003174                  JSR     %7,INCTAB       ;INC. ERROR COUNT
010210  016767  170636  170670          MOV     DMA,WORK        ;FETCH STARTING DISK ADDR
010216  016767  170626  170664          MOV     TRACK,WORK1     ;
010224  066767  170662  170654          ADD     WORK2,WORK      ;CALCULATE FAILING ADDR
010232  103002                          BCC     .+6             ;SHOULD DAF BE INCREMENTED
010234  005267  170650                  INC     WORK1
010240  016767  170576  170646          MOV     FLAG,WORK3
010246  042767  177743  170640          BIC     #177743,WORK3
010254  056767  170634  170626          BIS     WORK3,WORK1
010262  004567  002446                  JSR     %5,CONV         ;CONVERT WORD ADDR TO ASCII
010266  001106                          WORK
010270  013567                          MES1
010272  000006                          6
010274  004567  002434                  JSR     %5,CONV         ;CONVERT TRACK ADDR TO ASCII
010300  001110                          WORK1
010302  013603                          MES1A
010304  000002                          2
010306  017767  170556  170572          MOV     @SAVE,WORK      ;FETCH GOOD DATA
010314  004567  002414                  JSR     %5,CONV         ;CONVERT GOOD DATA TO ASCII
010320  001106                          WORK
010322  013704                          MES5
010324  000006                          6
010326  017767  170540  170552          MOV     @SAV1,WORK      ;FETCH BAD DATA
010334  004567  002374                  JSR     %5,CONV         ;CONVERT TO ASCII
010340  001106                          WORK
010342  013724                          MES6
010344  000006                          6
010346  016767  170470  170532          MOV     FLAG,WORK       ;WHICH READ THE
010354  042767  177774  170524          BIC     #177774,WORK            ;ERROR OCCURRED ON
010362  004567  002346                  JSR     %5,CONV
010366  001106                          WORK
010370  014017                          MES13
010372  000001                          1
010374  104000                          EMT     +0              ;PRINT MESSAGE
010376  013452                          HED1
010400  014017                          MES13
010402  013603                          MES1A
010404  013567                          MES1
010406  013704                          MES5
010410  013724                          MES6
010412  177777                          -1
010414  032777  002000  170356          BIT     #BIT10,@SWR     ;HALT ON ERROR
010422  001401                          BEQ     .+4
010424  000000                          HALT                    ;YES HALT BIT 10 SET IN SWR
010426  000645                          BR      WRDINC          ;GO COMPARE NEXT WORD
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;
```

A5

```
                                        ;
                                        ;ROUTINE TO ZERO DATA INPUT BUFFER
                                        ;ZERO BUFFER BEFORE READING
                                        ;
                                        ;
010430  016704  170450          ZBUF:   MOV     INPUT,%4        ;FETCH START OF INBUFFER
010434  016767  170424  170452          MOV     SWRDCT,WORK3
010442  006167  170446                  ROL     WORK3
010446  060467  170442                  ADD     %4,WORK3
010452  020467  170436          NZUF:   CMP     %4,WORK3        ;IS ROUTINE COMP.
010456  001001                          BNE     CLEAR           ;ZERO NEXT WORD
010460  000205                          RTS     %5              ;EXIT ROUTINE
010462  005024                  CLEAR:  CLR     (4)+            ;CLEAR THE WORD
010464  000772                          BR      NZUF
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;ROUTINE TO TEST FOR ADDITIONAL DATA TRANSFERS
                                        ;ANY DATA TRANSFERRED AFTER WORD COUNT OVERFLOW IS AN ERROR
                                        ;
                                        ;
010466  016704  170354          OVRFLO: MOV     WRDCT,%4        ;ADD WORD COUNT
010472  006104                          ROL     %4
010474  066704  170404                  ADD     INPUT,%4
010500  016767  170360  170406          MOV     SWRDCT,WORK3
010506  006167  170402                  ROL     WORK3
010512  066767  170366  170374          ADD     INPUT,WORK3
010520  020467  170370          CHWRD:  CMP     %4,WORK3        ;IS TEST COMPLETE
010524  001001                          BNE     CKNEX           ;CHECK NEXT WORD
010526  000205                          RTS     %5              ;TEST IS COMPLETE
010530  005724                  CKNEX:  TST     (4)+            ;TEST FOR ZERO WORD
010532  001772                          BEQ     CHWRD           ;WORD IS ZERO
010534  052767  001000  170300          BIS     #BIT9,FLAG      ;SET ERROR BIT
010542  010467  002246                  MOV     %4,ACNVX
010546  162767  000002  002240          SUB     #2,ACNVX
010554  004567  002154                  JSR     %5,CONV         ;CONVERT 1 OCTAL TO ASCII
010560  013014                          ACNVX                   ;ADDRESS
010562  013663                          MES4
010564  000006                          6
010566  010467  002222                  MOV     %4,ACNVX
010572  162767  000002  002214          SUB     #2,ACNVX
010600  017767  002210  002206          MOV     @ACNVX,ACNVX
010606  004567  002122                  JSR     %5,CONV         ;CONVERT OCTAL TO ASCII
010612  013014                          ACNVX                   ;DATA
010614  013724                          MES6
010616  000006                          6
010620  104000                          EMT     +0              ;CALL TYPE OUT ROUTINE
010622  013502                          MED3
010624  013663                          MES4
010626  013724                          MES6
010630  177777                          -1
010632  000732                          BR      CHWRD           ;FETCH NEXT WORD
```

B.5

```
;
;
;
;
;
;
```

```
                                        ;EXTENDED MEMORY EXERCISER
                                        ;THE PROGRAM DETERMINES HOW MUCH MEMORY
                                        ;IS ON THE SYSTEM THEN IT
                                        ;
010634  052777  000400  170152  EXTMEN: BIS     #BIT8,@DCS       ;CLEAR THE DISK
010642  013767  000042  170220          MOV     @#42,SAVE        ;GET MONITOR ADDRESS
010650  001410                          BEQ     1$               ;SKIP IF 0
010652  100432                          BMI     LGMEM            ;GREATER THAN 16K
010654  162767  000020  170206          SUB     #20,SAVE         ;DEC IT
010662  022767  014466  170200          CMP     #OUTBUF,SAVE     ;IS IT ACT 11
010670  100432                          BMI     GOTMEM           ;NO - SKIP
010672  012767  010750  167104  1$:     MOV     #MAXREF,4        ;SET UP I/O BUS TRAP
010700  012767  000340  167100          MOV     #340,6
010706  012767  017446  170154          MOV     #17446,SAVE      ;SET UP FOR 4K
010714  005777  170150          EXREF:  TST     @SAVE            ;REFERENCE MEMORY
010720  022767  177446  170142          CMP     #177446,SAVE     ;TEST FOR GREATER THAN 28K
010726  001410                          BEQ     MAXREF           ;LAST REFERENCE MADE TO I/O REG.
010730  062767  020000  170132          ADD     #20000,SAVE      ;SET UP FOR NEXT MEMORY REF.
010736  000766                          BR      EXREF            ;GO REFERENCE MEMORY
010740  162767  000020  170122  LGMEM:  SUB     #20,SAVE         ;DEC IT
010746  000403                          BR      GOTMEM
                                        ;
                                        ;ENTER HERE WHEN I/O BUS ERROR OCCURS
                                        ;
010750  162767  020000  170112  MAXREF: SUB     #20000,SAVE
010756  012767  000006  167020  GOTMEM: MOV     #6,4             ;RESTORE I/O BUS TRAP
010764  005067  167016                  CLR     6
010770  012706  000776                  MOV     #776,%6
010774  162767  014466  170066          SUB     #OUTBUF,SAVE     ;SET UP NEW WORD COUNT
011002  006067  170062                  ROR     SAVE
011006  042767  000001  170054          BIC     #BIT0,SAVE
011014  016767  170050  170042          MOV     SAVE,SWRDCT
011022  006067  170036                  ROR     SWRDCT
011026  016767  170032  170012          MOV     SWRDCT,WRDCT
011034  012767  014466  170042          MOV     #OUTBUF,INPUT
011042  066767  170022  170034          ADD     SAVE,INPUT
011050  000205                          RTS     %5
```

```
                                        ;
                                        ;BACKGROUND TEST FOR INTERRUPTS
                                        ;
011052  012767  011202  166734  XWAIT:  MOV     #RTIX,14        ;SET UP TRACE TRAP
011060  005067  166732                  CLR     16
011064  012767  177000  170002          MOV     #-1000,PASS     ;SET UP TIME BASE
011072  012737  011114  000010          MOV     #1$,@#10        ;SET ILLEGAL INST
011100  006727  000000                  SXT     #0              ;TEST FOR 11/45
011104  012767  000006  000070          MOV     #6,RTIX         ;MAKE IT AN RTT
011112  000401                          BR      2$              ;SKIP JUNK
011114  022626                  1$:     CMP     (6)+,(6)+       ;CLEAR STACK
011116  012737  000012  000010  2$:     MOV     #12,@#10        ;RESET I/O
011124  012746  000020                  MOV     #BIT4,-(6)      ;SET TRACE TRAP BIT
011130  012746  011136                  MOV     #.+6,-(6)
011134  000002                          RTI                     ;RETURNS TO NEXT LOCATION EITH T BIT SET
011136  005027  000000                  CLR     #0
011142  005267  177772          XINCW:  INC     XINCW-2
011146  105767  177766                  TSTB    XINCW-2
011152  100373                          BPL     XINCW
011154  005267  167714                  INC     PASS
011160  001401                          BEQ     .+4
011162  000765                          BR      XINCW-4
                                        ;REPORT BACKGROUND TEST TIMED OUT
011164  005046                          CLR     -(6)            ;CLEAR PS ON STACK
011166  012746  011174                  MOV     #1$,-(6)
011172  000002                          RTI                     ;SET RETURN
011174  104001                  1$:     EMT+1                   ;CLEAR TRACE BIT
011176  014027                          TIMO
011200  000000                          HALT
                                        ;
011202  000002                  RTIX:   RTI
```

E5

```
                                        ;RF11 POWER FAIL TEST #1
                                        ;       DISK ZERO
                                        ;       WRITE COMPLETE DISK WITH 125252 PATTERN
                                        ;       REPORT "OK"
                                        ;START WRITING THE SAME PATTERN
                                        ;WHEN POWER FAIL OCCURS ABORT TRANSFER
                                        ;SETUP NEW ENTRY POINT AND HALT
                                        ;
                                        ;POWER UP AND WRITE CHECK THE DISK FOR ERRORS
                                        ;
                                        ;***ONLY ONE ERROR IS CONSIDERED ACCEPTABLE***
                                        ;
                                        ;
011204  012706  001000          PFT1:   MOV     #1000,%6        ;SET UP STACK
011210  004767  000406                  JSR     %7,POWFAL       ;WRITE 125252 ON DISK
011214  052777  000400  167572  PFWAT:  BIS     #BIT8,@DCS      ;CLEAR DISK
011222  005067  167624                  CLR     DMA
011226  005067  167616                  CLR     TRACK
011232  012767  011214  167640          MOV     #PFWAT,HRDER    ;SET UP FOR HARD ERROR
011240  012767  011376  166556          MOV     #DOWN,24        ;SET UP POWER FAIL VEC.
011246  012767  000340  166552          MOV     #340,26
011254  104503                  MYBYWR: WRITE   +100
011256  032777  001000  167514          BIT     #BIT9,@SWR
011264  001002                          BNE     .+6
011266  000004                          IOT
011270  000404                          BR      .+12
011272  016777  167542  167502          MOV     PRIORITY,@PS
011300  000001                          WAIT
011302  004767  175734                  JSR     %7,DISBUF       ;SET UP NEW DISK BUFFER
011306  000762                          BR      MYBYWR
011310  000741                          BR      PFWAT
                                        ;ROUTINE TO CHECK DATA AFTER POWER FAIL
                                        ;
011312  052777  000400  167474  UPCHK:  BIS     #BIT8,@DCS      ;CLEAR THE DISK
011320  005067  167526                  CLR     DMA
011324  005067  167520                  CLR     TRACK
011330  012767  011312  167542          MOV     #UPCHK,HRDER    ;SET UP FOR HARD ERROR
011336  104507                  CHKDAT: WRCHECK +100
011340  032777  001000  167432          BIT     #BIT9,@SWR
011346  001002                          BNE     .+6
011350  000004                          IOT
011352  000404                          BR      .+12
011354  016777  167460  167420          MOV     PRIORITY,@PS
011362  000001                          WAIT
011364  004767  175652                  JSR     %7,DISBUF       ;SET UP NEW DISK BUFFER
011370  000762                          BR      CHKDAT
011372  000167  177616                  JMP     PFWAT           ;GO WAIT FOR ANOTHER
                                                                ;POWER FAIL
```

F5

```
                                        ;
                                        ;POWER DOWN ROUTINE
                                        ;ABORT DISK AND HALT
                                        ;
                                        ;
011376  052777  000400  167410  DOWN:   BIS     #BIT8,@DCS      ;ABORT DISK
011404  012767  011414  166412          MOV     #UP,24          ;SET POWER FAIL VECTOR
011412  000000                          HALT
                                        ;
011414  012767  011376  166402  UP:     MOV     #DOWN,24
011422  012706  001000                  MOV     #1000,%6
011426  104001                          EMT+1
011430  014325                          PWRF
011432  004767  000142                  JSR     %7,DELAY
011436  000167  177650                  JMP     UPCHK           ;GO CHECK DISK
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;POWER FAIL TEST #2
                                        ;DISK ZERO
                                        ;WRITE COMPLETE DISK WITH 125252 PATTERN
                                        ;REPORT "OK"
                                        ;WRITE CHECK DISK AND WAIT FOR POWER FAIL
                                        ;WHEN POWER COMES BACK WRITE CHECK DISK AGAIN
                                        ;AND CHECK FOR ERRORS
                                        ;***NO ERRORS SHOULD OCCUR.***
                                        ;
                                        ;DO NOT CREATE ANOTHER POWER FAIL UNTIL
                                        ;THE ADDRESS REGISTER HAS COMPLETELY CYCLED
                                        ;THROUGH.
                                        ;
011442  012706  001000          PFT2:   MOV     #1000,%6        ;SET UP STACK
011446  004767  000150                  JSR     %7,POWFAL       ;WRITE 125252 ON DISK
011452  005067  167374          PWRFL:  CLR     DMA
011456  005067  167366                  CLR     TRACK
011462  012767  011452  167410          MOV     #PWRFL,HRDER    ;SET UP HARD ERROR
011470  012767  011542  166326          MOV     #PWRDN,24       ;SET UP POWER FAIL VEC.
011476  012767  000340  166322          MOV     #340,26
011504  104507                  CHKDSK: WRCHECK +100
011506  032777  001000  167264          BIT     #BIT9,@SWR
011514  001002                          BNE     .+6
011516  000004                          IOT                     ;WAIT IN BACKGROUND
011520  000404                          BR      .+12
011522  016777  167312  167252          MOV     PRIORITY,@PS
011530  000001                          WAIT
011532  004767  175504                  JSR     %7,DISBUF       ;CHECK NEXT BUFFER
011536  000762                          BR      CHKDSK
011540  000744                          BR      PWRFL
```

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```
                                        ;
                                        ;ROUTINE TO ABORT DISK DURING POWER FAIL
                                        ;
011542  052777  000400  167244  PWRDN:  BIS     #BIT8,@DCS      ;CLEAR THE DISK
011550  012767  011560  166246          MOV     #PWRUP,24       ;SET UP RESTART
011556  000000                          HALT
                                        ;
011560  012767  011542  166236  PWRUP:  MOV     #PWRDN,24       ;RESET POWER FAIL VECTOR
011566  012706  001000                  MOV     #1000,%6
011572  004767  000002                  JSR     %7,DELAY
011576  000725                          BR      PWRFL           ;GO CHECK DISK
                                        ;
                                        ;
011600  012700  177633          DELAY:  MOV     #-145,%0
011604  005002                          CLR     %2
011606  000005                  1$:     RESET
011610  005202                          INC     %2
011612  001375                          BNE     1$
011614  005200                          INC     %0
011616  001373                          BNE     1$
011620  000207                          RTS     %7
                                        ;
                                        ;
                                        ;
                                        ;ROUTINE TO WRITE THE COMPLETE DISK
                                        ;WITH 125252 PATTERN
                                        ;WRITE CHECK AND REPORT ERRORS IF THEY
                                        ;OCCUR
                                        ;REPORT "OK" AT COMPLETION
011622  052777  000400  167164  POWFAL: BIS     #BIT8,@DCS      ;CLEAR THE DISK
011630  011667  167246                  MOV     (6),PASSC
011634  012706  001000                  MOV     #1000,%6
011640  012767  000020  167206          MOV     #20,PATNU       ;SET UP PATTERN
011646  005067  167200                  CLR     DMA
011652  005067  167172                  CLR     TRACK
011656  012767  002000  167200          MOV     #2000,SWRDCT    ;SETUP WORD COUNT
011664  016767  167174  167154          MOV     SWRDCT,WRDCT
011672  004567  175722                  JSR     %5,PASEL        ;GENERATE DATA BUFFER
011676  012767  014466  167152          MOV     #OUTBUF,BUF     ;SET UP CURRENT ADDRESS
011704  012767  011622  167166          MOV     #POWFAL,HRDER
011712  104503                  WRDNW:  WRITE   +100
011714  032777  001000  167056          BIT     #BIT9,@SWR      ;CHECK ON HOW TO WAIT
011722  001002                          BNE     .+6
011724  000004                          IOT                     ;BACKGROUND TEST
011726  000404                          BR      .+12
011730  016777  167104  167044          MOV     PRIORITY,@PS
011736  000001                          WAIT
011740  104507                          WRCHECK +100
011742  032777  001000  167030          BIT     #BIT9,@SWR      ;
011750  001002                          BNE     .+6
011752  000004                          IOT
011754  000404                          BR      .+12
011756  016777  167056  167016          MOV     PRIORITY,@PS
```

```
  1701  011764  000001                          WAIT
  1702  011766  004767  175250                  JSR     %7,DISBUF       ;SET UP NEW DISK BUFFER
  1703  011772  000747                          BR      WRDNW           ;WRITE NEW BUFFER
  1704  011774  104001                          EMT     +1
  1705  011776  014055                          OK
  1706  012000  000177  167076                  JMP     @PASSC
```

```
                                        ;ROUTINE TO ALLOW THE OPERATOR TO SET BITS
                                        ;IN THE I/O REGISTERS VIA THE SWITCH REGISTER
                                        ;
                                        ;WORD COUNT REGISTER
012004  017777  166770  167004  SELWC:  MOV     @SWR,@WC                ;MOV SWR INTO WORD COUNT REG
012012  000774                          BR      SELWC
                                        ;
                                        ;CURRENT ADDRESS REGISTER
012014  017777  166760  166776  SELCMA: MOV     @SWR,@CMA       ;MOV SWR INTO CURRENT ADDR REG
012022  000774                          BR      SELCMA
                                        ;
                                        ;DISK ADDRESS REGISTER
012024  017777  166750  166770  SELDAR: MOV     @SWR,@DAR       ;MOV SWR INTO DISK ADDR REG
012032  000774                          BR      SELDAR
                                        ;
                                        ;DISK ADDRESS EXT AND ERROR REGISTER
012034  017777  166740  166762  SELDAE: MOV     @SWR,@DAE       ;MOV SWR INTO DISK ADDR EXT REG
012042  000774                          BR      SELDAE
                                        ;
                                        ;DATA BUFFER REGISTER
012044  017777  166730  166754  SELDBR: MOV     @SWR,@DBR       ; MOV SWR INTO DATA BUFFER
012052  000774                          BR      SELDBR
                                        ;
                                        ;
                                        ;LOOK AHEAD REGISTER
012054  017700  166752          MOVLK:  MOV     @ADS,%0         ;MOVE LOOK AHEAD
012060  000005                          RESET
012062  000005                          RESET
012064  000773                          BR      MOVLK           ;INTO REGISTER 0
                                        ;
                                        ;
                                        ;DISK CONTROL STATUS REGISTER
012066  012777  000340  166706  SELDCS: MOV     #340,@PS        ;LOCK UP INTERRUPTS
012074  012777  177777  166714          MOV     #177777,@WC     ;SET WORD COUNT =1 WORD
012102  012777  014466  166710          MOV     #OUTBUF,@CMA    ;SET UP CURRENT ADDRESS
012110  017777  166664  166676          MOV     @SWR,@DCS       ;MOV SWR INTO CONTROL REG
012116  032777  000001  166670          BIT     #BIT0,@DCS      ;IS FUNCTION BITS SET
012124  001760                          BEQ     SELDCS          ;FUNCTION BITS NOT SET
012126  105777  166662          DKBUSY: TSTB    @DCS            ;TEST FOR DISK NOT READY
012132  100375                          BPL     DKBUSY          ;DISK STILL READY
012134  000754                          BR      SELDCS          ;DISK NOT BUSY SELECT NEW CR
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
```

J 5

```
                                        ;
                                        ;THIS ROUTINE ENABLES THE OPERATOR TO SELECT A TRACK STATICLY
                                        ;THE ROUTINE DOES A ONE WORD READ TO SELECT THE TRACK
                                        ;THE OPERATOR MAY CHANGE THE SWITCH REGISTER AT ANY TIME
                                        ;SWR6-0 EQUALS THE TRACK NUMBER
                                        ;SWR9-7 EQUALS THE DISK NUMBER
                                        ;
012136  052777  000400  166650  STAMP:  BIS     #BIT8,@DCS
012144  017767  166630  166736          MOV     @SWR,WORK1      ;FETCH SWR
012152  016767  166732  166726          MOV     WORK1,WORK
012160  042767  176000  166720          BIC     #176000,WORK    ;MASK THE TRACK AND DISK NO.
012166  006067  166714                  ROR     WORK
012172  006067  166710                  ROR     WORK
012176  006067  166704                  ROR     WORK
012202  006067  166700                  ROR     WORK
012206  006067  166674                  ROR     WORK
012212  016777  166670  166604          MOV     WORK,@DAE       ;DISK EXT. ADDR. REG. LOADED
012220  017767  166554  166660          MOV     @SWR,WORK
012226  000367  166654                  SWAB    WORK
012232  006167  166650                  ROL     WORK
012236  006167  166644                  ROL     WORK
012242  006167  166640                  ROL     WORK
012246  042767  003777  166632          BIC     #3777,WORK
012254  016777  166626  166540          MOV     WORK,@DAR       ;DISK ADDRESS REG LOADED
012262  012777  015070  166530          MOV     #INBUF,@CMA     ;LOAD CURRENT ADDRESS
012270  012777  177777  166520          MOV     #177777,@WC     ;LOAD WORD COUNT
012276  052777  000005  166510          BIS     #5,@DCS         ;GO AND READ
012304  105777  166504          CTBUSY: TSTB    @DCS            ;TEST FOR CONTROL NOT READ
012310  100375                          BPL     CTBUSY          ;WAIT FOR CONTROL NOT READY
012312  026777  166572  166460  SWRCHG: CMP     WORK1,@SWR
012320  001306                          BNE     STAMP           ;SWR HAS CHANGED
012322  000773                          BR      SWRCHG          ;SWR HAS NOT CHANGED
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
```

K5

```
                                        ;
                                        ;ROUTINE TO REPORT ERROR COUNT AND CONTENTS OF ONE REGISTER
                                        ;
012324  004567  000404                  STAER:  JSR     %5,CONV         ;CONVERT OCTAL TO ASCII
012330  001106                                  WORK                    ;DATA TO BE CONVERTED
012332  013750                                  MES10                   ;ADDRESS OF MESSAGE
012334  000006                                  6
012336  004567  000372                          JSR     %5,CONV         ;CONVERT OCTAL TO ASCII
012342  001066                                  ERCOUNT                 ;ERROR COUNT TO BE CONVERTED
012344  013536                                  MED5                    ;ADDRESS OF MESSAGE
012346  000003                                  3
012350  104000                                  EMT     +0              ;REPORT MESSAGE
012352  013534                                  MED5A
012354  013536                                  MED5
012356  013750                                  MES10
012360  177777                                  -1
012362  004767  001016                          JSR     %7,INCTAB       ;INC. ERROR COUNT
012366  000167  000056                          JMP     EREXT           ;EXIT ROUTINE
                                        ;
                                        ;ROUTINE TO REPORT ERROR COUNT AND THE CONTENTS OF TWO REGISTERS
                                        ;
                                        ;
                                        ;
012372  004567  000336                  STAER1: JSR     %5,CONV         ;CONVERT OCTAL TO ASCII
012376  001106                                  WORK                    ;DATA TO BE CONVERTED
012400  013750                                  MES10                   ;ADDRESS OF MESSAGE
012402  000006                                  6
012404  004567  000324                          JSR     %5,CONV         ;CONVERT OCTAL TO ASCII
012410  001110                                  WORK1                   ;DATA TO BE CONVERT
012412  013765                                  MES10A                  ;ADDRESS OF MESSAGE
012414  000006                                  6
012416  004567  000312                          JSR     %5,CONV         ;CONVERT OCTAL TO ASCII
012422  001066                                  ERCOUNT                 ;ERROR COUNT TO BE CONVERTED
012424  013536                                  MED5                    ;ADDRESS OF MESSAGE
012426  000003                                  3
012430  104000                                  EMT     +0              ;REPORT MESSAGE
012432  013534                                  MED5A
012434  013536                                  MED5
012436  013765                                  MES10A
012440  013750                                  MES10
012442  177777                                  -1
012444  004767  000734                          JSR     %7,INCTAB       ;INC. ERROR COUNT
012450  032777  002000  166322          EREXT:  BIT     @BIT10,@SWR     ;HALT ON ERROR
012456  001401                                  BEQ     1$
012460  000000                                  HALT
012462  000205                          1$:     RTS     %5              ;EXIT ROUTINE
                                        ;
                                        ;
                                        ;ROUTINE TO DECODE EMT CALLS
                                        ;EMT+1=TYPE ONE LINE OF TEXT
                                        ;EMT+0=TYPE A SERIES OF LINES
012464  011600                          EMTRP:  MOV     (6),%0
012466  022740  104001                          CMP     @EMT+1,-(0)     ;WAS THE CALL EMT+1
```

```
  1849  012472  001103                          BNE     TYPS            ;NO! TYPE A SERIES OF LINES OF TEXT
  1850  012474  000400                          BR      TYP             ;YES TYPE ONE LINE OF TEXT
```

```
012476  011600                          ;SUBROUTINE TO OUTPUT ASCII MESSAGE ON TELETYPE PRINTER.
012476  011600                  TYP:    MOV     @%6,%0          ;GET ADDRESS THAT CONTAINS MESSAGE ADDRESS
012500  062716  000002                  ADD     #2,@%6          ;SET UP EXIT.
012504  011000                          MOV     @%0,%0          ;ADDRESS OF MESSAGE TO R0.
012506  112067  000164          TYPA:   MOVB    (0)+,TYPDAT     ;GET CHARACTER
012512  122767  000100  000156          CMPB    #100,TYPDAT     ;CHECK FOR "@" CHARACTER
012520  001005                          BNE     TYPC            ;BRANCH IF NOT "@".
012522  005067  000150                  CLR     TYPDAT          ;OUTPUT NULL
012526  004767  000030                  JSR     %7,TYPD         ;TO CLEAR BUFFER
012532  000002                          RTI                     ;TERMINATOR CHAR. DONE. EXIT.
012534  122767  000045  000134  TYPC:   CMPB    #45,TYPDAT      ;CHECK FOR "%".
012542  001442                          BEQ     TYPF            ;BRANCH IF "%".
012544  122767  000042  000124          CMPB    #42,TYPDAT      ;NOT "%". CHECK FOR "*".
012552  001443                          BEQ     TYPG            ;BRANCH IF "*"
012554  004767  000002                  JSR     %7,TYPD         ;TYPE CHAR IN TYPDAT
012560  000752                          BR      TYPA
012562  032777  040000  166210  TYPD:   BIT     #BIT14,@SWR
012570  001026                          BNE     TYEXIT
012572  116777  000100  166204          MOVB    TYPDAT,@TPB     ;OUTPUT CHARACTER TO PRINTER
012600  105777  166204                  TSTB    @TPS            ;WAIT FOR DONE FLAG.
012604  100375                          BPL     .-4
012606  122767  000015  000062          CMPB    #15,TYPDAT      ;CHECK FOR CR
012614  001003                          BNE     1$              ;NO-SKIP
012616  012767  000011  000054          MOV     #9.,NULL        ;SET NULL COUNTER
012624  005767  000050          1$:     TST     NULL
012630  001406                          BEQ     TYEXIT          ;ZERO-EXIT
012632  005367  000042                  DEC     NULL            ;DECREMENT
012636  112767  000000  000032          MOVB    #0,TYPDAT       ;ZERO OUTPUT
012644  000746                          BR      TYPD            ;OUTPUT NULL
012646  000207                  TYEXIT: RTS     %7              ;EXIT
012650  112767  000015  000020  TYPF:   MOVB    #15,TYPDAT      ;MOVE CARRIAGE RETURN CODE TO TYPDAT
012656  004767  177700                  JSR     %7,TYPD         ;GO TYPE CHAR.
012662  112767  000012  000006  TYPG:   MOVB    #12,TYPDAT      ;MOVE LF CODE TO TYPDAT.
012670  004767  177666                  JSR     %7,TYPD         ;GO TYPE CHAR.
012674  000704                          BR      TYPA
012676  000000                  TYPDAT: 0
012700  000000                  NULL:   0
                                ;SUBROUTINE TO OUTPUT A SERIES OF ASCII MESSAGES ON TELETYPE PRINTER
012702  011600                  TYPS:   MOV     @%6,%0          ;GET ADDRESS THAT CONTAINS MESSAGE ADDRESS
012704  062716  000002                  ADD     #2,@%6          ;UPDATE TO NEXT MESSAGE ADDRESS
012710  011067  000014                  MOV     @%0,TYPSB       ;ADDRESS OF MESSAGE TO TYPSB
012714  022767  177777  000006          CMP     #-1,TYPSB       ;CHECK FOR TERMINATOR
012722  001001                          BNE     TYPSA           ;BRANCH IF NOT TERMINATOR.
012724  000002                          RTI                     ;TERMINATOR. EXIT
012726  104001                  TYPSA:  EMT     +1              ;CALL ON TYP SUB TO TYPE MESSAGE
012730  000000                  TYPSB:  0                       ;ADDRESS OF MESSAGE GOES HERE
012732  000763                          BR      TYPS            ;GO PROCESS NEXT MESSAGE
                                ;
                                ;
                                ;
                                ;
                                ;OCTAL TO ASCII CONVERT ROUTINE
                                ;
```

A6

```
                                        ;ENTER ROUTINE AS FOLLOWS
                                        ;JSR%5,CONV
                                        ;ADDR#=ADDRESS OF NUMBER TO BE CONVERTED
                                        ;ADDR BYTE=LSB OF WHERE ASCII IS GOING
                                        ;ASCII#=THE NUMBER OF ASCII CHAR. TO BE CONVERTED
                                        ;
                                        ;
012734  013567  000054                  CONV:   MOV     @(5)+,ACNVX     ;VALUE OF # TO BE CONVERTED
012740  012501                                  MOV     (5)+,%1         ;ASCII ADDR
012742  012502                                  MOV     (5)+,%2         ;# OF ASCII CHAR
012744  060201                                  ADD     %2,%1
```

```
012746  016703  000042          ACVN:   MOV     ACNVX,%3
012752  042703  177770                  BIC     #177770,%3      ;ISOLATE LEAST SIGNIFICANT OCTAL#
012756  062703  000060                  ADD     #60,%3          ;SET UP ASCII#
012762  110341                          MOVB    %3,-(1)         ;STORE ASCII CHAR
012764  042767  000007  000022          BIC     #7,ACNVX
012772  006067  000016                  ROR     ACNVX           ;ROTATE OCTAL#
012776  006067  000012                  ROR     ACNVX
013002  006067  000006                  ROR     ACNVX
013006  005302                          DEC     %2              ;-1 FROM ASCII CHAR COUNT
013010  001356                          BNE     ACVN
013012  000205                          RTS     %5              ;EXIT # CONVERTED
013014  000000                  ACNVX:  0                       ;WORK REGISTER
                                ;
                                ;
                                ;
                                ;
                                ;ROUTINE TO HANDLE KEYBOARD CONVERSATION
                                ;ROUTINE ACCEPTS NUM, OR ALPHA CHARACTERS
                                ;
013016  012767  000040  000424  NOCHA:  MOV     #40,TSTCH       ;SET UP FOR NUM, CHAR,
013024  000403                          BR      TYST
013026  012767  000100  000414  ALPHA:  MOV     #100,TSTCH      ;SET UP FOR ALPHA CHAR
013034  012777  000340  165740  TYST:   MOV     #340,@PS        ;LOCK UP INTERRUPTS
013042  005067  000400                  CLR     TEXBUF          ;CLEAR TEXT BUFFER REG
013046  105777  165740          TSTFLG: TSTB    @TKS            ;CHECK FOR FLAG
013052  100375                          BPL     TSTFLG          ;
013054  017777  165726  165722          MOV     @TKB,@TPB       ;CHARACTER IN BUFFER
013062  105777  165722                  TSTB    @TPS            ;ECHO CHARACTER
013066  100375                          BPL     .-4
013070  022777  000377  165710          CMP     #377,@TKB       ;CHECK FOR RUB-OUT
013076  001014                          BNE     CKCH            ;EXIT IF NOT RUB-OUT
013100  104001                          EMT     +1
013102  013746                          MES#                    ;REPORT RUB-OUT ACKNOWLEDGED
013104  042767  000007  000334          BIC     #7,TEXBUF
013112  006067  000330                  ROR     TEXBUF
013116  006067  000324                  ROR     TEXBUF
013122  006067  000320                  ROR     TEXBUF
013126  000747                          BR      TSTFLG          ;GO WAIT FOR NEW CHAR.
013130  022777  000215  165650  CKCH:   CMP     #215,@TKB       ;CHECK FOR CARRIAGE RETURN
013136  001001                          BNE     .+4
013140  000207                          RTS     %7              ;EXIT DELIMITER TYPED
013142  036777  000302  165636          BIT     TSTCH,@TKB
013150  001003                          BNE     CHOK
013152  104001                          EMT     +1              ;REPORT QUESTION MARK
013154  013744                          MES7
013156  000733                          BR      TSTFLG          ;WAIT FOR CORRECT CHAR.
013160  017767  165622  165720  CHOK:   MOV     @TKB,WORK
013166  042767  177770  165712          BIC     #177770,WORK
013174  000241                          CLC
013176  006167  000244                  ROL     TEXBUF
013202  000241                          CLC
013204  006167  000236                  ROL     TEXBUF
013210  000241                          CLC
013212  006167  000230                  ROL     TEXBUF
```

```
013216  066767  165664  000222          ADD     WORK,TEXBUF     ;ADD CHARACTER
013224  000710                          BR      TSTFLG          ;WAIT FOR NEW CHARACTER
                                ;ROUTINE TO SET ACTION ANABLE ON MA/MF PARITY MEMORIES
                                ;CALL JSR PC, MAMF
        172100                          PARCSR = 172100
        000114                          PARVEC = 114
        000004                          ERRVEC = 4
        000006                          SP = %6

013226  012737  013320  000114  MAMF:   MOV     #PARSRV,@#PARVEC  ;SET PARITY INTERRUPT VECTOR
013234  012737  000340  000116          MOV     #340,@#PARVEC+2 ;AND PRIORITY LEVEL 1 ON INTERRUPT
013242  013746  000004                  MOV     @#ERRVEC,-(SP)  ;SAVE CURRENT ERROR VECTOR
013246  013746  000006                  MOV     @#ERRVEC+2,-(SP)  ;AND PRIORITY LEVEL
013252  012737  000006  000004          MOV     #ERRVEC+2,@#ERRVEC
013260  012737  000002  000006          MOV     #RTI,@#ERRVEC+2
013266  012700  172100                  MOV     #PARCSR,%0      ;GET FIRST CSR ADDRESS
013272  012702  000001                  MOV     #1,%2
013276  012720  000001          1$:     MOV     #1,(0)+         ;SET ACTION ENABLE IF AVAILABLE
013302  006302                          ASL     %2              ;SHIFT AVAILABILITY INDICATOR
013304  103374                          BCC     1$
013306  012637  000006                  MOV     (SP)+,@#ERRVEC+2  ;RESTORE ERROR VECTOR
013312  012637  000004                  MOV     (SP)+,@#ERRVEC  ;PRIORITY LEVEL AND INTERRUPT VECTOR
013316  000207                          RTS     %7
                                ;PARITY ERROR SERVICE ROUTINE
                                ;WHEN A PARITY ERROR IS DETECTED THE ROUTINE SCANS
                                ;MEMORY FOR THE PARITY ERROR.  WHEN THE ERROR
                                ;IS DETECTED THE PROGRAM HALTS WITH THE ADDRESS
                                ;CAUSING THE ERROR IN R0
                                ;TO CONTINUE PRESS CONTINUE


013320  104001                  PARSRV: EMT+1
013322  014354                          PARERR
013324  012737  013352  000114          MOV     #2$,@#PARVEC    ;REPOSITION PARITY ERROR INT.
013332  012737  013400  000004          MOV     #4$,@#ERRVEC    ;SET TIME OUT TRAP
013340  005037  000006                  CLR     @#ERRVEC+2
013344  005000                          CLR     %0
013346  005720                  1$:     TST     (0)+            ;SCAN MEMORY
013350  000776                          BR      1$
013352  000000                  2$:     HALT                    ;PARITY ERROR - ADDRESS
                                                                ;CAUSING ERROR IS IN REGISTER 0
013354  000005                  3$:     RESET
013356  012737  013320  000114          MOV     #PARSRV,@#PARVEC  ;RESTORE PARITY VECTOR
013364  012737  000006  000004          MOV     #ERRVEC+2,@#ERRVEC  ;RESTORE TIME OUT HALT
013372  004767  177630                  JSR     %7,MAMF
013376  000002                          RTI
013400  000000                  4$:     HALT                    ;ERROR - PARITY ERROR NOT DETECTED ON SCAN
013402  000764                          BR      3$              ;4(SP) CONTAINS PC SHERE
                                                                ;PARITY ERROR WAS ORIGINALLY DETECTED
013404  016703  165432          INCTAB: MOV     FLAG,%3
013410  042703  177743                  BIC     #177743,%3      ;MASK DEVICE NO
013414  000241                          CLC
013416  006003                          ROR     %3              ;NORMALIZE
013420  005263  013426                  INC     TABLE(3)        ;INCREMENT ERROR COUNT
```

```
  2024  013424  000207                          RTS     %7
  2025  013426  000000                  TABLE:  0                       ;ERROR COUNT DRIVE 0
  2026  013430  000000                          0                       ;ERROR COUNT DRIVE 1
  2027  013432  000000                          0                       ;ERROR COUNT DRIVE 2
  2028  013434  000000                          0                       ;ERROR COUNT DRIVE 3
  2029  013436  000000                          0                       ;ERROR COUNT DRIVE 4
  2030  013440  000000                          0                       ;ERROR COUNT DRIVE 5
  2031  013442  000000                          0                       ;ERROR COUNT DRIVE 6
  2032  013444  000000                          0                       ;ERROR COUNT DRIVE 7
```

```
013446  000000                    TEXBUF: 0
013450  000000                    TSTCH:  0
                                  ;
                                  ;
                                  ;
                                  ;
                                  ;
                                  ;ERROR MESSAGE HEADERS
                                  ;

                                          .EVEN
013452  042045  052101  020101    HED1:   .ASCII  /%DATA ERR @/
013460  051105  020122     100
                                  ;
                                  ;
013465     045  052123  052101    HED2:   .ASCII  /%STATUS ERR @/
013472  051525  042440  051122
013500  040040
                                  ;
                                  ;
013502  042445  052130  040522    HED3:   .ASCII  /%EXTRA BKS @/
013510  041040  051513  040040
                                  ;
013516  042045  020113  042101    HED4:   .ASCII  /%DK ADDR ERR @/
013524  051104  042440  051122
013532  040040
                                  ;
                                  ;
013534  040045                    HEDSA:  .ASCII  /%@/
                                  ;
                                  ;
013536  020040  020040  051105    HED5:   .ASCII  /    ERR CNT @/
013544  020122  047103  020124
013552     100
                                  ;
                                  ;
013553     045  040522  042516    HED6:   .ASCII  /%RANEX ERR @/
013560  020130  051105  020122
013566     100
                                  ;
                                  ;
                                  ;MESSAGE TRAILERS
                                  ;
                                  ;
013567     040  020040  020040    MES1:   .ASCII  /       DAR @/
013574  020040  040504  020122
013602     100
                                  ;
                                  ;
                                  ;
013603     040  020040  040504    MES1A:  .ASCII  /   DAE @/
013610  020105     100
                                  ;
                                  ;
```

```
                                        ;
013613     040  020040  020040  MES2:   .ASCII  /       DCS @/
013620  020040  041504  020123
013626     100
                                        ;
013627     040  020040  020040  MES2A:  .ASCII  /       WRD ERR@/
013634  020040  051110  020104
013642  051105  040122
                                        ;
                                        ;
013646  020040  020040  053440  MES3:   .ASCII  /     WRD CNT@/
013654  042122  041440  052116
013662     100
                                        ;
                                        ;
                                        ;
013663     040  020040  020040  MES4:   .ASCII  /       WRD ADDR,@/
013670  020040  051127  020104
013676  042101  051104  040056
                                        ;
                                        ;
                                        ;
013704  020040  020040  020040  MES5:   .ASCII  /       GD DATA @/
013712  043440  020104  040504
013720  040524  040040
                                        ;
                                        ;
                                        ;
```

```
2115
2116  013724  020040  020040  020040  MES6:    .ASCII  /       BD DATA @/
2117  013732  041040  020104  040504
2118  013740  040524  040040
2119                                  ;
2120                                  ;
2121                                  ;MO:
2122  013744  040077                  MES7:    .ASCII  /?@/
2123                                  ;
2124                                  ;
2125                                  ;
2126                                  ;
2127  013746  040057                  MES8:    .ASCII  '/@'
2128                                  ;
2129                                  ;
2130  013750  020040  020040  020040  MES10:   .ASCII  /       WRD1 @/
2131  013756  053440  042122  020061
2132  013764     100
2133                                  ;
2134                                  ;
2135  013765     040  020040  020040  MES10A:  .ASCII  /       WRD2 @/
2136  013772  020040  051127  031104
2137  014000  040040
2138                                  ;
2139  014002  052445  044516  020124  MES11:   .ASCII  /%UNIT NO.@/
2140  014010  047516  040056
2141                                  ;
2142                                  ;
2143  014014  020040     100          MES12:   .ASCII  /  @/
2144                                  ;
2145                                  ;
2146  014017     040  051040  040505  MES13:   .ASCII  /  READ @/
2147  014024  020104     100
2148                                  ;
2149                                  ;
2150  014027     045  050103  020125  TIMO:    .ASCII /%CPU BKGRND TIMED OUT@/
2151  014034  045502  051107  042116
2152  014042  052040  046511  042105
2153  014050  047440  052125     100
2154                                  ;
2155                                  ;
2156  014055     045  045517  040041  OK:      .ASCII  /%OK!@/
2157
2158                                  ;CONVERSATION TEXT
2159                                  ;
2160                                  ;
2161  014062  042045  052101  020101  CON1:    .ASCII  /%DATA TEST ONLY? @/
2162  014070  042524  052123  047440
2163  014076  046116  037531  040040
2164                                  ;
2165                                  ;
2166                                  ;
2167  014104  046445  046125  044524  CON2:    .ASCII  /%MULTI DK MODE?@/
2168  014112  042040  020113  047515
```

```
014120  042504  040077
                                        ;
                                        ;
014124  021445  047440  020106  CON3:   .ASCII  /%# OF DKS 1 TO 10 OCTAL?@/
014132  045504  020123  020061
014140  047524  030440  020060
014146  041517  040524  037514
014154     100
                                        ;
                                        ;
014155     045  054105  020056  CON4:   .ASCII  /%FX. DK?@/
014162  045504  040077
                                        ;
                                        ;
014166  047445  052120  053440  CON5:   .ASCII  /%OPT WRD CNT? @/
014174  042122  041440  052116
014202  020077     100
                                        ;
                                        ;
014205     045  042514  043516  CON6:   .ASCII  /%LENGTH (1 TO 1000)?@/
014212  044124  024040  020061
014220  047524  030440  030060
014226  024460  040077
                                        ;
                                        ;
014232  053445  042122  040440  CON7:   .ASCII  /%WRD ADDR?@/
014240  042104  037522     100
                                        ;
                                        ;
014245     045  050117  027124  CON8:   .ASCII  /%OPT. DATA PAT. @?@/
014252  042040  052101  020101
014260  040520  027124  021440
014266  040077
                                        ;
                                        ;
014270  053445  044522  042524  CON9:   .ASCII  /%WRITE?@/
014276  040077
                                        ;
                                        ;
014300  053445  044522  042524  CON10:  .ASCII  /%WRITE CHECK?@/
014306  041440  042510  045503
014314  040077
                                        ;
                                        ;
014316  051045  040505  037504  CON11:  .ASCII  /%READ?@/
014324     100
                                        ;
                                        ;
014325     045  047520  042527  PWRF:   .ASCII  /%POWER HAS FAILED@/
014332  020122  040510  020123
014340  040506  046111  042105
014346     100

                                        ;
```

I-6

```
014347     045  047105  040104  END:     .ASCII  /%END@/
014354  046445  046505  051117  PARERR:  .ASCII  /%MEMORY PARITY ERROR@/
014362  020131  040520  044522
014370  054524  042440  051122
014376  051117     100
014401     040  020040     100  PATMES:  .ASCII  /   @/
014405     045  040520  052124  PATHED:  .ASCII  /%PATTERN @/
014412  051105  020116     100
014417     045  051104  053111  NODRV:   .ASCII  /%DRIVE ZERO OFF LINE@/
014424  020105  042532  047522
014432  047440  043106  046040
014440  047111  040105
014444  042045  044522  042526  RKNUM:   .ASCII  /%DRIVE(S) ON LINE@/
014452  051450  020051  047117
014460  046040  047111  040105

                                          .EVEN
```

```
  2240
  2241  014466  000000                    OUTBUF: 0
  2242          015070                    .=.+400
  2243  015070  000000                    INBUF:  0
  2244                                    ;
  2245                                    ;
  2246                                    ;
  2247                                    ;
  2248          000001                    .END
```

```
ACNVX     013014          340#    341#    342#    343#    345     441#    443     1250#   1251#   1253    1451#   1452#   1454
                         1457#   1458#   1459#   1461    1912#   1916    1920#   1921#   1922#   1923#   1927#
ACVN      012746         1916#   1925
ADAM      010174         1357    1361#
ADRCMP    003260          531     537#
ADRD      005462          893     895#
ADS       001032          162#    661     1733
ADTST     002056          247     336#    1024
ADT2      002150           55     366#     479
ADT3      003014           61     495#     555
ADT4      003370           65     572#     646
ADT5      004016           68     654#     691
AKH       007470         1204    1207    1212#
ALPHA     013026          251     257     282     315     321     327     1937#
ASKWC     001554          270     280#
BIT0    = 000001           10#    1127    1507    1744
BIT1    = 000002           11#
BIT10   = 002000           20#     254     350    1115    1124    1235    1406    1838
BIT11   = 004000           21#     221     245     260     336     477     554     644     690     758     835     988    1000
BIT12   = 010000           22#     330     877     892
BIT13   = 020000           23#     324     866    1131
BIT14   = 040000           24#     318     856    1100    1868
BIT15   = 100000           25#     308     591     593     596     633     635     641
BIT2    = 000004           12#
BIT3    = 000010           13#
BIT4    = 000020           14#    1527
BIT5    = 000040           15#
BIT6    = 000100           16#    1184    1215    1232
BIT7    = 000200           17#     165    1146
BIT8    = 000400           18#     376     402     427     508     526     576     610     660     698     773     900     939
                         1113    1481    1562    1580    1601    1651    1677    1764
BIT9    = 001000           19#     860     871     886     920     941     948     957     965     967    1061    1121    1134
                         1364    1450    1569    1585    1638    1689    1696
BUF       001056          181#    368#    399#    429#    459#    500#    577#    611#    659#    705#    729#    779#    794#
                          858#    868#    879#    938#    954#    1036    1686#
CHKBUF    002650          435     454#
CHKDAT    011336         1584#   1592
CHKDOS    006224         1002#   1012
CHKDSK    011504         1637#   1645
CHKFLG    002046          329     331#
CHOK      013160         1958    1962#
CHWRD     010520         1445#   1449    1469
CKCH      013130         1946    1954#
CKNEX     010530         1446    1448#
CLEAR     010462         1427    1429#
CLRREG    005160          837#
CLRTAB    001126          204#    207
CMA       001020          157#    1716#   1742#   1781#
CMDAE     007274         1183    1186#
CMNETK    003714          624     631#
CMPDTK    003656          617     623#
CMPNEX    003266          539#    549
CMPX1     004532          741     749#
COMDAR    007256         1180    1182#
```

```
COMPAR    010112    894    963    1350#
CONM      001372    218    249#
CONV      012734    233    344    442    968    972    976    1064   1076   1085   1094   1105   1218   1222
                    1252   1374   1378   1383   1388   1394   1453   1460   1799   1803   1819   1823   1827
                    1912#
CON1      014062    250    2161#
CON10     014300    320    2208#
CON11     014316    326    2213#
CON2      014104    256    2167#
CON3      014124    262    2172#
CON4      014155    272    2179#
CON5      014166    281    2183#
CON6      014205    286    2188#
CON7      014232    295    2194#
CON8      014245    302    2198#
CON9      014270    314    2204#
CTBUSY    012304    1784#  1785
DAE       001024    159#   226*   246*   1062   1102   1186   1212   1724*  1773*
DAR       001022    158#   384    441    468    1083   1182   1205   1209   1214   1720*  1780*
DATAT     005170    352    848#   901    909
DATTES    001514    259    271#   275
DBR       001026    160#   1030   1728*
DCS       001014    155#   221    376*   378    380    383    402*   404    406    408    427*   432    434
                    436    462    464    467    508*   510    512    514    526*   528    530    533    576*
                    580    582    585    610*   614    616    619    660*   662    667    670    698*   707
                    709    712    718    720    723    731    733    736    773*   783    785    787    796
                    798    801    816    818    821    939*   1058   1070   1093   1100   1113*  1127*  1481*
                    1562*  1580*  1601*  1651*  1677*  1743*  1744   1746   1764*  1783*  1784
DELAY     011600    1609   1657   1661#
DELMES    006576    1073   1083#
DISBUF    007242    902    1179#  1575   1591   1644   1702
DISK      006344    42     1030#
DKBUSY    012126    1746#  1747
DKINT     006436    47     1055#
DMA       001052    179#   212*   299*   372*   390    392*   401*   430*   457*   495*   520*   524*   552*
                    572*   594*   598*   607*   637*   642*   654*   674    686    688*   703*   716*   728*
                    781*   793*   814*   837*   929*   930*   932*   969    998*   1035   1170*  1171*  1179*
                    1182   1196*  1214*  1219   1233*  1366   1563*  1581*  1632*  1681*
DOWN      011376    37     1566   1601#  1605
DRVERO    006300    1010   1013#
DSKDR     001446    261#   266
DSKNOR    001076    189#   241*   242*   243*   244*   267*   268*   269*   1004
DSKRD     005402    882#   899
ELH       005446    889    892#
EMTRP     012464    40     1847#
END       014347    1016   2223#
ERADR     007524    1193   1218#
ERCOUN    001066    185#   382*   410*   439*   466*   515*   532*   542*   584*   618*   627*   669*   681*
                    711*   722*   735*   742*   751*   788*   800*   807*   820*   828*   1804   1828
EREXT     012450    1813   1838#
ERRVEC =  000004    1976#  1981   1982   1983*  1984*  1990*  1991*  2004*  2005*  2013*
ER1       002276    386#
ER10      003312    543#
ER11      003464    586#
```

M6

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ER12      003650      620#
ER13      003710      628#
ER14      004124      671#
ER15      004176      682#
ER16      004340      713#
ER17      004404      724#
ER20      004464      737#
ER21      004524      745#
ER22      004564      754#
ER23      004716      789#
ER24      004776      802#
ER25      005036      810#
ER26      005102      822#
ER27      005142      831#
ER3       002432      411#
ER4       002616      440#
ER5       002752      469#
ER6       003144      516#
ER7       003252      534#
ESH       005356      867     874     877#
EXGEN     010042     1302    1307#
EXMFLG    002134      337     350#
EXRAX     006162      966     986#
EXREF     010714     1491#   1495
EXTCME    007410     1195    1202#
EXTDR     007522     1201    1217#
EXTMEN    010634       81     850    1481#
EXTPP     006340      906    1014    1019    1024#
FILDAT    007700     1265#   1268
FLAG      001042      175#    210*    219*    245*    254*    260*    279*    308*    312*    318*    324*    330*    331
                      336     340     350     856     866     877     880*    884*    896     904     920*    965     967*
                     1000    1002    1011*   1013*   1017*   1032    1061*   1074    1184*   1188    1194    1198*   1208*
                     1215    1232*   1364*   1371    1392    1450*   2019
GOTMEM    010756     1487    1497    1502#
HED1      013452     1399    2044#
HED2      013465     1069    2048#
HEDJ      013502     1465    2053#
HED4      013516     1227    2056#
HED5      013536     1805    1809    1829    1833    2064#
HED5A     013534      238    1110    1808    1832    2061#
HED6      013553      981    2069#
HINUM     010046     1278    1288    1303*   1309#
HRDER     001100      190#    852*    921*    1118    1565*   1583*   1634*   1687*
INADB     003060      503#    506     522
INBUF     015070      611     623     626     729     740     743     749     753     794     805     809     826     830
                     1781    2243#
INCADS    004204      676     679     686#
INCCMP    003316      540     546#
INCTAB    013404     1060    1231    1365    1812    1837    2019#
INDADT    002760      465     473#
INPUT     001104      192#    879     954    1352    1422    1441    1444    1511*   1512*
INSRD     003560      590     607#
INSWT     003432      579#    588     595     599     601
INTEXT    007024     1059    1120    1131#
```

A7

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LDAT      005234          852     855#    903
LGMEM     010740         1484    1496#
LOGICA    006330         1020#
LONUM     010044         1277    1286    1298*   1308#
LPADT3    003360          551     554#
LPADT5    004132          668     674#
LPSPI1    004572          750     758#
LPTSK     004002          632     644#
LPXSPI    005150          827     835#
LP2ADT    003000          474     477#
MA        001030          161#
MAMF      013226          216    1979#   2014
MAXREF    010750         1488    1493    1501#
MES1      013567          970     983    1087    1091    1220    1229    1376    1402    2077#
MES1A     013603          974     982    1066    1090    1224    1228    1380    1401    2083#
MES10     013750         1801    1810    1821    1835    2130#
MES10A    013765         1825    1834    2135#
MES11     014002          339    2139#
MES12     014014          346     349    2143#
MES13     014017         1078    1081    1396    1400    2146#
MES2      013613         1096    1099    2088#
MES2A     013627         1107    1111    2092#
MES3      013646          978     984    2097#
MES4      013663          444     447    1455    1466    2103#
MES5      013704         1385    1403    2109#
MES6      013724         1390    1404    1462    1467    2116#
MES7      013744         1960    2122#
MES8      013746         1948    2127#
MOVLK     012054          114    1733#   1736
MSTR      005530         904#
MVNEM     003530          592     596#
MYBYWR    011254         1568#   1576
NOCHA     013016          263     273     287     296     303    1935#
NODRV     014417          231    2231#
NULL      012700         1875*   1876    1878*   1888#
NZUF      010452         1426#   1430
OK        014055         1705    2156#
OPDAR     001636          284     294#    298
OPDSEL    007054          855    1146#
OPPAT     001664         301#     305
OPRD      002020          323     325#
OPWCK     001772          317     319#
OPWRT     001744          307     313#    332
OUTBUF    014466          368     422*    426*    429     500     502     505     537     548     574*    577     589     591
                          593*    596*    597*    659     704*    705     776*    777*    779     858     868     924     926*
                          928     929     932     933*    934     936     938    1262    1351    1486    1505    1511    1686
                         1742    2241#
OVRFLO    010466          895     964    1439#
PARCSR  = 172100         1974#   1985
PARERR    014354         2002    2224#
PARSRV    013320         1979    2001#   2012
PARVEC  = 000114         1975#   1979*   1980*   2003*   2012*
PASEL     007620          373     854    1250#   1685
PASS      001074          188#   1520*   1534*
```

PASSC	001102	191#	918*	986*	1678*	1706								
PATHED	014405	1257	2229#											
PATMES	014401	1254	1258	2228#										
PATNU	001054	180#	213*	309*	311*	369	370*	374*	907*	908	910*	1250	1260	1680*
PAT0	010050	1265	1322#											
PAT1	010052	1323#												
PAT10	010070	1330#												
PAT11	010072	1331#												
PAT12	010074	1332#												
PAT13	010076	1333#												
PAT14	010100	1334#												
PAT15	010102	1335#												
PAT16	010104	1336#												
PAT17	010106	1337#												
PAT2	010054	1324#												
PAT20	010110	1338#												
PAT3	010056	1325#												
PAT4	010060	1326#												
PAT5	010062	1327#												
PAT6	010064	1328#												
PAT7	010066	1329#												
PFT1	011204	85	1560#											
PFT2	011442	88	1630#											
PFWAT	011214	1562#	1565	1577	1593									
POWFAL	011622	1561	1631	1677#	1687									
PRIORI	001040	165#	864	875	890	922	945	952	961	1573	1589	1642	1693	1700
PS	001002	147#	209*	699*	774*	849*	853*	864*	869*	875*	882*	890*	922*	945*
		952*	961*	1573*	1589*	1642*	1693*	1700*	1740*	1938*				
PWRDN	011542	1635	1651#	1655										
PWRF	014325	1608	2217#											
PWRFL	011452	1632#	1634	1646	1658									
PWRUP	011560	1652	1655#											
RANDOM	007720	925	937	1264	1277#	1306								
RANER	006072	921	965#											
RANEX	005564	77	918#	990										
RANNU	001044	176#												
RCNODV	001272	222	224	228#										
RDMORE	002304	381	390#											
RDTDN	003212	526#	536	553										
RDTKS	003616	613#	622	638	640	643								
RDWAIT	005436	887	890#											
READ	= 104405	31#	527	613	730	795	815	885	956					
REH	005512	878	900#											
REPDRV	001306	229	233#											
REPOEN	006310	1001	1005	1015#										
RFADT	002224	376#	389	393										
RFRD	002330	391	395#	476										
RKNUM	014444	235	239	2235#										
RTIX	011202	1518	1523*	1545#										
SAVE	001070	186#	369*	374	395*	420	423	430	454*	456*	507*	519	537*	539
		541	546*	548	609*	623	625	631	633	635*	636*	641*	656*	1351*
		1353	1358*	1382	1482*	1485*	1486	1490*	1491	1492	1494*	1496*	1501*	1505*
		1506*	1507*	1508	1512									
SAV1	001072	187#	394*	401	409	415	417	437	457	473	475*	1352*	1353	1359*

C1

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                        1387
SELCMA   012014           98    1716#   1717
SELDAE   012034          106    1724#   1725
SELDAR   012024          102    1720#   1721
SELDBR   012044          110    1728#   1729
SELDCS   012066          118    1740#   1745    1748
SELWC    012004           94    1712#   1713
SHIFT    007736         1281#   1285
SLH      005304          857     863    866#
SOFTER   006760         1101    1119#
SP      =%000006        1977#   1981*   1982*   1990    1991
SPECOR   001234         221#    227
SPIL1    004346         710     716#
SPIL2    004412         721     727#
SPIL3    004472         734     740#
SPIRAL   004232          71     698#    715     726     739     748     757     759
STAER    012324         516     534     586     620     671     713     724     737     789     802     822    1799#
STAER1   012372         386     411     440     469     543     628     682     745     754     810     831    1819#
STAMP    012136         122    1764#   1787
START    001116          46     202#
STATUS   001036         164#
SUADR    002440         407     415#    455
SWR      001000         146#    217     477     554     644     690     758     835     860     871     886     892     900
                        941     948     957     988    1115    1121    1124    1131    1134    1146    1149    1157    1235
                       1406    1569    1585    1638    1689    1696    1712    1716    1720    1724    1728    1743    1765
                       1774    1786    1838    1868
SWRCHG   012312        1786#   1788
SWRDCT   001064        184#    214*    215     292*    293     851    1200    1423    1442    1508*   1509*   1510    1683*
                       1684
TABLE    013426         204    1009    2023*   2025#
TDMA     001062         183#
TEXBUF   013446         220*    223     225*    228     234     241     252     258     264*    265     267     274     277*
                        278*    279     283     288     290     292     297     299     304     306     309     316     322
                        328    1939*   1949*   1950*   1951*   1952*   1965*   1967*   1969*   1970*   2033#
TFBL     003152         513    519#
TIMO     014027        1542    2150#
TKB      001006         149#   1942    1945    1954    1957    1962
TKS      001012         151#   1940
TPR      001004         148#   1870*   1942*
TPS      001010         150#   1871    1943
TRACK    001050         178#    211*    371*    496*    573*    600*    608*    639*    655*    702*    780*    838*    934*
                        973     999*   1031    1156*   1181*   1190    1197*   1212*   1213*   1234*   1367    1564*   1582*
                       1633*   1682*
TSTCH    013450        1935*   1937*   1957    2034#
TSTFLG   013046        1940#   1941    1953    1961    1971
TSTTK    003472         583    589#
TWRDCT   001060         182#
TYEXIT   012646        1869    1877    1881#
TYP      012476        1850    1853#
TYPA     012506        1856#   1867    1886
TYPC     012534        1858    1862#
TYPD     012562        1860    1866    1868#   1880    1883    1885
TYPDAT   012676        1856*   1857    1859*   1862    1864    1870    1873    1879*   1882*   1884*   1887#
TYPF     012650        1863    1882#
```

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TYPG      012662          1865    1884#
TYPS      012702          1849    1890#   1898
TYPSA     012726          1894    1896#
TYPSB     012730          1892*   1893    1897#
TYST      013034          1936    1938#
UP        011414          1602    1605#
UPCHK     011312          1580#   1583    1610
VECTOR    001034           163#
WC        001016           156#   1119    1712*   1741*   1782*
WCCON     001574           285#    289     291
WCWAIT    005346           872     875#
WDERR     010176          1354    1364#
WONWD     002334           398#    399     414
WORK      001106           197#    203*    206*    384*    385*    409*    415*    416*    420     437*    438*    468*    497*
                           503     504*    507     514*    519*    521     523*    533*    541*    585*    619*    626*    664*
                           670*    675     677*    678     680*    712*    723*    736*    743*    753*    787*    801*    809*
                           821*    830*    896*    897*    898     923*    935*   1002*   1003*   1004    1006    1032*   1033*
                          1034    1041*   1042*   1043    1062*   1063*   1065    1070*   1071*   1072    1074*   1075*   1077
                          1083*   1084*   1086    1093*   1095    1102*   1103*   1104*   1106    1149*   1150*   1151*   1152*
                          1153*   1154*   1155*   1156    1157*   1158*   1159*   1160*   1161*   1162*   1163*   1164*   1165*
                          1166*   1167*   1168*   1169*   1171    1188*   1189*   1190*   1191*   1192    1205*   1206*   1261*
                          1266*   1267    1301*   1305*   1366*   1368*   1375    1382*   1384    1387*   1389    1392*   1393*
                          1395    1766*   1767*   1768*   1769*   1770*   1771*   1772*   1773    1774*   1775*   1776*   1777*
                          1778*   1779*   1780    1800    1820    1962*   1963*   1970
WORK1     001110           198#    383*    408*    436*    467*    498*    525*    539     547*    550     625*    674*    675
                           678     744*    752*    808*    829*   1186*   1187*   1192    1202*   1203    1223    1367*   1370*
                          1373*   1379    1765*   1766    1786    1824
WORK2     001112           199#   1350*   1355*   1356    1368
WORK3     001114           200#   1371*   1372*   1373    1423*   1424*   1425*   1426    1442*   1443*   1444*   1445
WRABF     003104           508#    518
WRADTS    004052           660#    673     685     689
WRCADT    002522           425     427#    451
WRCHEC  = 104407            30#    431     870     947    1584    1637    1695
WRDCMP    010132          1353#   1360
WRDCT     001046           177#    215*    293*    367*    400*    428*    460*    501*    578*    612*    658*    701*    727*
                           778*    792*    851*    928*    930     935     977    1037    1179    1200*   1206    1209*   1210*
                          1211*   1261    1356    1439    1510*   1684*
WRDINC    010142          1355#   1409
WRDNW     011712          1688#   1703
WRITE   = 104403           29#    377     403     461     509     579     663     706     717     782     859     940    1568
                          1688
WRLG      005620           923#    927     931     987
WRWAIT    005274           861     864#
XINCW     011142          1531#*  1532    1533    1536
XLPADT    004222           687     690#
XSPIRA    004602            74     773#    791     804     813     824     834     836
XWAIT     011052            35    1518#
X1SPIL    004724           786     792#
X2SPIL    005004           799     805#
X3SPIL    005044           806     814#
X4SPIL    005110           819     826#
ZBUF      010430           883     955    1422#
ZEROAD    002660           424     456#    472
ZWBIT     003764           634     641#
```

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.       = 015072        33#     34#     39#     45#     51#     54#     141#    253     351     379     405     433     459
                        463     478     511     529     581     615     645     708     719     732     784     797     817
                        905     942     944     949     951     958     960     989     1116    1122    1125    1132    1135
                        1147    1216    1236    1369    1407    1528    1535    1570    1572    1586    1588    1639    1641
                        1690    1692    1697    1699    1872    1944    1955    2242#
```

ADC	1287	1289	1291	1292	1294	1297									
ADD	225	226	392	454	520	546	552	594	598	637	642	907	930	1011	1013
	1171	1179	1190	1199	1206	1286	1288	1290	1293	1295	1296	1358	1359	1368	1425
	1441	1444	1494	1512	1854	1891	1915	1918	1970						
ASL	1281	1988													
BCC	599	638	1180	1207	1369	1989									
BCS	931														
BEQ	224	289	307	332	337	351	391	421	424	474	478	540	551	590	624
	632	634	645	676	679	687	741	750	806	827	857	867	878	927	966
	989	1001	1005	1019	1101	1116	1120	1122	1125	1132	1183	1236	1264	1302	1357
	1407	1449	1483	1493	1535	1745	1839	1863	1865	1877					
BHI	1010														
BIC	312	343	416	419	596	635	880	897	920	926	933	967	1003	1017	1033
	1042	1063	1071	1075	1104	1155	1169	1170	1187	1189	1191	1198	1202	1213	1232
	1372	1393	1507	1767	1779	1917	1920	1949	1963	2020					
BIS	219	245	254	260	279	308	318	324	330	376	402	427	508	526	576
	593	610	641	660	698	773	939	1034	1061	1113	1127	1184	1208	1364	1373
	1450	1481	1562	1580	1601	1651	1677	1764	1783						
BIT	221	331	336	350	477	554	591	633	644	690	758	835	856	860	866
	871	877	886	892	900	941	948	957	965	988	1000	1100	1115	1121	1124
	1131	1134	1146	1215	1235	1406	1569	1585	1638	1689	1696	1744	1838	1868	1957
BLOS	266	275	291	298	305										
BMI	218	1484	1487												
BNE	207	222	229	253	259	284	317	323	329	506	522	549	555	592	691
	759	836	861	872	887	893	899	901	909	942	949	958	987	1073	1135
	1147	1193	1204	1216	1268	1285	1306	1354	1427	1446	1570	1586	1639	1665	1667
	1690	1697	1787	1849	1858	1869	1874	1894	1925	1946	1955	1958			
BPL	379	381	405	407	433	435	463	465	511	513	529	531	581	583	615
	617	666	668	708	710	719	721	732	734	784	786	797	799	817	819
	905	1059	1195	1533	1747	1785	1872	1941	1944						
BR	227	270	389	393	414	425	451	455	472	518	536	553	588	595	601
	622	640	643	673	685	689	715	726	739	748	757	791	804	813	824
	834	863	874	889	903	944	951	960	1012	1014	1201	1360	1409	1430	1469
	1495	1497	1524	1536	1572	1576	1577	1588	1592	1641	1645	1646	1658	1692	1699
	1703	1713	1717	1721	1725	1729	1736	1748	1788	1850	1867	1880	1886	1898	1936
	1953	1961	1971	2008	2017										
CLC	276	310	1007	1964	1966	1968	2021								
CLR	205	210	211	212	213	220	246	370	371	372	394	395	422	456	458
	495	496	497	498	523	524	525	572	573	574	607	608	609	654	655
	656	702	780	837	838	910	998	999	1055	1196	1197	1233	1234	1280	1350
	1429	1503	1519	1530	1538	1563	1564	1581	1582	1632	1633	1662	1681	1682	1859
	1939	2005	2006												
CMP	223	252	258	265	274	283	290	297	304	306	316	322	328	390	420
	423	473	505	521	539	548	550	589	623	631	675	678	686	740	749
	805	826	898	908	1004	1009	1072	1182	1192	1203	1263	1353	1356	1426	1445
	1486	1492	1525	1786	1848	1893	1945	1954							
CMPB	1857	1862	1864	1873											
COM	1038	1210													
DEC	206	385	438	677	792	1084	1266	1284	1301	1305	1878	1924			
EMT	230	237	249	255	261	271	280	285	294	301	313	319	325	338	348
	446	980	1015	1068	1080	1089	1098	1109	1226	1256	1398	1464	1541	1607	1704
	1807	1831	1848	1896	1947	1959	2001								
HALT	34	232	1117	1126	1133	1237	1408	1543	1603	1653	1840	2009	2016		
INC	475	504	547	597	600	636	639	680	688	716	727	814	884	986	1039

	1181	1211	1355	1370	1531	1534	1664	1666	2023						
IOT	862	873	888	943	950	959	1571	1587	1640	1691	1698				
JMP	46	55	61	65	68	71	74	77	81	85	88	94	98	102	106
	110	114	118	122	247	352	476	479	646	906	990	1024	1118	1593	1610
	1706	1813													
JSR	216	233	251	257	263	273	282	287	296	303	315	321	327	344	373
	386	411	440	442	469	516	534	543	586	620	628	671	682	713	724
	737	745	754	789	802	810	822	831	850	854	855	883	894	895	902
	925	937	955	963	964	968	972	976	1020	1060	1064	1076	1085	1094	1105
	1218	1222	1231	1252	1365	1374	1378	1383	1388	1394	1453	1460	1561	1575	1591
	1609	1631	1644	1657	1685	1702	1799	1803	1812	1819	1823	1827	1837	1860	1866
	1883	1885	2014												
MOV	203	204	208	209	214	215	241	267	292	293	299	309	340	366	367
	368	369	374	382	383	384	398	399	400	401	408	409	410	415	417
	426	428	429	430	436	437	439	441	457	459	460	466	467	468	499
	500	501	502	503	507	514	515	519	532	533	537	541	542	575	577
	578	584	585	611	612	618	619	625	626	627	657	658	659	661	662
	664	669	670	674	681	699	700	701	703	704	705	711	712	722	723
	728	729	735	736	742	743	744	751	752	753	774	775	776	777	778
	779	781	787	788	793	794	800	801	807	808	809	820	821	828	829
	830	848	849	851	852	853	858	864	868	869	875	879	882	890	896
	918	919	921	922	923	924	928	929	932	934	935	936	938	945	952
	954	961	1002	1006	1018	1030	1031	1032	1035	1036	1037	1040	1041	1043	1056
	1062	1070	1074	1083	1093	1102	1114	1136	1149	1156	1157	1186	1188	1200	1205
	1209	1212	1214	1250	1260	1261	1262	1265	1277	1278	1279	1298	1300	1303	1304
	1351	1352	1366	1367	1371	1382	1387	1392	1422	1423	1439	1442	1451	1457	1459
	1482	1488	1489	1490	1502	1504	1508	1510	1511	1518	1520	1521	1523	1526	1527
	1528	1539	1560	1565	1566	1567	1573	1583	1589	1602	1605	1606	1630	1634	1635
	1636	1642	1652	1655	1656	1661	1678	1679	1680	1683	1684	1686	1687	1693	1700
	1712	1716	1720	1724	1728	1733	1740	1741	1742	1743	1765	1766	1773	1774	1780
	1781	1782	1847	1853	1855	1875	1890	1892	1912	1913	1914	1916	1935	1937	1938
	1942	1962	1979	1980	1981	1982	1983	1984	1985	1986	1987	1990	1991	2003	2004
	2012	2013	2019												
MOVB	1856	1870	1879	1882	1884	1919									
NOP	1021	1022	1023												
RESET	202	1663	1734	1735	2011										
ROL	243	244	268	269	277	278	311	418	1158	1159	1160	1161	1162	1163	1164
	1165	1166	1167	1168	1282	1283	1424	1440	1443	1776	1777	1778	1965	1967	1969
ROR	341	342	1008	1150	1151	1152	1153	1154	1251	1506	1509	1768	1769	1770	1771
	1772	1921	1922	1923	1950	1951	1952	2022							
RTI	1044	1057	1128	1137	1529	1540	1545	1861	1895	1984	2015				
RTS	1148	1172	1217	1238	1269	1307	1361	1428	1447	1513	1668	1841	1881	1926	1956
	1992	2024													
SUB	242	264	1123	1452	1458	1485	1496	1501	1505						
SWAB	1103	1775													
SXT	1522														
TRAP	29	30	31												
TST	217	228	288	380	406	434	464	512	530	582	616	667	709	720	733
	785	798	818	904	1058	1119	1267	1448	1491	1876	2007				
TSTB	378	404	432	462	510	528	580	614	665	707	718	731	783	796	816
	1194	1532	1746	1784	1871	1940	1943								
WAIT	865	876	891	946	953	962	1574	1590	1643	1694	1701				
.ASCII	2044	2048	2053	2056	2061	2064	2069	2077	2083	2088	2092	2097	2103	2109	2116
	2122	2127	2130	2135	2139	2143	2146	2150	2156	2161	2167	2172	2179	2183	2188

	2194	2198	2204	2208	2213	2217	2223	2224	2228	2229	2231	2235
.ENABL	7											
.END	2248											
.EVEN	143	1318	2043	2239								
.LIST	5	34										
.NLIST	5	34										
.REPT	34											
.TITLE	2											

ERRORS DETECTED: 0

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*DZRFBB,DZRFBB/SOL/CRF_DZRFBB
RUN-TIME: 6 14 3 SECONDS
CORE USED:  8K
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