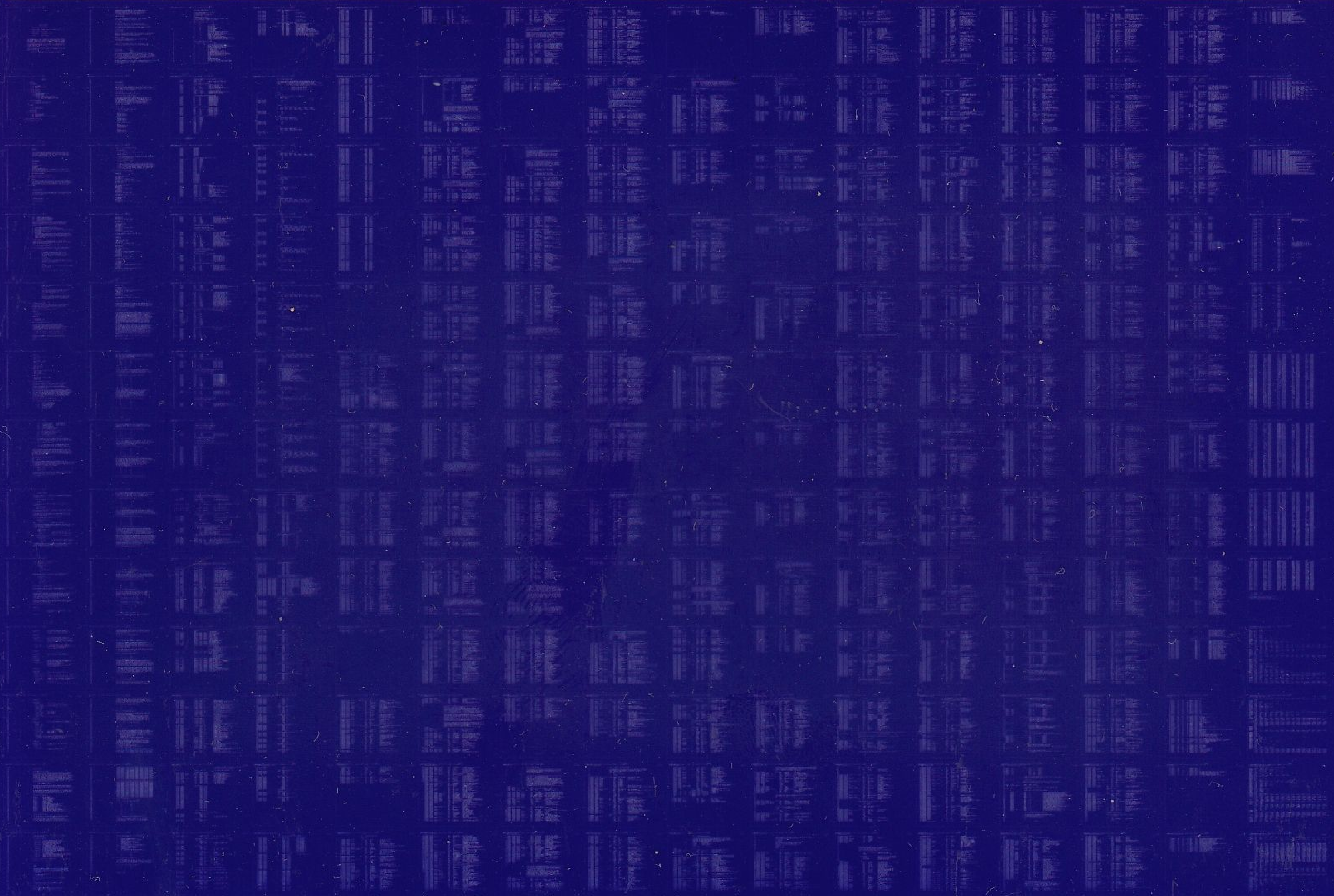
RM02/03/05

RM05/3/2 EXT'D DR TST
CZRMVBO

AH-S074B-MC
FICHE 1 OF 2

AUG 1981



RM02/03/05

RM05/3/2 EXT'D DR TST
CZRMVBO

AH-S074B-MC
FICHE 2 OF 2

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				IDENTIFICATION
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			PRODUCT CODE:	AC-S072B-MC

			PRODUCT NAME:	CZRMVB0  RM05/3/2 EXTENDED DRIVE TEST

			PRODUCT DATE:	APRIL 1981

			MAINTAINER:	CX DIAGNOSTIC GROUP

			AUTHOR:		MIKE LEAVITT



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CONTENTS

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'.      ABSTRACT
        --------

        THIS  PROGRAM CONTAINS A SERIES OF TESTS THAT WILL VERIFY THAT
        THF DISK IS CAPABLE OF PERFORMING SEEKS, THAT THE ACCESS TIMCS
        ARE  WITHIN  'OLERANCE AND  THAT  THE TRACK/SECTOR  ADDRESSING
        C:RCUITRY OPERATES PROPERLY,  AND  THAT THE  DATA STORAGE  AND
        RETRIEVAL CAPABILITIES ARE FUNCTIONING.



2.      REQUIREMENTS
        ------------

2.'     EQUIPMENT

        PDP-11 PROCESSOR
        12K MEMORY
        TELETYPE
        PROGRAM LOADING DEVICE
        KW11-L OR KW11-P (THE KW11-P IS REQUIRED FOR THE TIMING TESTS)
        RH11 OR RH70 CONTROLLER
        1 TO 8 DISK DRIVES (ANY COMBINATION OF RM05'S, RM03'S OR RM02'S)

2.2     PRELIMINARY PROGRAMS

        RM05/3/2 DISKLESS TEST, PART 1 & 2

        RM05/3/2 FUNCTIONAL TEST, PART 1, 2 & 3

2.3     MEDIA

        THE PROGRAM REQUIRES THAT EACH DRIVE TO BE TESTED HAS A FORMATTED
        DISK PACK.  THE PACK MAY BE FORMATTED IN EITHER 16-BIT OR 18-BIT
        MODE, DEPENDING ON THE TESTING REQUIREMENTS.  NOTE THAT THE PROGRAM
        WILL NOT TEST A MIXTURE OF DRIVES WITH BOTH 16 AND 18 BIT MODE
        PACKS.



3.      LOADING PROCEDURE
        -----------------

        THE PROGRAM MAY BE LOADED FROM PAPER TAPE USING THE ABSOLUTE LOADER
        OR IT MAY BE  LOADED FROM  THE APPROPRIATE  'XXDP' MEDIA  USING THE
        ASSOCIATED LOADER.



4.      STARTING PROCEDURE
        ------------------

4.1     STARTING ADDRESSES
```

```
                200     NORMAL STARTING ADDRESS
                204     SELECT OPERATING PARAMETERS
                210     SELECT RH11-RH70 ADDRESSES
                214     COMBINATION OF 204 AND 210

                NOTE:  STARTING ADDRESSES 210 AND 214 ARE AVAILABLE WHEN THE
                PROGRAM IS INITIALLY STARTED; THESE STARTING ADDRESSES ARE
                TREATED AS ADDRESSES 200 OR 204 RESPECTIVELY ON RESTARTS.

        4.2     OPERATOR ACTION

                1.  LOAD PROGRAM INTO MEMORY (SEE SECTION 3.)
                2.  LOAD A FORMATTED PACK INTO DRIVE(S) TO BE TESTED
                3.  BRING DRIVE(S) TO ONLINE STATE, WRITE ENABLED, AND LOCKED ON PORT.
                4.  LOAD ADDRESS 200.
                5.  SET SWITCHES (SEE SECTION 5.)
                6.  PRESS START.
                7.  THE PROGRAM WILL TYPEOUT THE STATUS OF THE DRIVES ATTACHED TO
                    THE SELECTED MASSBUS SUBSYSTEM.  TO INHIBIT THIS TYPEOUT, DO NOT
                    RESTART THE PROGRAM FROM ANY OF THE STARTING ADDRESSES; INSTEAD
                    TYPE A 'CONTROL C' ON THE KEYBOARD TO RETURN THE PROGRAM TO
                    COMMAND ENTRY MODE.

        4.3     PROGRAM ACTION

                  IN AN EFFORT TO ALLOW CONVERSATION WITH A PROGRAM FOR THE
                PURPOSE OF CONTROLLING ITS OPERATION AND PARAMETERS THE FOLLOWING
                CONSTRUCTIONS HAVE BEEN ADOPTED.

                NOTE1.  IN ALL EXAMPLES BRACKETS ARE USED FOR CLARITY AND ARE
                        NOT TYPED BY THE USER.

                NOTE2:  THE CARRRIAGE RETURN TYPED BY THE USER IS INDICATED BY
                        <CR> AND WILL BE ECHOED AS A 'CARRIAGE RETURN-LINE FEED'.

                <.><CR>         PERIOD

                                A STATEMENT TERMINATOR: WHEN TYPED AT THE
                                END OF A LINE (LEGAL ON ALL LINES) IT TELLS
                                THE PARAMETER STRING INTERPRETER (PSI) THIS IS
                                THE END OF CHANGES TO THE CURRENT PARAMETER
                                STRING.

                <..><CR>        PERIOD PERIOD

                                THE 'PERIOD PERIOD' TERMINATOR IS TYPED TO INDICATE
                                THE END OF TEST PARAMETER MODIFICATION AND TO SIGNAL
                                THE START OF TEST EXECUTION.

                <,><CR>         COMMA

                                THE COMMA IS USED AS A SEPARATOR BETWEEN DRIVE NUMBERS
                                AND TEST NUMBERS.

                </>             SLASH

                                A MODIFICATION INDICATOR: IF A SLASH FOLLOWS A TEST
```

```
                                        NUMBER, THE PROGRAM WILL OPEN THAT TEST FOR PARAMETER
                                        MODIFICATION.

                          <^U>          CONTROL-U

                                        DELETE THE PRESENT INPUT STRING AND START A NEW
                                        LINE. TYPED BY DEPRESSING THE ''CONTROL KEY''
                                        (CTRL) AND THEN STRIKING THE 'U''.

                          <\>           RUBOUT

                                        DELETE THE LAST CHARACTER FROM THE INPUT STRING.
                                        TYPED BY STRIKING THE 'RUBOUT'' KEY. WHICH WILL
                                        BE ECHOED BY A BACKSLASH (\) FOLLOWED BY THE
                                        CHARACTER DELETED.


                4.3.1     CONTROL SWITCH SELECTION

                          STARTING THE PROGRAM AT ANY OF THE POSSIBLE STARTING ADDRESSES
                          WITH SW<07>=1 WILL RESULT IN ENTERING THE ''CONTROL SWITCH
                          SETTING'' MODE. THUS, ALLOWING THE OPERATOR TO SPECIFY THE
                          DESIRED STATE OF ''C.SWR''.

                          CONTROL SWITCH SELECTION EXAMPLES:

                          EXAMPLE #1

                            SET SW<07>=0
                            C.SWR=000000 / 400..

                          EXAMPLE #2

                            SET SW<07>=0
                            C.SWR=000000 / 220.
                            C.SWR=000000 / 220..

                4.3.2     RH11 - RH70 ADDRESS SELECTION

                          STARTING THE PROGRAM AT 200 WILL RESULT IN AUTOMATIC
                          SELECT OF THE DEFAULT VALUES OF BUS ADDRESS (RMCS1),
                          VECTOR ADDRESS, AND PRIORITY LEVEL OF THE RH11-RH70.
                          IF THE DEFAULT VAULE OF THE BUS ADDRESS DOES NOT RESPOND
                          (TIMES OUT) WHEN ADDRESSED, AN ERROR IS REPORTED.
                          AFTER THE ERROR IS REPORTED ONE OF TWO COURSES OF ACTION
                          WILL BE TAKEN:

                          1. IF THERE IS A MONITOR -- RETURN TO THE MONITOR

                          2. IF THERE ISN'T A MONITOR -- ASK FOR NEW ADDRESSES

                          STARTING THE PROGRAM AT 210 OR 214 ALLOWS THE OPERATOR
                          TO CHANGE THE ADDRESS OF THE RH11 OR RH70 AND THE VECTOR
                          ADDRESS.

                          ADDRESS SELECTION EXAMPLES
```

EXAMPLE #1

```
RMCS1=176700 / 177200.
```

EXAMPLE #2

```
RMCS1=176700 / 176300<CR>
RMVEC=254 / 260<CR>
```

EXAMPLE #3

```
RMCS1=176700<CR>
RMVEC=254 / 260.
```

EXAMPLE #4

```
RH/RM FAILED TO RESPOND TO ADDRESSING
RMCS1   ERR PC
176300  XXXXXX
RMCS1=176300 / 176700.
```

EXAMPLE #5

```
RMCS1=176700 / 1776\67\6300<CR>
RMVEC=254<CR>
RMCS1=176300.
```

4.3.3 DRIVE AND PARAMETER SELECTION

STARTING THE PROGRAM AT 200 OR 210 WILL RESULT IN AUTOMATIC SELECTION OF THE DRIVES TO TEST AND THE TESTS TO RUN.

STARTING THE PROGRAM AT 204 OR 214 ALLOWS THE OPERATOR TO SELECT THE DRIVE(S) TO BE TESTED, THE TESTS TO BE EXFCUTED, AND THE PARAMETERS TO USE.

EACH TEST CONTAINS TWO SETS OF TRACK LIMIT PARAMCTERS. PARAMETERS 'LT'', 'FT'' AND ''IT'' ARE USED BY RM03/2 DRIVES AND PARAMETERS 'LT''', 'FT''' AND ''IT''' ARE USED BY RM05 DRIVES. THE PROGRAM DETERMINES WHICH DRIVF IS BEING TESTED AND SELECTS THE CORRECT SET OF TRACK LIMIT VALUES. IF THE PROGRAM IS BEING USED TO TEST A SUBSYSTEM WHICH CONTAINS BOTH RM03/2 AND RM05 DRIVES, THE OPERATOR MUST CHANGE BOTH SETS OF TRACK LIMITS IF THE TESTS ARE TO BE MODIFIED FOR ALL DRIVES TESTED.

4.3.3.1 DRIVE AND PARAMETER SELECTION DESCRIPTION

THE FOI LOWING IS A TABLE OF TERMS USED BY THE PSI.

'R''	REPEATS (ITERATIONS)
'FC''	FIRST CYLINDER ADDRESS
'LC''	LAST CYLINDER ADDRESS
''IC''	INCREMENT CYLINDER
'FT''	FIRST TRACK ADDRESS
'LT''	LAST TRACK ADDRESS
''IT''	INCREMENT TRACK

```
        ''FT'''   FIRST TRACK ADDRESS      ;RM05 PARAMETER
        ''LT'''   LAST TRACK ADDRESS       ;RM05 PARAMETER
        ''IT'''   INCREMENT TRACK          ;RM05 PARAMETER
        'FS''     FIRST SECTOR ADDRESS
        'LS''     LAST SECTOR ADDRESS
        'PAT''    PATTERN (USED FOR DATA TEST)
        'WDX''    WORD OF PATTERN 0 WHERE X IS 1 TO 16

       *''S''     ALL SEEK TESTS (TESTS 0 - 10)
       *''T''     ALL TIMING TESTS (TESTS 12 - 15)
       *''A''     ALL ADDRESS TESTS (TESTS 16 - 17)
       *''D''     THE DATA TEST (TEST 20)
       *''E''     THE EXERCISER (TEST 21)

       * USED BY THE OPERATOR TO SELECT TEST GROUPS

NOTE:   ALL NUMBERS WILL BE IN DECIMAL EXCEPT FOR THE PATTERN
        (PAT) AND WORDS (WDX) SELECTION.  'PAT'' WILL BE SELECTED BY
        A BIT (I.E. 001000(8)=PATTERN 9) AND 'WDX'' WILL BE IN OCTAL.

SPECIAL CASES OF CONTROL CHARACTERS

        IF <..> IS TYPED WHILE A TEST IS OPEN FOR MODIFICATION
        (</>) AND OTHER TESTS IN THE ''TEST COMMAND'' STRING
        ARE TO BE MODIFIED, THE REMAINING TESTS WILL BE UNCHANGED.


WHEN THE PROGRAM IS STARTED FROM LOCATION 200 OR 210, TESTS 0-10,
12,13,15-20 WILL BE RUN USING ALL AVAILABLE, ONLINE DRIVES. IF THE
OPERATOR WISHES TO SELECT THE DRIVES TO BE TESTED, THE TESTS TO BE
PERFORMED, OR THE PARAMETERS TO BE USED, THE CONVERSATION MODE MAY
BE ENTERED BY TYPING A 'CONTROL C' OR BY STARTING THE PROGRAM FROM
EITHER LOCATION 204 OR 214.


THE PROGRAM WILL THEN RESPOND WITH:

        DRIVE(S)=

THE FOLLOWING EXAMPLES ASSUME THAT THE OPERATOR IS TO TEST
DRIVE #3 USING TESTS 2 THRU 7 AND TEST 11 AND DOES NOT DESIRE TO CHANGE
THE PARAMETERS (INITIAL CYLINDER ADDRESS, FINAL CYLINDER ADDRESS, ETC.).
THE USER WOULD TYPE '3<CR>' WHICH SAYS 'THIS IS THE END OF DRIVE ENTRY'.
THE PROGRAM WILL THEN REQUEST TEST NUMBERS.

THE TRANSACTION APPEARS AS FOLLOWS:

        DRIVE(S)=3<CR>
        TEST=

THE OPERATOR MAY NOW ENTER DESIRED TEST NUMBERS.  IN THE EXAMPLE,
HE WANTS TESTS 2 THRU 7 AND TEST 11 SO HE TYPES 2-7<,> (THE 'COMMA'
SEPARATES ENTRIES), 11<.><CR> ('PERIOD' 'CARRIAGE RETURN' -
END OF CHANGES, START TEST EXECUTION.)

IT NOW LOOKS LIKE THIS
```

```
        DRIVE(S)=3<CR>
        TEST=2-7,11.<CR>
```

IN THE NEXT EXAMPLE, IT IS ASSUMED THAT THE OPERATOR WISHES TO TEST DRIVE 4 AND TO RUN TESTS 1 AND 3 THRU 11, MODIFYING THE PARAMETERS FOR TESTS 3 AND 10.

THE TRANSACTION WOULD BE AS FOLLOWS:

```
        DRIVE(S)=4<CR>
        TEST=
```

THE OPERATOR NOW ENTERS THE TEST NUMBERS. THE TRANSACTION IS GIVEN BELOW:

```
        DRIVE(S)=4<CR>
        TEST=1,3/4-7,10/11<CR>
```

NOTICE THIS SAYS SELECT TEST 1, CONTINUE<,>; SELECT TEST 3, OPEN</>; SELECT TESTS 4-7, CONTINUE<,>; SELECT TEST 10, OPEN</>; SELECT TEST 11, END OF INPUT <.>.

THE PROGRAM SCANS THE TEST NUMBER INPUT AND DETERMINES THAT THE PARAMETERS FOR TEST 3 AND TEST 10 ARE TO BE CHANGED. THE OTHER TESTS WILL NOT BE ALTERED.

(THE ENTIRE TRANSACTION IS REPEATED FOR CLARITY)

```
        DRIVE(S)=4<CR>
        TEST=1,3/4-7,10/11<CR>
          TEST 3
            R=X /                   ;WHERE X IS ITERATION
```

THE NEW VALUE FOR 'R' MAY BE ENTERED. TERMINATING THE ENTRY WITH A <.> (PERIOD) WILL TERMINATE THE CHANGES FOR THIS TEST; TYPING A <CR> OR TERMINATING THE ENTRY WITH A <CR> WILL CAUSE THE PROGRAM TO MOVE TO THE NEXT PARAMETER.

```
        DRIVE(S)=4<CR>
        TEST=1,3/4-7,10/11<CR>
          TEST 3
            R=1 / <CR>              ;DO NOT ALTER-BUT CONTINUE
            FC=N /                  ;WHERE 'N' IS FIRST CYLINDER ADDRESS
```

IF THE OPERATOR DOES NOT WISH TO CHANGE 'FC', THE FOLLOWING OCCURS:

```
        DRIVE(S)=4<CR>
        TEST=1,3/4-7,10/11.<CR>
          TEST 3
            R=1 / <CR>              ;DO NOT ALTER THIS LINE BUT CONTINUE
            FC=0 / <CR>             ;DO NOT ALTER THIS LINE BUT CONTINUE
            LC=822 /
```

THE PROGRAM RESPONDS WITH THE PREVIOUSLY ASSIGNED PARAMETER FOR LAST CYLINDER ADDRESS IN THIS CASE USING 822 AS THE EXAMPLE. THIS IS WHAT THE OPERATOR INTENDED TO MODIFY AND IS WHY TEST 3 WAS OPENED. TO CHANGE THE VALUE TO '20', THE NEW VALUE IS TYPED

FOLLOWED BY A 'PERIOD' TERMINATOR (<.><CR>).

THE TOTAL TRANSACTION AND RESPONSE:

```
        DRIVE(S)=4<CR>
        TEST=1,3/4-7,10/11<CR>
          TEST 3
            R=1 / <CR>
            FC=0 / <CR>
            LC= 822 / 20.<CR>
          TEST 10
            R=1 /
```

THE PROGRAM HAS LOADED TEST 3 WITH ITS NEW PARAMETERS AND THE PROGRAM IS WAITING FOR CHANGES TO TEST 10'S PARAMETERS.

```
        DRIVE(S)=4<CR>
        TEST=1,3/4-7,10/11<CR>
          TEST 3
            R=1 / <CR>
            FC=0 / <CR>
            LC= 822 / 20.<CR>
          TEST 10
            R=1 / 10.<CR>
```

THE OPERATOR TYPES THE NEW VALUE (10) AND TERMINATES THE ENTRY WITH A 'PERIOD' 'CARRIAGE RETURN'.

THE PROGRAM NOW LOADS TEST 10 WITH THE NEW PARAMETERS (TEST 11 RETAINS THE PREVIOUSLY ASSIGNED PARAMETERS) AND RESPONDS WITH:

```
        DRIVE(S)=
```

SINCE THE USER DID NOT END THE CONVERSATION MODE WITH A 'PERIOD PERIOD', THE PROGRAM HAS LOOPED BACK TO THE BEGINNING LOOKING FOR MORE CHANGES. THAT IS TO SAY, AFTER THE ENTRY FOR DRIVE SELECTION, A <,><CR> WILL CAUSE THE TEST MESSAGE TO BE REPEATED AND FURTHER CHANGES CAN BE MADE. HOWEVER, AT SOME POINT IN ORDER TO EXECUTE THE PROGRAM, A 'PERIOD PERIOD' MUST BE TYPED.

IF A SINGLE 'PERIOD' IS TYPED WHILE DRIVE OR TEST NUMBERS ARE BEING ENTERED, THE PROGRAM WILL START EXECUTION IMMEDIATELY. A 'PERIOD PERIOD' MUST BE TYPED BEFORE THE PROGRAM WILL EXIT TEST PARAMETER CHANGE MODE TO GO TO FXECUTION.

4.3.3.2 DRIVE AND PARAMETER SELECTION EXAMPLES

EXAMPLE #1

```
DRIVE=4.<CR>              ;SELECT DRIVE #4, TERMINATE AND
                          ;BEGIN EXECUTION USING PREVIOUSLY ASSIGNED
                          ;PARAMETERS
```

EXAMPLE #2

```

DRIVE=0<CR>              ;SELECT DRIVE #0 AND MAKE CHANGES ","
TEST=1-5.<CR>            ;RUN TEST 1 THRU 5 ONLY, USE DEFAULT
                         ;PARAMETERS AND TERMINATE AND EXECUTE."

EXAMPLE #3
----------

DRIVE=2<CR>              ;SELECT DRIVE #2 AND MAKE CHANGES ","
TEST=1-5,6/7/10/<CR>     ;RUN TEST 1-5 WITH DEFAULT PARAMETERS, OPEN
  TEST 6                 ;TEST 6,7 AND 10 FOR CHANGES
    R=1 / <CR>           ;LEAVE 'R' AS IS AND MOVE TO NEXT PARAMETER
    FC=0 / 10.<CR>       ;SET 'FC' CYLINDER ADDRESS TO 10, END CHANGES
                         ;TO TEST 6.

  TEST 7
    R=1 / 50<CR>         ;50 ITERATIONS, MOVE TO NEXT PARAMETER
    FC=0 / <CR>          ;DO NOT CHANGE 'FC' CYLINDER ADDRESS BUT CONTINUE
    LC=822 / 50..<CR>    ;TEST 10 IS STILL PENDING AND WILL BE
                         ;RETAIN ITS PRESENT PARAMETERS.


EXAMPLE #4
----------

DRIVE=0<CR>              ;SELECT DRIVE #0 AND MAKE CHANGES
TEST=S,E.<CR>            ;RUN ALL SEEK TESTS AND THE EXERCISER

EXAMPLE #5
----------

DRIVE=1<CR>
TEST=S/D<CR>             ;RUN ALL SEEK TESTS (OPEN FOR CHANGES) AND
  TEST 0                 ;THE DATA TEST (WITH DEFAULT PARAMETERS).
    R=10 / <CR>          ;RUN WITH 10 ITERATIONS
    FC=0 / 10..<CR>      ;CHANGE FIRST CYLINDER ADDRESS
                         ;AND START EXECUTION
                         ;TESTS 1 - 10 WILL RETAIN THEIR PREVIOUSLY
                         ;ASSIGNED PARAMETERS.

EXAMPLE #6
----------

DRIVE=1<CR>
TEST=S/<CR>              ;OPEN THE SEEK TESTS (TESTS 0-10)
  TEST 0
    R=10 / 100.<CR>      ;CHANGE TO 100 ITERATIONS, TO TO THE NEXT TEST
  TEST 1
    R=100 / 1000.<CR>    ;CHANGE 'R' TO 1000 ITERATIONS, MOVE TO NEXT TEST
  TEST 2
    R=1 / 10<CR>         ;CHANGE 'R' TO 10 ITERATIONS, GO TO NEXT PARAMETER
    FC=0 / 50<CR>        ;CHANGE 'FC' TO 50, GO TO NEXT PARAMETER
    LC=822 / 51.<CR>     ;CHANGE 'LC' TO 51, GO TO THE NEXT TEST
  TEST 3
    R=1.<CR>             ;MOVE TO NEXT TEST
  TEST 4
    R=1..<CR>            ;USE TEST 4'S PARAMETERS AND START PROGRAM EXECUTION
```

```

                    EXAMPLE #7
                    ----------

                    DRIVE=1<CR>
                    TEST=D/<CR>                 ;SELECT AND OPEN THE DATA TEST
                      TEST 20
                        R=1 / 1000<CR>          ;DO 1000 ITERATION OF TEST PATTERN
                        FC=0 / 10<CR>           ;#8 ON CYLINDER 10, TRACK 2, SECTOR 4
                        LC=822 / 10<CR>
                        IC=64 / 0<CR>
                        FT=0 / 2<CR>
                        LT=4 / 2<CR>
                        IT=1 / <CR>
                        FT'=0 / 2<CR>           ;RM05 PARAMETER
                        LT'=18 / 2<CR>          ;RM05 PARAMETER
                        IT'=1 / <CR>            ;RM05 PARAMETER
                        FS=0 / 4<CR>
                        LS=22 / 4<CR>
                        PAT=177777 / 400..<CR> ;RUN WITH PATTERN #8

                    EXAMPLE #8
                    ----------

                    DRIVE=1<CR>                 ;USE THE SAME PARAMETERS AS IN EXAMPLE
                    TEST=D/<CR>                 ;#7, BUT ALSO SPECIFY A DATA PATTERN (PAT #0).
                      TEST 20
                        R=1000 / <CR>
                        FC=10 / <CR>
                        LC=10 / <CR>
                        IC=0 / <CR>
                        FT=2 / <CR>
                        LT=2 / <CR>
                        IT=1 / <CR>
                        FT'=0 / 2<CR>           ;RM05 PARAMETER
                        LT'=18 / 2<CR>          ;RM05 PARAMETER
                        IT'=1 / <CR>            ;RM05 PARAMETER
                        FS=4 / <CR>
                        LS=4 / <CR>
                        PAT=000400 / 401<CR> ;RUN WITH PATTERNS #8 & #0 (0-OPERATOR INPUT)
                          WD1=165555 / 125252<CR> ;FIRST WORD OF PATTERN 0
                          WD2=133333 / 52525..<CR> ;SECOND WORD OF PATTERN 0
                                                ;<..> START EXECUTION

                    EXAMPLE #9
                    ----------

                    DRIVE=0,1,4<CR>             ;TEST DRIVES 0,1, AND 4 IN SEQUENCE
                    TEST=0-5/<CR>               ;CHANGE TEST 5
                      TEST 0
                        R=10 / <CR>
                        FC=0 / <CR>
                        LC=822 / 1..<CR>        ;CHANGE LAST CYLINDER FROM 822 TO 1
                                                ;START PROGRAM EXECUTION.



```

5. SWITCH SETTINGS

5.1 OPERATIONAL SWITCH SETTINGS

IF THE PROGRAM IS BEING RUN ON A SWITCHLESS PROCESSOR THE PROGRAM WILL DETERMINE THAT THE HARDWARE SWITCH REGISTER IS NOT PRESENT AND WILL USE A 'SOFTWARE' SWITCH REGISTER. THF 'SOFTWARE' SWITCH REGISTER IS LOCATED AT LOCATION 176 . THE SETTINGS OF THE 'SOFTWARE' SWITCHES ARE CONTROLLED THROUGH A KEYBOARD ROUTINE WHICH IS CALLED BY TYPING A 'CONTROL G'. THE PROGRAM WILL RECOGNIZE THE 'CONTROL G' AT ANY TIME EXCEPT WHEN THE PROGRAM IS IN KEYBOARD ENTRY MODE, OR IS AT A HIGHER PRIORITY PROCESSING AN DRIVE INTERRUPT. THE 'SOFTWARE' SWITCH VALUES ARE ENTERED AS AN OCTAL NUMBER IN RESPONSE TO THE PROMPT FROM THE SWITCH ENTRY ROUTINE:

```
        'SWR = NNNNNN    NEW ='
```

EACH TIME SWITCH SETTINGS ARE ENTERED, THE ENTIRE SWITCH REGISTER IMAGE MUST BE ENTERED. LEADING ZEROS ARE NOT REQUIRED. 'RUBOUT' AND 'CONTROL U' FUNCTIONS MAY BE USED TO CORRECT TYPING ERRORS DURING SWITCH ENTRY.

ON PROCESSORS WITH HARDWARE SWITCH REGISTERS, THE 'SOFTWARE' SWITCH REGISTER MAY BE USED, IF THE PROGRAM FINDS ALL 1'S IN THE SWITCHES. ALL SWITCH REGISTER REFERENCES WILL BE TO THE 'SOFTWARE' REGISTER AND THE PROCEDURES DESCRIBED ABOVE MUST BE FOLLOWED.

THE SWITCH SETTINGS ARE:

SW<15>=1	HALT ON ERROR
SW<14>=1	LOOP ON TEST
SW<13>=1	INHIBIT ERROR TYPEOUTS
SW<12>=1	TYPE TEST NUMBER
SW<11>=1	INHIBIT ITERATIONS
SW<10>=1	RING BELL ON ERROR
SW<09>=1	LOOP ON ERROR
SW<08>=1	PRINT ERROR MESSAGE ON LINE PRINTER
SW<07>=1	READ 'C.SWR' SETTINGS FROM TTY
SW<06>=1	INHIBIT TIME REPORTS (TESTS 12-15)
SW<05>=1	REPORT ONE ERROR PER SECTOR (TESTS 16 & 17)
SW<04>=1	INHIBIT WRITES (TEST 20)
SW<03>=1	INHIBIT WRITE CHECKS (TEST 20)
SW<02>=1	INHIBIT READ AND SOFTWARE COMPARES (TEST 20)
SW<01>=1	INHIBIT SOFTWARE COMPARES (TEST 20)
SW<00>=1	PERFORM READ AFTER WRITE CHECK ERROR (TEST 20)

5.2 CONTROL SWITCH SETTINGS

THE CONTROL SWITCH SETTINGS ARE ENTERED THROUGH THE KEYBOARD.

TO ENTER THE CONTROL SWITCH SETTING MODE PLACE SW<07>=1 BEFORE PRESSING START. THEN UPON STARTING THE PROGRAM IT WILL TYPE THE PRESENT CONTENTS OF THE CONTROL SWITCH REGISTER (C.SWR) AND WAIT FOR THE NEW SETTING TO BE INPUT. THE INPUT

STRING MUST CONSIST OF 1 TO 6 OCTAL DIGITS, TWO PERIODS (..), AND A CARRIAGE RETURN.

THE C.SWR SETTINGS ARE:

C.SWR<15>=0	WRITE PACK BEFORE TESTING (TEST16)
=1	INHIBIT WRITE PACK BEFORE TESTING (TEST16)
C.SWR<14>=0	NO STALL BETWEEN DRIVE FUNCTIONS
=1	STALL AFTER EVERY DRIVE FUNCTION
C.SWR<13>=0	USE SPECIFIC STALL TIMES
=1	USE RANDOM STALL TIMES
C.SWR<12>=0	NO INCREMENTING STALLS IN TEST 4
=1	PERFORM INCREMENTING STALLS IN TEST 4
C.SWR<08>=0	DO IMPLIED SEEKS WITH DATA TRANSFERS
=1	DO EXPLICIT SEEKS BEFORE DATA TRANSFERS
C.SWR<07>=0	DO READ HEADER AND DATA COMMANDS IN TESTS 0-7
=1	DO EXPLICIT SEEK COMMANDS IN TESTS 0-7
C.SWR<06>=0	60 HZ POWER SOURCE
=1	50 HZ POWER SOURCE
C.SWR<05>=0	ALLOW SOFTWARE TIMEOUTS(ENABLE WATCHDOG TIMER)
=1	INHIBIT SOFTWARE TIMEOUTS(DISABLE WATCHDOG TIMER)
C.SWR<00>=0	OPERATE IN 32. SECTOR (16 BIT) MODE
=1	OPERATE IN 30. SECTOR (18 BIT) MODE

THE DEFAULT CONDITION OF C.SWR<15:00>=0.

REFER TO 4.3.1 FOR C.SWR SELECTION

6. ERRORS

THERE ARE A NUMBER OF ERRORS THAT CAN OCCUR IN THIS PROGRAM. WHEN AN ERROR IS ENCOUNTERED, THE CALL TO THE ERROR ROUTINE IS MADE AND IF SW<13> IS NOT SET, AN ERROR MESSAGE PERTAINING TO THE ERROR WILL BE TYPED. EACH ERROR TYPEOUT WILL CONTAIN THE FOLLOWING:

1. AN ERROR MESSAGE
2. A DATA HEADER
3. A DATA STRING

REFER TO THE FOLLOWING SECTION FOR THE DIFFERENT ERRORS THAT CAN OCCUR.

6.1 ERROR TYPES

THE ERRORS THAT OCCUR IN THIS PROGRAM FALL INTO THREE (3) CATEGORIES DEFINED AND EXPLAINED AS FOLLOWS:

6.1.1 DRIVER ERROR

THESE ERRORS WILL BE DETECTED BY THE RH/RM DRIVER. THERE ARE TWO CLASSES OF DRIVER ERRORS; THOSE THAT CAN NOT BE IDENTIFIED IN A MANNER THAT ALLOWS THE

```
                        INFORMATION TO BE RETURNED TO A 'DATA PARAMETER BLOCK''
                        (DPB) AND THOSE THAT CAN. THE FIRST CLASS WILL BE
                        REPORTED BY ERROR CALLS (EMT'S) 1-5 WITHIN THE DRIVER.
                        THE SECOND CLASS WILL PASS THE ERROR CODES TO THE
                        STATUS/ERROR WORD (DPB+16) OF THE PROPER DPB.

                6.1.2   NON-FATAL ERRORS

                        THESE ERRORS WILL BE DUE TO 'DISK'' OR 'DATA'' FAILURES
                        WHICH WILL BE REPORTED AS THEY OCCUR.  AFTER REPORTING
                        THE ERROR THE PROGRAM WILL CONTINUE TESTING.

                6.1.3   FATAL ERRORS

                        THIS TYPE OF ERROR WILL BE THE RESULT OF ANY KIND
                        OF ERROR THAT INHIBITS THE PROGRAM FROM TESTING THE DISK.

                        THIS ERROR WILL BE REPORTED WHEN IT OCCURS, THEN THE PROGRAM
                        WILL ABORT THE TEST AND GO TO THE END OF PROGRAM.

                6.2     ERROR RECOVERY

                6.2.1   PRETEST ERROR

                        WHEN THIS TYPE OF ERROR OCCURS IT WILL BE REPORTED.  THEN DEPENDING
                        ON HOW THE PROGRAM WAS STARTED IT WILL ASK FOR THE DRIVES AND
                        ADDRESSES FOR TESTING OR RETURN TO MONITOR.

                6.2.2   NON-FATAL ERROR

                        WHEN THIS TYPE OF ERROR OCCURS IT WILL BE REPORTED AND
                        THE PROGRAM WILL CONTINUE IN TEST.

                6.2.3   FATAL ERROR

                        WHEN THIS TYPE OF ERROR OCCURS IT WILL BE REPORTED.  THE
                        PROGRAM WILL ABORT THE TEST AND GO TO THE END OF PROGRAM.




                7.      RESTRICTIONS
                        ------------

                        THE PROGRAM WILL TEST THE DRIVES IN EITHER 16 BIT MODE OR IN 18
                        BIT MODE DEPENDING ON THE SETTING OF 'S.SWR<00>'.  IF 'C.SWR<00>'
                        IS 0, ALL OF THE DRIVES WILL BE TESTED IN 16 BIT MODE; IF 'C.SWR<00>
                        IS 1, ALL OF THE DRIVES WILL BE TESTED IN 18 BIT MODE.  THE PROGRAM
                        HAS NO PROVISIONS FOR TESTING DRIVES WITH INTERMIXED PACKS OR TESTING
                        BOTH 16 BIT MODE AND 18 BIT MODE DRIVES ON THE SAME SYSTEM.
                        ACT11 AUTOMATIC MODE ASSUMES 16 BIT MODE.

                        BEFORE THE PROGRAM IS STARTED, PROPERLY FORMATTED PACKS MUST BE MOUNTED
                        ON THE DRIVES WHICH WILL BE TESTED.  THE PROGRAM ASSUMES A
                        PROPERLY FORMATTED PACK.  THE FORMAT OF THE PACK IS NOT ALTERED
                        BY THE PROGRAM.
```

8. MISCELLANEOUS

8.1 EXECUTION TIME

THE PROGRAM REQUIRES APPROXIMATELY 26 MINUTES TO MAKE ONE PASS WITH RM03/2 DRIVES AND APPROXIMATELY 35 MINUTES TO A PASS WITH RM05 DRIVES. THIS ASSUMES THE DEFAULT TEST SEQUENCE (TESTS 0-10,12,13 & 15-20) AND DEFAULT TEST PARAMETERS.

8.2 STACK POINTER

THE STACK POINTER IS INITIALLY SET TO 1100.

8.3 TIMING TESTS (TESTS 12-15) PRINTOUTS

AT THE COMPLETION OF EACH OF THE TIMING TESTS THE TIME OF THE MINIMUM SEEK, MAXIMUM SEEK, AND THE AVERAGE OF ALL OF THE SEEKS PERFORMED ARE TYPED ON THE TTY. THE NUMBER OF SEEKS THAT HAD TIMES BELOW THE MINIMUM TIME ALLOWED WILL BE TYPED ON THE SAME LINE AS THE MINIMUM TIME. THE NUMBER ABOVE THE MAXIMUM WILL BE TYPED ON THE SAME LINE AS THE MAXIMUM TIME, AND THE TOTAL NUMBER OF SEEKS PERFORMED WILL BE ON THE SAME LINE AS THE AVERAGE.

8.3.1 TIMING TOLERANCES

1. TEST 12 -- ROTATIONAL SPEED TIMES

   --TIMES FOR RM05/3 DRIVES--

   60 HZ
   MINIMUM=16340 US
   MAXIMUM=17000 US
   NOMINAL=16670 US

   50 HZ
   MINIMUM=16250 US
   MAXIMUM=17090 US
   NOMINAL=16670 US

   --TIMES FOR RM02 DRIVES--

   60 HZ
   MINIMUM=24500 US
   MAXIMUM=25500 US
   NOMINAL=25000 US

   50 HZ
   MINIMUM=24370 US
   MAXIMUM=25630 US
   NOMINAL=25000 US

```
                2. TEST 13 -- ONE CYLINDER SEEK TIMES

                   MAXIMUM=6000 US

                3. TEST 14 -- AVERAGE SEEK TIMING TEST (NOT DEFAULT)

                   MAXIMUM=30000 US

                   ** THERE ARE NO SPECIFICATIONS GIVEN FOR AN AVERAGE SEEK TIME **
                   ** ON  THIS PARTICULAR  DRIVE. THEREFORE, THIS TEST SHOULD BE **
                   ** USED FOR REFERENCE ONLY.                                   **

                4. TEST 15 -- MAXIMUM SEEK TIMES

                   MAXIMUM=55000 US

                   ** THERE IS  NO SPECIFICATION  GIVEN FOR THE  MAXIMUM REVERSE **
                   ** SEEK TIME ON THIS PARTICULAR DRIVE. THEREFORE, ANY REVERSE **
                   ** SEEK TIMES ABOVE THE  MAXIMUM TIME OF 55.0 MS WILL  NOT BE **
                   ** TYPED  IN THE  TIMING REPORT.  HOWEVER,  THE TIMING REPORT **
                   ** WILL STILL  TYPE THE  MINIMUM, MAXIMUM  AND  AVERAGE TIMES **
                   ** FOR THE REVERSE SEEKS. (SEE SECTION 8.3.2, EX. 2)          **

        8.3.2.  TIMING TESTS PRINTOUT EXAMPLES


                EXAMPLE #1
                ----------


                ROTATIONAL SPEED TIMES
                MIN=16670 US
                MAX=16690 US
                AVG=16680 US  10 SEARCHES TIMED

                ALLOWABLE ROTATIONAL SPEED LIMITS FOR RM05/3
                MIN=16250 US
                MAX=17090 US

                ONE CYLINDER SEEK TIMES
                 * FORWARD
                MIN=5350 US
                MAX=6920 US
                AVG=5550 US  821 SEEKS TIMED
                 * REVERSE
                MIN=5140 US
                MAX=5960 US
                AVG=5430 US  822 SEEKS TIMED

                ALLOWABLE ONE CYLINDER SEEK LIMIT
                MAX=6000 US

                AVERAGE SEEK TIMES
                 * FORWARD
                MIN=27770 US
                MAX=28640 US
                AVG=28230 US  128 SEEKS TIMED
                 * REVERSE
```

```
MIN=27990 US
MAX=28550 US
AVG=28220 US  128 SEEKS TIMED

ALLOWABLE AVERAGE TIME LIMIT
MAX=30000 US

MAXIMUM SEEK TIMES
 * FORWARD
MIN=49990 US
MAX=51980 US
AVG=51010 US  128 SEEKS TIMED
 * REVERSE
MIN=48120 US
MAX=50650 US
AVG=49340 US  128 SEEKS TIMED

ALLOWABLE MAXIMUM (FORWARD) SEEK TIME LIMIT
MAX=55000 US


EXAMPLE #2
----------

ROTATIONAL SPEED TIMES
MIN=16670 US
MAX=16690 US
AVG=16680 US  10 SEARCHES TIMED

ALLOWABLE ROTATIONAL SPEED LIMITS FOR RM05/3
MIN=16250 US
MAX=17090 US

ONE CYLINDER SEEK TIMES
 * FORWARD
MIN=5470 US
MAX=7940 US  3 ABOVE THE MAXIMUM OF 6000 US
AVG=5830 US  821 SEEKS TIMED
 * REVERSE
MIN=5040 US
MAX=5970 US
AVG=5330 US  822 SEEKS TIMED

ALLOWABLE ONE CYLINDER SEEK LIMIT
MAX-6000 US

AVERAGE SEEK TIMES
 * FORWARD
MIN=29730 US
MAX=32620 US  73 ABOVE THE MAXIMUM OF 30000 US
AVG=29900 US  128 SEEKS TIMED
 * REVERSE
MIN=28620
MAX=32230 US  108 ABOVE THE MAXIMUM OF 30000 US
AVG=32800 US  128 SEEKS TIMED

ALLOWABLE AVERAGE TIME LIMIT
```

```
               MAX=30000 US

               MAXIMUM SEEK TIMES
                * FORWARD
               MIN=57510 US
               MAX=57240 US  128 ABOVE THE MAXIMUM OF 55000 US
               AVG=57020 US  128 SEEKS TIMED
                * REVERSE
               MIN=57050 US
               MAX=57550 US
               AVG=57210 US  128 SEEKS TIMED

               ALLOWABLE MAXIMUM (FORWARD) SEEK TIME LIMIT
               MAX=55000 US


      8.4      END OF TEST

               WITH ALL SWITCHES ON A ''0'' AN ''END OF PASS'' MESSAGE WILL BE
               TYPED AT THE COMPLETION OF TESTING A DRIVE AND THE ''END OF TEST''
               TYPEOUT WILL OCCUR WHEN ALL DRIVES HAVE BEEN TESTED. ALSO, THE
               END OF TEST COULD OCCUR ON A DRIVE, IF THE MAXIMUM ERROR LIMIT
               IN LOCATION 'ERMAX' IS EXCEEDED.


      9.       PROGRAM DESCRIPTION
               -------------------

               THIS PROGRAM CONTAINS NINETEEN TESTS NUMBERED 0-22 IN OCTAL.
               TESTS 0-7 & 11 WILL READ THE CYLINDER, TRACK, AND SECTOR INFORMATION
               FROM THE HEADER, USING A ''READ HEADER AND DATA'' COMMAND, AND
               THEN CHECK THE INFORMATION FOR VALIDITY. THUS, INSURING
               THE SEEK OPERATION FUNCTIONS PROPERLY. TESTS 12-15 WILL MEASURE
               THE ROTATIONAL SPEED, THE ONE CYLINDER SEEK, THE AVERAGE SEEK
               AND THE MAXIMUM SEEK TIMES TO ENSURE THEY ARE ALL WITHIN THE
               TOLERANCES ALLOWED. TEST 16 AND 17 ENSURES THE SECTOR AND
               TRACK ADDRESSING CIRCUITRY WORKS PROPERLY. TEST 20 VERIFIES
               THE DATA STORAGE AND RETRIEVAL CAPABILITIES ARE FUNCTIONAL.
               AND TEST 21 WILL STRESS AND CHECK THE READ/WRITE AND SERVO
               SYSTEMS.

               THE PROGRAM WILL START BY IDENTIFING ITSELF AND DETERMINING ALL
               DRIVES THAT ARE AVAILABLE FOR TESTING. THEN BEGINNING WITH
               THE LOWEST NUMERICAL DRIVE AND PROCEEDING IN SEQUENTIAL ORDER.
               ALL OF THE DRIVES WILL BE TESTED. ONE PASS THROUGH THE TEST
               SEQUENCE (TESTS 0-10,12-20) WILL BE PERFORMED ON EACH DRIVE BEFORE
               MOVING TO THE NEXT DRIVE IN SEQUENCE.  DRIVE TO BE
               TESTED WILL BE TYPED AT THE BEGINNING OF EACH PASS, AN ''END
               OF PASS'' MESSAGE WILL BE TYPED AT THE COMPLETION OF EACH PASS,
               AND AN ''END OF TEST'' MESSAGE WILL BE TYPED AFTER TESTING ALL
               DRIVES.

               REFER TO THE FOLLOWING SECTIONS FOR DETAILED DESCRIPTIONS
               OF EACH TEST.

      9.1      TEST 0 - RECAL/RANDOM SEEK TEST
```

```
                                THIS TEST WILL CAUSE THE DRIVE TO EXECUTE A RECALIBRATE COMMAND
                                AND THEN  SEEK TO A RANDOM CYLINDER BETWEEN 'FC'' AND 'LC''.  AT
                                THE  COMPLETION OF BOTH COMMANDS, STATUS INDICATORS ARE CHECKED
                                TO ENSURE THAT NO ERRORS OCCURRED.

                                THE PARAMETERS USED BY THE TEST ARE GIVEN BELOW:

                                        R       -       200
                                        FC      -         0
                                        LC      -       822
                                        FT      -         0
                                        FT'     -         0
                                        FS      -         0

                        9.2     TEST 1 - SEEK/SEEK TEST

                                THIS TEST WILL CAUSE THE DRIVE TO EXECUTE A FORWARD SEEK
                                CYCLE TO 'LC'', 'LT'', 'LS'' FOLLOWED BY A REVERSE SEEK CYCLE TO
                                'FC'', 'FT'', 'FS''.  AT THE COMPLETION OF EACH SEEK, THE PROPER
                                INDICATORS ARE EXAMINED TO ENSURE PROPER OPERATION.


                                THE PARAMETERS USED BY THE TEST ARE GIVEN BELOW:

                                        R       -       100
                                        FC      -         0
                                        LC      -       256
                                        IC      -         0
                                        FT      -         0
                                        LT      -         0
                                        FT'     -         0
                                        LT'     -         0
                                        FS      -         0
                                        LS      -         0

                        9.3     TEST 2 - INCREMENTAL SEEK TEST

                                THIS TEST WILL COMMAND FORWARD SEEK CYCLES TO ADVANCE THE
                                CYLINDER ADDRESS FROM 'FC'' TO 'LC'' BY THE INCREMENT ''IC''.
                                WHEN THE RESULTANT CYLINDER ADDRESS (NC) EXCEEDS
                                ''LC'' REVERSE SEEK CYCLES ARE INITIATED; STARTING
                                AT THE LAST LEGAL 'NC'' AND DECREMENTING BY ''IC''
                                UNTIL 'NC'' IS LESS THAN 'FC''. AT THE COMPLETION OF EACH
                                SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO
                                ENSURE PROPER OPERATION.

                                THE PARAMETERS USED BY THE TEST ARE GIVEN BELOW:

                                        R       -         1
                                        FC      -         0
                                        LC      -       822
                                        IC      -         1
                                        FT      -         0
                                        FT'     -         0
                                        FS      -         0

                        9.4     TEST 3 - STEPPING SEEK TEST
```

```

                THIS TEST WILL COMMAND SEEK CYCLES TO CYLINDER 0,1,2,4,
                8,16,32,64,128,256 AND 512.  AT THE COMPLETION OF EACH SEEK
                COMMAND THE PROPER INDICATORS ARE EXAMINED TO VERIFY PROPER
                OPERATION.

                THE PARAMETERS USED BY THE TEST ARE GIVEN BELOW:

                        R       -       8
                        FC      -       0
                        LC      -     512
                        IC      -       1
                        FT      -       0
                        FT'     -       0
                        FS      -       0

        9.5     TEST 4 - OSCILLATING SEEK TEST

                THIS TEST WILL COMMAND SEEK CYCLES FROM ''FC'' TO ''NC'' AND BACK
                TO ''FC''.  ''NC'' STARTS AT ''FC'' AND INCREMENTS BY ''IC'' UP TO CYLINDER
                ''LC'', THEN IS DECREMENTED BY ''IC'' BACK TO CYLINDER ''FC''.  AT THE
                COMPLETION OF EVERY SEEK COMMAND THE PROPER INDICATORS ARE
                EXAMINED TO ENSURE PROPER OPERATION.

                THE FOLLOWING PARAMETERS ARE USED BY THE TEST:

                        R       -       1
                        FC      -       0
                        LC      -     822
                        IC      -       1
                        FT      -       0
                        FT'     -       0
                        FS      -       0

        9.6     TEST 5 - CONVERGING/DIVERGING SEEK TEST

                THIS TEST WILL CAUSE THE DRIVE TO EXECUTE FORWARD AND REVERSE
                SEEKS FROM ''NC1'' AND ''NC2'' RESPECTIVELY. ''NC1'' WILL BE INCREMENTED
                BY ''IC'' AND ''NC2'' WILL BE DECREMENTED BY ''IC'' UNTIL ''NC1'' IS
                GREATER THAN THE INITIAL VALUE OF ''NC2'' AND ''NC2'' IS
                LESS THAN THE INITIAL VALUE OF ''NC1''.  AT THE COMPLETION OF
                EACH SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO
                ENSURE PROPER OPERATION.  ''NC1'' AND ''NC2'' DEFAULT TO
                ''FC'' AND ''LC'' RESPECTIVELY.
                THE FOLLOWING PARAMETERS ARE USED BY THE TEST:

                        R       -       1
                        FC      -       0
                        LC      -     822
                        IC      -       1
                        FT      -       0
                        FT'     -       0
                        FS      -       0

        9.7     TEST 6 - SERVO ADDRESSING LOGIC NOISE GENERATOR TEST

                IN THIS TEST A SEEK IS DONE TO CYL ''NC'' THEN A SEEK TO
                NC+4 THEN NC+1 THEN NC+3 THEN NC+2 THEN NC+5.  NOW 'NC'' IS UPDATED
                BY ''IC'' AND THE ABOVE SEQUENCE IS REPEATED UNITL 'LC'' IS
                EXCEEDED BY ANY OF THE ABOVE VALUES.  THE INITIAL VALUE OF 'NC''
                IS 'FC''.  AT THE COMPLETION OF EACH SEEK COMMAND THE
                PROPER INDICATORS ARE EXAMINED TO ENSURE PROPER OPERATION.

                THE FOLLOWING PARAMETERS ARE USED BY THE TEST:

                        R       -       1
                        FC      -       0
                        LC      -     822
                        IC      -       1
                        FT      -       0
                        FT'     -       0
                        FS      -       0

        9.8     TEST 7 - RANDOM SEEK TEST

                THIS TEST PERFORMS RANDOM SEEK OPERATIONS BETWEEN CYLINDERS 'FC'
                'LC'.  AFTFR EACH SEEK, THE POSITION OF THE DRIVE IS VERIFIED BY
                READING A SECTOR FROM THE CURRENTLY ADDRESSED CYLINDER AND TRACK.
                THE TRACK ADDRESS IS INCREMENTED FOR EACH SEEK SO THAT VERIFICATION
                OF POSITIONING OCCURS USING EACH HEAD.  TRACK ADDRESSES ARE INCREMENTED
                BETWEEN PARAMTERS 'FT' AND 'LT'.

                THE FOLLOWING PARAMETERS ARE USED BY THE TEST:

                        R       -    5000
                        FC      -       0
                        LC      -     822
                        FT      -       0
                        LT      -       4
                        FT'     -       0
                        LT'     -      18

        9.9     TEST 1C - SERVO SETTLE DOWN TEST

                THIS TEST VERIFIES THAT THE SERVO HAS SETTLED DOWN AND THAT
                THE DRIVE IS ON CYLINDER WHEN THE DRIVE INDICATES SEEK COMPLETE.
                RANDOM SEEKS ARE ISSUED BETWEEN CYLINDERS 'NC1' AND 'NC1+IC'
                ('NC1' STARTS AT VALUE 'FC').  AT THE COMPLETION OF 1000 (10) SEEKS,
                'NC1' IS INCREMENTED BY VALUE 'IC' AND THE SEQUENCE IS REPEATED.
                THE TEST IS COMPLETED WHEN 'NC1' HAS BEEN INCREMENTED BEYOND 'LC'.

                WHEN THE SEEK COMPLETES, THE PROGRAM READS THE DRIVE'S LOOK-AHEAD
                REGISTER (RMLA) TO DETERMINE THE ADDRESS OF THE SECTOR ROTATING  INTO
                POSITION.  THE PROGRAM THEN ISSUES A WRITE HEADER AND DATA COMMAND
                FOR THAT SECTOR. ERRORS IN THIS TEST INDICATE THAT THE SERVO SYSTEM
                MAY NOT BE ADJUSTED CORRECTLY, THAT THE DRIVE IS MALFUNCTIONING, OR
                THAT A PACK WITH MARGINAL SERVO TRACKS IS MOUNTED ON THE DRIVE.

                THIS TEST IS VALID ONLY IF THE OPERATION IS STARTED WITHIN A FEW
                HUNDRED MICRO-SECONDS AFTER SEEK DONE OCCURS.  THE NECESSARY TIME
                DEPENDENT PARAMETERS OCCUR WITHIN THE REQUIRED TIME RANGE FREQUENTLY
                ENOUGH TO PERMIT THIS TEST TO BE EFFECTIVE.

                THE FOLLOWING PARAMETERS ARE USED BY THE TEST:
```

```
                R       -       1
                FC      -       0
                LC      -       822
                IC      -       100
                FT      -       0
                FT'     -       0

9.10    TEST 11 - ALL SEEKS TEST (NOT DEFAULT)

        THIS TEST VERIFIES THAT THE DISK DRIVE CAN SEEK FROM EACH CYLINDER
        TO ALL OTHER CYLINDERS.

        BEGINNING WITH CYLINDER 'FC', THE TEST SEEKS TO EACH CYLINDER
        BETWEEN 'FC' AND 'LC' FROM CYINDER 'FC'.  THE BEGINNING CYLINDER
        ADDRESS IS INCREMENTED AND THE TEST SEEKS BETWEEN THE NEW CYLINDER
        ADDRESS AND ALL CYLINDERS BETWEEN 'FC' AND 'LC'.  THE SEQUENCE
        CONTINUES UNTIL AL' CYLINDERS HAVE BEEN CHECKED.

        THE FOLLOWING PARAMETERS ARE USED BY THIS TEST:

                R       -       1
                FC      -       0
                LC      -       822
                IC      -       1
                FT      -       0
                FT'     -       0
                FS      -       0

9.11    TEST 12 - ROTATIONAL SPEED TIMING TEST

        THIS TEST WILL START A SEARCH TO CYLINDER 'FC', TRACK 'FT',
        SECTOR 'FS'. AS SOON AS THE INTERRUPT OCCURS, THE GO BIT IS
        SET AGAIN AND THE OPERATION IS TIMED. THIS PROCEDURE IS
        REPEATED 10 TIMES THEN THE AVERAGE TIME IS CALCULATED AND
        CHECKED TO ENSURE IT IS WITHIN TOLERANCE:

        RM05/3:
                16.67 MS/REV + OR - 2% IF 60HZ
                16.67 MS/REV + OR - 2.5% IF 50HZ.

        RM02:
                25.00 MS/REV + OR - 2% IF 60HZ
                25.00 MS/REV + OR - 2.5% IF 50HZ.

        THE FOLLOWING PARAMETERS ARE USED BY THE TEST:

                R       -       1
                FC      -       0
                FT      -       0
                FT'     -       0
                FS      -       0

9.12    TEST 13 - ONE CYLINDER SEEK TIMING TEST

        THIS TEST WILL COMMAND FORWARD SEEK CYCLES TO ADVANCE THE
        CYLINDER BY ONE UNTIL THE INCREMENT IS GREATER THAN THE
```

CYLINDER 'LC', THEN REVERSE SEEK TO CYLINDER 'FC'. THE TIME TO PERFORM EACH SEEK IS CHECKED TO ENSURE IT DOES NOT EXCEED THE MAXIMUM TIME PERMITTED FOR A ONE CYLINDER SEEK. MAXIMUM TIME IS 6.0 MS.

THE TEST USES THE FOLLOWING PARAMETERS:

R	-	1
FC	-	0
LC	-	822

9.13 TEST 14 - AVERAGE SEEK TIMING TEST (NOT DEFAULT)

THIS TEST WILL COMMAND A FORWARD SEEK FROM CYLINDER 'FC' TO CYLINDER 'LC', THEN A REVERSE FROM CYLINDER 'LC' TO CYLINDER 'FC'. BOTH SEEKS ARE TIMED AND CHECKED TO ENSURE THEY ARE WITHIN THE TOLERANCE ALLOWED FOR THE AVERAGE SEEK. THIS SEQUENCE IS REPEATED 128 TIMES (FOR A TOTAL OF 256. SEEKS). MAXIMUM TIME IS 30.0 MS.

** THERE ARE NO SPECIFICATIONS GIVEN FOR AN AVERAGE SEEK TIME **
** ON THIS PARTICULAR DRIVE. THEREFORE, THIS TEST SHOULD BE **
** USED FOR REFERENCE ONLY. **

THE TEST USES THE FOLLOWING PARAMETERS:

R	-	1
FC	-	0
LC	-	220

9.14 TEST 15 - MAXIMUM SEEK TIMING TEST

THIS TEST WILL COMMAND A FORWARD SEEK FROM CYLINDER 'FC' TO CYLINDER 'LC', THEN A REVERSE SEEK FROM CYLINDER 'LC' TO CYLINDER 'FC'. BOTH SEEKS ARE TIMED, BUT ONLY THF FORWARD SEEKS ARE CHECKED TO ENSURE THEY ARE WITHIN THE TOLERANCE ALLOWED FOR THE MAXIMUM SEEK TIME. THIS SEQUENCE IS REPEATED 128 TIMES (FOR A TOTAL OF 256. SEEKS). THE MAXIMUM (FORWARD) TIME IS 55.0 MS.

** THERE IS NO SPECIFICATION GIVEN FOR THE MAXIMUM REVERSE **
** SEEK TIME ON THIS PARTICULAR DRIVE. THEREFORE, ANY REVERSE **
** SEEK TIMES ABOVE THE MAXIMUM TIME OF 55.0 MS WILL NOT BE **
** TYPED IN THE TIMING REPORT. HOWEVER, THE TIMING REPORT **
** WILL STILL TYPE THE MINIMUM, MAXIMUM AND AVERAGE TIMES **
** FOR THE REVERSE SEEKS. (SEE SECTION 8.3.2, EX. 2) **

THE TEST USES THE FOLLOWING PARAMETERS:

R	-	1
FC	-	0
LC	-	822

9.15 TEST 16 - SECTOR ADDRESSING TEST

THIS TEST WRITES DATA INTO ALL SECTORS OF TRACK 'FT'. THE DATA WILL BE 256 WORDS OF THE SECTOR ADDRESS OF THE SECTOR BEING WRITTEN. A WRITE CHECK IS PERFORMED, THE BUFFER IS

```
                CLEARED (TO 177400) AND THE DATA IS READ AND COMPARED.  THEN SECTOR
                IS REWRITTEN AND SECTORS 0 - 31 ARE WRITE CHECKED.  THEN
                SECTOR 1 IS REWRITTEN AND SECTORS 0 - 31 ARE WRITE CHECKED.
                THIS REWRITE AND WRITE CHECK PROCEDURE IS CONTINUED UP THROUGH
                REWRITE SECTOR 31 AND WRITE CHECK SECTORS 0-31.

                THE TEST USES THE FOLLOWING PARAMETERS:

                        R       -       1
                        FC      -       0
                        FT      -       0
                        FT'     -       0

        9.16    TEST 17 - TRACK ADDRESSING TEST

                THIS TEST WILL WRITE DATA IN THE FORM OF TRACK ADDRESSES
                IN CYLINDER ''FC'' SECTOR ''FS'' OF EVERY TRACK WITH EACH TRACK
                GETTING ITS OWN TRACK ADDRESS.
                A WRITE CHECK IS THEN PERFORMED ON EACH TRACK TO INSURE
                THE DATA IS VALID.  THEN TRACK 0 IS REWRITTEN AND TRACK 1
                THROUGH LAST TRACK IS WRITE CHECKED.  THEN TRACK 1 IS
                REWRITTEN AND TRACK 2 THROUGH LAST TRACK IS WRITE CHECKED.
                THIS PROCEDURE IS CONTINUED UP THROUGH REWRITING NEXT TO
                LAST TARCK AND WRITE CHECKING LAST TRACK.

                THE TEST USES THE FOLLOWING PARAMETERS:

                        R       -       1
                        FC      -       0
                        FS      -       0

        9.17    TEST 20 - DATA TEST

                THIS TEST PERFORMS DATA STORAGE AND RETRIEVAL ON CYLINDERS
                ''FC'' THROUGH ''LC'' BY THE INCREMENT ''IC'' USING THE DATA PATTERNS
                SPECIFIED. THE FOLLOWING SEQUENCE OCCURS FOR EACH CYLINDER:
                1.      SET ''NT'' TO ''FT'' THEN REPEAT 2-4 UNTIL ''NT'' > ''LT''
                2.      WRITE THEN WRITE CHECK ''FS'' THROUGH ''LS'' OF TRACK ''NT''
                3.      READ THEN SOFTWARE COMPARE ''FS'' THROUGH ''LS'' OF TRACK ''NT''
                4.      INCREMENT ''NT'' BY ''IT''
                5.      REPEAT STEPS 1-4 FOR EACH DATA PATTERN
                6.      REPEAT STEPS 1-5 FOR ''FC'' THROUGH ''LC'' ADVANCING BY ''IC''

                IF A WRITE CHECK ERROR OCCURS THE ERROR IS REPORTED AND
                THE TRACK IN ERROR IS REWRITTEN AND CHECKED. THIS CHECK IS
                ACCOMPLISHED BY PERFORMING TWO(2) SUCCESSIVE ERROR FREE
                WRITE CHECKS. IF THE CHECK FAILS THE ERROR IS REPORTED AS
                FATAL AND NO READ OCCURS.
                FS DEFAULTS TO 1 AND LS DEFAULTS TO 0
                PAT DEFAULTS TO 177777 (ALL POSSIBLE PATTERNS)
                THE POSSIBLE PATTERNS ARE:

                *PAT 0  PAT 1   PAT 2   PAT 3   PAT 4   PAT 5   PAT 6   PAT 7
                ------  ------  ------  ------  ------  ------  ------  ------
                155555  000001  177776  000000  133331  052525  155555  026455
                133333  000003  177774  000000  133331  052525  155555  026455
                155555  000007  177770  000000  133331  052525  155555  026455
```

```
                        133333  000017  177760  177777  133331  125252  155555  151322
                        155555  000037  177740  177777  133331  125252  155555  151322
                        133333  000077  177700  177777  133331  125252  155555  151322
                        155555  000177  177600  000000  133331  052525  155555  026455
                        133333  000377  177400  000000  133331  052525  155555  026455
                        155555  000777  177000  177777  133331  125252  155555  151322
                        133333  001777  176000  177777  133331  125252  155555  151322
                        155555  003777  174000  000000  133331  052525  155555  026455
                        133333  007777  170000  177777  133331  125252  155555  151322
                        155555  017777  160000  000000  133331  052525  155555  026455
                        133333  037777  140000  177777  133331  125252  155555  151322
                        155555  077777  100000  000000  133331  052525  155555  026455
                        133333  177777  000000  177777  133331  125252  155555  151322

                        *PAT 8  PAT 9   PAT 10  PAT 11  PAT 12  PAT 13  PAT 14  PAT 15
                        ------  ------  ------  ------  ------  ------  ------  ------
                        155555  000001  177776  172666  077777  153333  000000  177777
                        133333  000002  177775  155555  137777  066667  177777  000000
                        155555  000004  177773  172666  157777  153333  177777  000000
                        133333  000010  177767  155555  167777  066667  177777  000000
                        155555  000020  177757  172666  173777  153333  177777  000000
                        133333  000040  177737  155555  175777  066667  177777  000000
                        155555  000100  177677  172666  176777  153333  177777  000000
                        133333  000200  177577  155555  177377  066667  177777  000000
                        155555  000400  177377  172666  177577  153333  177777  000000
                        133333  001000  176777  155555  177677  066667  177777  000000
                        155555  002000  175777  172666  177737  153333  177777  000000
                        133333  004000  173777  155555  177757  066667  177777  000000
                        155555  010000  167777  172666  177767  153333  177777  000000
                        133333  020000  157777  155555  177773  066667  177777  000000
                        155555  040000  137777  172666  177775  153333  177777  000000
                        133333  100000  077777  155555  177776  066667  177777  000000

                        * WORST CASE PATTERN

                        THE TEST USES THE FOLLOWING PARAMETERS:

                                R       -          1
                                FC      -          0
                                LC      -        822
                                IC      -         64
                                FT      -          0
                                LT      -          4
                                IT      -          1
                                FT'     -          0
                                LT'     -         18
                                IT'     -          1
                                FS      -          1
                                LS      -          0
                                PAT     -     177777

                9.18    TEST 21 - RANDOM ADDRESS AND RANDOM PATTERN TEST

                        STARTING AT "FC" AND GOING THROUGH "LC" THE DISK PACK
                        IS WRITTEN WITH A RANDOM PATTERN. THE FIRST TWO WORDS
                        OF EACH SECTOR WILL BE THE BASE OF THE RANDOM GENERATOR
                        FOR THAT SECTOR.
                THE TEST THEN PERFORMS THE FOLLOWING SEQUENCE 'R'' TIMES
                'R'' DEFAULTS TO 20,000.

                1)      GENERATE A RANDOM ADDRESS
                2)      WRITE A RANDOM PATTERN AT THE ADDRESS
                        GENERATED IN 1.
                3)      GENERATE A RANDOM ADDRESS
                4)      READ THE SECTOR AT THE ADDRESS
                        GENERATED IN 3.
                5)      DO A SOFTWARE CHECK OF THE DATA READ IN 4.
                6)      DO A WRITE CHECK OF THE DATA WRITTEN IN 2
                7)      GENERATE A RANDOM ADDRRESS
                8)      READ THE SECTOR AT THE ADDRESS
                        GENERATED IN 7.
                9)      DO A SOFTWARE CHECK OF THE DATA READ IN 8
                10)     DO A WRITE CHECK OF THE DATA WRITTEN IN 2

                THE TEST USES THE FOLLOWING PARAMETERS:

                        R       -       20000
                        FC      -           0
                        LC      -         822

        9.19    TEST 22 - SEEK TIME ADJUSTMENT TEST

                THIS TEST PERFORMS SEEKS BETWEEN CYLINDERS 0 & 255 TO ALLOW THE
                OPERATOR TO ADJUST THE SEEK TIME ON AN RM05/3/2 USING THE
                DDU.  THE PROGRAM STALLS APPROXIMATELY 5 SECONDS BETWEEN SEEKS
                SO THAT THE SEEK TIME INDICATORS ON THE DDU MAY BE OBSERVED.

                THE TEST USES THE FOLLOWING PARAMETERS:

                        R       -        5000
                        FC      -           0
                        LC      -         255



        10.     PROGRAM LISTING
                ---------------
        @
```

```
;*LAST REVISION 04-APR-81

.TITLE  CZRMVBO RM05/3/2 EXT'D DR TST
;*COPYRIGHT (C) 1981
;*DIGITAL EQUIPMENT CORPORATION
;*COLORADO SPGS., CO. 80919
;*
;*PROGRAM BY MIKE LEAVITT
;*
;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
;*PACKAGE (MAINDEC-11-DZQAC-C5), 18-MAR-81
;*
.SBTTL  OPERATIONAL SWITCH SETTINGS
;*
;*      SWITCH                  USE
;*      ------          -------------------
;*        15            HALT ON ERROR
;*        14            LOOP ON TEST
;*        13            INHIBIT ERROR TYPEOUTS
;*        12            TYPE TEST NUMBER
;*        10            BELL ON ERROR
;*         9            LOOP ON ERROR
;*         8            PRINT ERROR MESSAGE ON LINE PRINTER
;*         7            READ 'C.SWR' SETTINGS FROM TTY
;*         6            INHIBIT TIME REPORTS (TESTS 12-15)
;*         5            REPORT ONE ERROR PER SECTOR (TESTS 16 & 17)
;*         4            INHIBIT WRITES (TEST 20)
;*         3            INHIBIT WRITE CHECKS (TEST 20)
;*         2            INHIBIT READ AND SOFTWARE COMPARES (TEST 20)
;*         1            INHIBIT SOFTWARE COMPARES (TEST 20)
;*         0            PERFORM READ AFTER WRITE CHECK ERROR (TEST 20)

.SBTTL  CONTROL SWITCH SETTINGS
;*
;*    SWITCH  STATE                USE
;*    ------  -----     ---------------------------------
;*      15      0       WRITE PACK BEFORE TESTING (TEST 21)
;*              1       INHIBIT WRITING PACK BEFORE TESTING (TEST 21)
;*      14      0       NO STALL BETWEEN DRIVE FUNCTIONS
;*              1       STALL AFTER EVERY DRIVE FUNCTION
;*      13      0       USE SPECIFIC STALL TIME
;*              1       USE RANDOM STALL
;*      12      0       NO INCREMENTING STALL IN TEST 4
;*              1       DO INCREMENTING STALL IN TEST 4
;*       8      0       DO IMPLIED SEEKS WITH DATA TRANSFERS
;*              1       DO EXPLICIT SEEKS BEFORE DATA TRANSFERS
;*       7      0       DO 'READ HEADER AND DATA' IN TESTS 0-11
;*              1       DO EXPLICIT SEEKS IN TESTS 0-11
;*       6      0       60 HZ
;*              1       50 HZ
;*       5      0       RUN WATCHDOG TIMER
;*              1       INHIBIT WATCHDOG TIMER
;*       0      0       TEST DRIVE(S) IN 32. SECTOR (16 BIT) MODE
;*              1       TEST DRIVE(S) IN 30. SECTOR (18 BIT) MODE

.SBTTL  BASIC DEFINITIONS
```

```
                            ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
        001100              STACK   = 1100
        104000              ERROR   = EMT           ;;BASIC DEFINITION OF ERROR CALL
        000004              SCOPE   = IOT           ;;BASIC DEFINITION OF SCOPE CALL

                            ;*MISCELLANEOUS DEFINITIONS
        000011              HT      = 11            ;;CODE FOR HORIZONTAL TAB
        000012              LF      = 12            ;;CODE FOR LINE FEED
        000015              CR      = 15            ;;CODE FOR CARRIAGE RETURN
        000200              CRLF    = 200           ;;CODE FOR CARRIAGE RETURN-LINE FEED
        177776              PS      = 177776        ;;PROCESSOR STATUS WORD
        177776              PSW=PS
        177774              STKLMT  = 177774        ;;STACK LIMIT REGISTER
        177772              PIRQ    = 177772        ;;PROGRAM INTERRUPT REQUEST REGISTER
        177570              DSWR    = 177570        ;;HARDWARE SWITCH REGISTER
        177570              DDISP   = 177570        ;;HARDWARE DISPLAY REGISTER

                            ;*GENERAL PURPOSE REGISTER DEFINITIONS
        000000              R0      - %0            ;;GENERAL REGISTER
        000001              R1      - %1            ;;GENERAL REGISTER
        000002              R2      = %2            ;;GENERAL REGISTER
        000003              R3      - %3            ;;GENERAL REGISTER
        000004              R4      = %4            ;;GENERAL REGISTER
        000005              R5      - %5            ;;GENERAL REGISTER
        000006              R6      - %6            ;;GENERAL REGISTER
        000007              R7      - %7            ;;GENERAL REGISTER
        000006              SP      - %6            ;;STACK POINTER
        000007              PC      = %7            ;;PROGRAM COUNTER

                            ;*PRIORITY LEVEL DEFINITIONS
        000000              PR0     = 0             ;;PRIORITY LEVEL 0
        000040              PR1     = 40            ;;PRIORITY LEVEL 1
        000100              PR2     = 100           ;;PRIORITY LEVEL 2
        000140              PR3     = 140           ;;PRIORITY LEVEL 3
        000200              PR4     = 200           ;;PRIORITY LEVEL 4
        000240              PR5     = 240           ;;PRIORITY LEVEL 5
        000300              PR6     = 300           ;;PRIORITY LEVEL 6
        000340              PR7     = 340           ;;PRIORITY LEVEL 7

                            ;*"SWITCH REGISTER" SWITCH DEFINITIONS
        100000              SW15    = 100000
        040000              SW14    = 40000
        020000              SW13    = 20000
        010000              SW12    = 10000
        004000              SW11    = 4000
        002000              SW10    - 2000
        001000              SW09    = 1000
        000400              SW08    = 400
        000200              SW07    = 200
        000100              SW06    = 100
        000040              SW05    = 40
        000020              SW04    = 20
        000010              SW03    = 10
        000004              SW02    = 4
        000002              SW01    = 2
        000001              SW00     = 1
        001000              SW9-SW09
        000400          SW8=SW08
        000200          SW7=SW07
        000100          SW6=SW06
        000040          SW5=SW05
        000020          SW4=SW04
        000010          SW3=SW03
        000004          SW2=SW02
        000002          SW1=SW01
        000001          SW0=SW00

                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
        100000          BIT15   = 100000
        040000          BIT14   = 40000
        020000          BIT13   = 20000
        010000          BIT12   = 10000
        004000          BIT11   = 4000
        002000          BIT10   = 2000
        001000          BIT09   = 1000
        000400          BIT08   = 400
        000200          BIT07   = 200
        000100          BIT06   = 100
        000040          BIT05   = 40
        000020          BIT04   = 20
        000010          BIT03   = 10
        000004          BIT02   = 4
        000002          BIT01   = 2
        000001          BIT00   = 1
        001000          BIT9=BIT09
        000400          BIT8=BIT08
        000200          BIT7=BIT07
        000100          BIT6=BIT06
        000040          BIT5=BIT05
        000020          BIT4=BIT04
        000010          BIT3=BIT03
        000004          BIT2=BIT02
        000002          BIT1=BIT01
        000001          BIT0=BIT00

                        ;*BASIC "CPU" TRAP VECTOR ADDRESSES
        000004          ERRVEC  = 4             ;;TIME OUT AND OTHER ERRORS
        000010          RESVEC  = 10            ;;RESERVED AND ILLEGAL INSTRUCTIONS
        000014          TBITVEC = 14            ;;"T" BIT
        000014          TRTVEC  = 14            ;;TRACE TRAP
        000014          BPTVEC  = 14            ;;BREAKPOINT TRAP (BPT)
        000020          IOTVEC  = 20            ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
        000024          PWRVEC  = 24            ;;POWER FAIL
        000030          EMTVEC  = 30            ;;EMULATOR TRAP (EMT) **ERROR**
        000034          TRAPVEC = 34            ;;"TRAP" TRAP
        000060          TKVEC   = 60            ;;TTY KEYBOARD VECTOR
        000064          TPVEC   = 64            ;;TTY PRINTER VECTOR
        000240          PIRQVEC = 240           ;;PROGRAM INTERRUPT REQUEST VECTOR

                        .SBTTL  RH REGISTERS

                        ;CONTROL AND STATUS REGISTER 1 (RMCS1)

        000100          IE      = 100                   ;INTERRUPT ENABLE (BIT #6)
        000200          RDY     = 200                   ;READY (BIT #7)
        000400          A16     = 400                   ;HIGH ORDER BUS ADDRESS BIT (BIT #8)
        001000          A17     = 1000                  ;HIGH ORDER BUS ADDRESS BIT (BIT #9)
        002000          PSEL    = 2000                  ;PORT SELECT (BIT #10)
        020000          MCPE    - 20000                 ;MASSBUSS PARITY ERROR (BIT #13)
        040000          TRE     = 40000                 ;TRANSFER ERROR (BIT #14)
                        ;SC     = 100000                ;SPECIAL CONDITION (BIT #15)

                        ;WORD COUNT REGISTER (RMWC)
                        ;(EACH BIT IS CALLED BY BIT NUMBER)

                        ;BUS ADDRESS REGISTER (RMBA)
                        ;(EACH BIT IS CALLED BY BIT NUMBER)

                        ;CONTROL AND STATUS REGISTER 2 (RMCS2)

        000001          US1     = 1                     ;UNIT SELECT (BIT #0)
        000002          US2     = 2                     ;UNIT SELECT (BIT #1)
        000004          US4     = 4                     ;UNIT SELECT (BIT #2)
        000010          BAI     = 10                    ;BUS ADDRESS INCREMENT INHIBIT (BIT #3)
                        ;PAT    = 20                    ;MASSBUS PARITY TEST (BIT #4)
        000040          CLR     = 40                    ;CLEAR (BIT #5)
        000100          IR      = 100                   ;INPUT READY (BIT #6)
        000200          OR      = 200                   ;OUTPUT READY (BIT #7)
        000400          MPE     = 400                   ;MASS BUS PARITY ERROR (BIT #8)
        001000          MXF     = 1000                  ;MISSED TRANSFER ERROR (BIT #9)
        002000          PGE     = 2000                  ;PROGRAM ERROR (BIT #10)
        004000          NEM     = 4000                  ;NON EXISTENT MEMORY (BIT #11)
        010000          NED     = 10000                 ;NON EXISTENT DRIVE (BIT #12)
        020000          UPE     = 20000                 ;UNIBUS PARITY ERROR (BIT #13)
        040000          WCE     = 40000                 ;WRITE CHECK ERROR (BIT #14)
        100000          DLT     = 100000                ;DATA LATE (BIT #15)

                        ;DATA BUFFER REGISTER (RMDB)
                        ;(EACH BIT IS CALLED BY BIT NUMBER)

                        .SBTTL  RM REGISTERS

                        ;CONTROL AND STATUS 1 REGISTER. (#00)

        000001          GO      = 1                     ;GO BIT (BIT #0)
        000002          F1      = 2                     ;FUNCTION CODE BIT #1
        000004          F2      = 4                     ;FUNCTION CODE BIT #2
        000010          F3      = 10                    ;FUNCTION CODE BIT #3
        000020          F4      = 20                    ;FUNCTION CODE BIT #4
        000040          F5      = 40                    ;FUNCTION CODE BIT #5
        004000          DVA     = 4000                  ;DEVICE AVAILABLE (BIT #11)

                        ;DRIVE STATUS REGISTER (RMDS) (#01)

        000001          OM      = 1                     ;OFFSET MODE
        000100          VV      - 100                   ;VOLUME VALID (BIT #6)
        000200          DRY     = 200                   ;DRIVE READY (BIT #7)
        000400          DPR     - 400                   ;DRIVE PRESENT (BIT #8)
        001000          PGM     = 1000                  ;PROGRAMABLE (BIT #9)
        002000          LST     = 2000                  ;LAST SECTOR TRANSFERRED (BIT #10)
        004000          WRL     - 4000                  ;WRITE LOCK (BIT #11)
```

```
   135        010000                  MOL     = 10000                 ;MEDIUM ON-LINE (BIT #12)
   136        020000                  PIP     = 20000                 ;POSITIONING OPERATION IN PROGRESS (BIT #13)
   137        040000                  ERR     = 40000                 ;COMPOSITE ERROR (BIT #14)
   138        100000                  ATA     = 100000                ;ATTENTION ACTIVE (BIT #15)
   139
   140                                ;ERROR REGISTER #01 (RMER1) (#02)
   141
   142        000001                  ILF     = 1                     ;ILLEGAL FUNCTION (BIT #0)
   143        000002                  ILR     = 2                     ;ILLEGAL REGISTER (BIT #1)
   144        000004                  RMR     = 4                     ;REGISTER MODIFICATION REFUSED (BIT #2)
   145        000010                  PAR     = 10                    ;PARITY ERROR (BIT #3)
   146        000020                  FER     = 20                    ;FORMAT ERROR (BIT #4)
   147        000040                  WCF     = 40                    ;WRITE CLOCK FAIL (BIT #5)
   148        000100                  ECH     = 100                   ;ECC HARD ERROR (BIT #6)
   149        000200                  HCE     = 200                   ;HEADER COMPARE ERROR (BIT #7)
   150        000400                  HCRC    = 400                   ;HEADER CRC ERROR (BIT #8)
   151        001000                  AOE     = 1000                  ;ADDRESS OVERFLOW ERROR (BIT #9)
   152        002000                  IAE     = 2000                  ;INVALID ADDRESS ERROR (BIT #10)
   153        004000                  WLE     = 4000                  ;WRITE LOCK ERROR (BIT #11)
   154        010000                  DTE     = 10000                 ;DRIVE TIMING ERROR (BIT #12)
   155        020000                  OPI     = 20000                 ;OPERATION INCOMPLETE (BIT #13)
   156        040000                  UNS     = 40000                 ;DRIVE UNSAFE (BIT #14)
   157        100000                  DCK     = 100000                ;DATA CHECK ERROR (BIT 15)
   158
   159                                ;MAINTAINABILITY REGISTER #01 (RMMR1)(#03) - READ ONLY BITS
   160
   161        000001                  DMD     = 1                     ;DIAGNOSTIC MODE
   162        000002                  LSIT    = 2
   163                                ;LS     = 4
   164        000010                  WD      = 10
   165        000020                  EECC    = 20
   166        000040                  WC      = 40
   167        000100                  CONT    = 100
   168        000200                  PHA     = 200
   169        000400                  PDA     = 400
   170        001000                  ECRC    = 1000
   171        002000                  PLFS    = 2000
   172        004000                  ESRC    = 4000
   173        010000                  REX     = 10000
   174        020000                  EBL     = 20000
   175                                ;R/G    = 40000
   176        100000                  OCC     = 100000
   177
   178                                ;MAINTAINABILITY REGISTER #01 (RMMR1) (#03) - WRITE ONLY BITS
   179
   180        000001                  DMD     = 1                     ;DIAGNOSTIC MODE BIT
   181        000002                  MSC     = 2
   182        000004                  MI      = 4
   183        000010                  MWP     = 10
   184        000020                  DTG     = 20
   185        000040                  MS      = 40
   186        000100                  MDF     = 100
   187        000200                  MSER    = 200
   188        000400                  MOC     = 400
   189        001000                  MUR     = 1000
   190        002000                  MRD     = 2000
   191        004000                  MCLK    = 4000
```

```
010000                  MSEN    = 10000
020000                  DTO     = 20000
040000                  OBEN    = 40000
100000                  OBCK    = 100000

                        ;ATTENTION SUMMARY PSEUDO-REGISTER (RMAS) (#04)

000001                  AT0     = 1                     ;DEVICE 0 (BIT #0)
000002                  AT1     = 2                     ;DEVICE 1 (BIT #1)
000004                  AT2     = 4                     ;DEVICE 2 (BIT #2)
000010                  AT3     = 10                    ;DEVICE 3 (BIT #3)
000020                  AT4     = 20                    ;DEVICE 4 (BIT #4)
000040                  AT5     = 40                    ;DEVICE 5 (BIT #5)
000100                  AT6     = 100                   ;DEVICE 6 (BIT #6)
000200                  AT7     = 200                   ;DEVICE 7 (BIT #7)

                        ;DESIRED SECTOR/TRACK ADDRESS REGISTER (RMDA) (#05)
                        ;(EACH BIT IS CALLED BY BIT NUMBER)

                        ;DRIVE TYPE REGISTER (RMDT) (#06)

000001                  DT00    = 1                     ;DRIVE TYPE NUMBER BIT 1
000002                  DT01    = 2                     ;DRIVE TYPE NUMBER BIT 2
000004                  DT02    = 4                     ;DRIVE TYPE NUMBER BIT 3
000010                  DT03    = 10                    ;DRIVE TYPE NUMBER BIT 4
000020                  DT04    = 20                    ;DRIVE TYPE NUMBER BIT 5
000040                  DT05    = 40                    ;DRIVE TYPE NUMBER BIT 6
000100                  DT06    = 100                   ;DRIVE TYPE NUMBER BIT 7
000200                  DT07    = 200                   ;DRIVE TYPE NUMBER BIT 8
000400                  DT08    = 400                   ;DRIVE TYPE NUMBER BIT 9
004000                  DRQ     = 4000                  ;DRIVE REQUEST REQUIRED (BIT #11)
020000                  MOH     = 20000                 ;MOVING HEAD (BIT #13)
040000                  TAP     = 40000                 ;TAPE DRIVE (BIT #14)
100000                  NBA     = 100000                ;NOT BLOCK ADDRESSED (BIT #15)

                        ;LOOK-AHEAD REGISTER (RMLA) (#07)


000100                  SC0     = 100                   ;SECTOR COUNT FIELD 0 (BIT #6)
000200                  SC1     = 200                   ;SECTOR COUNT FIELD 1 (BIT #7)
000400                  SC2     = 400                   ;SECTOR COUNT FIELD 2 (BIT #8)
                        ;SC3    = 1000                  ;SECTOR COUNT FIELD 3 (BIT #9)
                        ;SC4    = 2000                  ;SECTOR COUNT FIELD 4 (BIT #10)


                        ;RM MAINTAINABILITY REGISTER #2 (RMMR2) (#10)

                        ;RM ERROR REGISTER #02 (RMMR2) (#10)

                        ;OFFSET REGISTER (RMOF) (#11)

000200                  OFD     = 200                   ;OFFSET DIRECTION (BIT #07)
002000                  HCI     = 2000                  ;HEADER COMPARE INHIBIT (BIT #10)
004000                  ECI     = 4000                  ;ERROR CORRECTION CODE INHIBIT (BIT #11
010000                  FMT16   = 10000                 ;FORMAT BIT (BIT #12)

                        ;DESIRED CYLINDER ADDRESS (RMDC) (#12)
```

```
                                        ;(EACH BIT IS CALLED BY BIT NUMBER)

                                        ;CURRENT CYLINDER ADDRESS (RMHR) (#13)
                                        ;(EACH BIT IS CALLED BY BIT NUMBER)

                                        ;SERIAL NUMBER REGISTER (RMSN) (#14)
                                        ;(EACH IS CALLED BY BIT NUMBER)


                                        ;RM ERROR REGISTER #02 (RMER2) (#15)

        020000                          OPE     = 20000                 ;OPERATOR PLUG ERROR (BIT #13)
        040000                          SKI     = 40000                 ;SEEK INCOMPLETE (BIT #14)
        100000                          BSE     = 100000                ;BAD SECTOR ERROR (BIT #15)

                                        ;ECC POSITION REGISTER (RMEC1) (#16)
                                        ;(EACH BIT IS CALLED BY BIT NUMBER)

                                        ;ECC PATTERN REGISTER (RMEC2) (#17)
                                        ;(EACH BIT IS CALLED BY BIT NUMBER)

                                        ;;****************************************************************

                                        ;OP CODE DEFINITIONS
        000101                          NOOP    = 101
        000103                          UNLOAD  = 103
        000105                          SEEK    = 105
        000107                          RECAL   = 107
        000111                          DRVCLR  = 111
        000113                          RELEASE = 113
        000115                          OFFSET  = 115
        000117                          RTC     = 117
        000121                          READIN  = 121
        000123                          PACK    = 123
        000131                          SEARCH  = 131
        000151                          WRCKD   = 151
        000153                          WRCKHD  = 153
        000161                          WRITE   = 161
        000163                          WRTHD   = 163
        000171                          READ    = 171
        000173                          READHD  = 173
        000141                          GETREG  = 141
        000143                          SETFORM = 143
        000145                          SELDRV  = 145

                                        ;OTHER EQUATES

        177400                          SCTRWC  = -256.                 ;WORD COUNT FOR SECTOR

```

```
                                        .SBTTL  TRAP CATCHER

         000000                                 .=0
                                        ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
                                        ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                        ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
         000174                                 .=174
000174   000000                         DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
000176   000000                         SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER

                                        .SBTTL  STARTING ADDRESS(ES)

000200   000137  004670                         JMP     @#START1                ;;JUMP TO STARTING ADDRESS OF PROGRAM

000204   000137  004712                         JMP     @#START2        ;SELECT OPERATING PARAMETERS

000210   000137  004660                         JMP     @#START3        ;SELECT RH/RM ADDRESSES

000214   000137  004702                         JMP     @#START4        ;COMBINATION OF 204 AND 210

                                        .SBTTL  ACT11 HOOKS

                                        ;;***************************************************************
                                        ;HOOKS REQUIRED BY ACT11
         000220                                 $SVPC=.                 ;SAVE PC
         000046                                 .=46
000046   021560                                 $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
         000052                                 .=52
000052   020000                                 .WORD   20000           ;;2)SET LOC.52 TO 20000
         000220                                 .=$SVPC                 ;; RESTORE PC

         001100                         . 1100
                                        .SBTTL  APT PARAMETER BLOCK

                                        ;;***************************************************************
                                        ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                        ;;***************************************************************
         001100                                 .$X=.   ;;SAVE CURRENT LOCATION
         000024                                 .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
000024   000200                                 200     ;;FOR APT START UP
         000044                                 .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
000044   001100                                 $APTHDR ;;POINT TO APT HEADER BLOCK
         001100                                 .=.$X   ;;RESET LOCATION COUNTER
                                        ;;***************************************************************
                                        ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                        ;INTERFACE SPEC.

001100                                  $APTHD:
001100   000000                         $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001102   001234                         $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001104   004064                         $TSTM:  .WORD   2100.   ;;RUN TIM OF LONGEST TEST
001106   004064                         $PASTM: .WORD   2100.   ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001110   004064                         $UNITM: .WORD   2100.   ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDED UNIT
001112   000030                                 .WORD   $ETEND-$MAIL/2  ;;LENGTH MAILBOX-ETABLE(WORDS)
         001114                         TAB.XY=.        ;COMMON TAG STARTING ADDRESS
```

```
     0                                          .SBTTL  COMMON TAGS

                                                ;;*****************************************************************
                                                ;*THIS TABLE CONTAINS VARIOUS COMMON STORAGE LOCATIONS
                                                ;*USED IN THE PROGRAM.

              001114                                    .=TAB.XY
   001114                                       $CMTAG:                                 ;;START OF COMMON TAGS
   001114  000000                                       .WORD   0
   001116     000                               $TSTNM: .BYTE   0                       ;;CONTAINS THE TEST NUMBER
   001117     000                               $ERFLG: .BYTE   0                       ;;CONTAINS ERROR FLAG
   001120  000000                               $ICNT:  .WORD   0                       ;;CONTAINS SUBTEST ITERATION COUNT
   001122  000000                               $LPADR: .WORD   0                       ;;CONTAINS SCOPE LOOP ADDRESS
   001124  000000                               $LPERR: .WORD   0                       ;;CONTAINS SCOPE RETURN FOR ERRORS
   001126  000000                               $ERTTL: .WORD   0                       ;;CONTAINS TOTAL ERRORS DETECTED
   001130     000                               $ITEMB: .BYTE   0                       ;;CONTAINS ITEM CONTROL BYTE
   001131     001                               $ERMAX: .BYTE   1                       ;;CONTAINS MAX. ERRORS PER TEST
   001132  000000                               $ERRPC: .WORD   0                       ;;CONTAINS PC OF LAST ERROR INSTRUCTION
   001134  000000                               $GDADR: .WORD   0                       ;;CONTAINS ADDRESS OF 'GOOD' DATA
   001136  000000                               $BDADR: .WORD   0                       ;;CONTAINS ADDRESS OF 'BAD' DATA
   001140  000000                               $GDDAT: .WORD   0                       ;;CONTAINS 'GOOD' DATA
   001142  000000                               $BDDAT: .WORD   0                       ;;CONTAINS 'BAD' DATA
   001144  000000                                       .WORD   0                       ;;RESERVED--NOT TO BE USED
   001146  000000                                       .WORD   0
   001150     000                               $AUTOB: .BYTE   0                       ;;AUTOMATIC MODE INDICATOR
   001151     000                               $INTAG: .BYTE   0                       ;;INTERRUPT MODE INDICATOR
   001152  000000                                       .WORD   0
   001154  177570                               SWR:    .WORD   DSWR                    ;;ADDRESS OF SWITCH REGISTER
   001156  177570                               DISPLAY: .WORD  DDISP                   ;;ADDRESS OF DISPLAY REGISTER
   001160  177560                               $TKS:   177560                          ;;TTY KBD STATUS
   001162  177562                               $TKB:   177562                          ;;TTY KBD BUFFER
   001164  177564                               $TPS:   177564                          ;;TTY PRINTER STATUS REG. ADDRESS
   001166  177566                               $TPB:   177566                          ;;TTY PRINTER BUFFER REG. ADDRESS
   001170     000                               $NULL:  .BYTE   0                       ;;CONTAINS NULL CHARACTER FOR FILLS
   001171     002                               $FILLS: .BYTE   2                       ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
   001172     012                               $FILLC: .BYTE   12                      ;;INSERT FILL CHARS. AFTER A "LINE FEED"
   001173     000                               $TPFLG: .BYTE   0                       ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0 YES)
   001174  000000                               $REGAD: .WORD   0                       ;;CONTAINS THE ADDRESS FROM
                                                                                        ;;WHICH ($REG0) WAS OBTAINED
   001176  000000                               $REG0:  .WORD   0                       ;;CONTAINS (($REGAD)+0)
   001200  000000                               $REG1:  .WORD   0                       ;;CONTAINS (($REGAD)+2)
   001202  000000                               $REG2:  .WORD   0                       ;;CONTAINS (($REGAD)+4)
   001204  000000                               $REG3:  .WORD   0                       ;;CONTAINS (($REGAD)+6)
   001206  000000                               $REG4:  .WORD   0                       ;;CONTAINS (($REGAD)+10)
   001210  000000                               $REG5:  .WORD   0                       ;;CONTAINS (($REGAD)+12)
   001212  000000                               $TMP0:  .WORD   0                       ;;USER DEFINED
   001214  000000                               $TMP1:  .WORD   0                       ;;USER DEFINED
   001216  000000                               $TMP2:  .WORD   0                       ;;USER DEFINED
   001220  000000                               $TIMES: 0                               ;;MAX. NUMBER OF ITERATIONS
   001222  000000                               $ESCAPE:0                               ;;ESCAPE ON ERROR ADDRESS
   001224     207      377      377             $BELL:  .ASCIZ  <207><377><377>         ;;CODE FOR BELL
   001230     077                               $QUES:  .ASCII  /?/                     ;;QUESTION MARK
   001231     015                               $CRLF:  .ASCII  <15>                    ;;CARRIAGE RETURN
   001232     012      000                      $LF:    .ASCIZ  <12>                    ;;LINE FEED
                                                ;;*****************************************************************
                                                .SBTTL  APT MAILBOX-ETABLE
```

```
                                ;;*************************************************************
                                .EVEN
001234                          $MAIL:                      ;;APT MAILBOX
001234  000000                  $MSGTY: .WORD   AMSGTY      ;;MESSAGE TYPE CODE
001236  000000                  $FATAL: .WORD   AFATAL      ;;FATAL ERROR NUMBER
001240  000000                  $TESTN: .WORD   ATESTN      ;;TEST NUMBER
001242  000000                  $PASS:  .WORD   APASS       ;;PASS COUNT
001244  000000                  $DEVCT: .WORD   ADEVCT      ;;DEVICE COUNT
001246  000000                  $UNIT:  .WORD   AUNIT       ;;I/O UNIT NUMBER
001250  000000                  $MSGAD: .WORD   AMSGAD      ;;MESSAGE ADDRESS
001252  000000                  $MSGLG: .WORD   AMSGLG      ;;MESSAGE LENGTH
001254                          $ETABLE:                    ;;APT ENVIRONMENT TABLE
001254     000                  $ENV:   .BYTE   AENV        ;;ENVIRONMENT BYTE
001255     000                  $ENVM:  .BYTE   AENVM       ;;ENVIRONMENT MODE BITS
001256  000000                  $SWREG: .WORD   ASWREG      ;;APT SWITCH REGISTER
001260  000000                  $USWR:  .WORD   AUSWR       ;;USER SWITCHES
001262  000000                  $CPUOP: .WORD   ACPUOP      ;;CPU TYPE,OPTIONS
                                ;*                          BITS 15-11=CPU TYPE
                                ;*                                  11/04=01,11/05=02,11/20=03,11/40 04,11/45 05
                                ;*                                  11/70=06,PDQ=07,Q=10
                                ;*                          BIT 10=REAL TIME CLOCK
                                ;*                          BIT  9=FLOATING POINT PROCESSOR
                                ;*                          BIT  8=MEMORY MANAGEMENT
001264     000                  $MAMS1: .BYTE   AMAMS1      ;;HIGH ADDRESS,M.S. BYTE
001265     000                  $MTYP1: .BYTE   AMTYP1      ;;MEM. TYPE,BLK#1
                                ;*                          MEM.TYPE BYTE   --  (HIGH BYTE)
                                ;*                                  900 NSEC CORE=001
                                ;*                                  300 NSEC BIPOLAR=002
                                ;*                                  500 NSEC MOS=003
001266  000000                  $MADR1: .WORD   AMADR1      ;;HIGH ADDRESS,BLK#1
                                ;*                            MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF ''TYPE'' ABOVE
001270     000                  $MAMS2: .BYTE   AMAMS2      ;;HIGH ADDRESS,M.S. BYTE
001271     000                  $MTYP2: .BYTE   AMTYP2      ;;MEM.TYPE,BLK#2
001272  000000                  $MADR2: .WORD   AMADR2      ;;MEM.LAST ADDRESS,BLK#2
001274     000                  $MAMS3: .BYTE   AMAMS3      ;;HIGH ADDRESS,M.S.BYTE
001275     000                  $MTYP3: .BYTE   AMTYP3      ;;MEM.TYPE,BLK#3
001276  000000                  $MADR3: .WORD   AMADR3      ;;MEM.LAST ADDRESS,BLK#3
001300     000                  $MAMS4: .BYTE   AMAMS4      ;;HIGH ADDRESS M.S.BYTE
001301     000                  $MTYP4: .BYTE   AMTYP4      ;;MEM.TYPE,BLK#4
001302  000000                  $MADR4: .WORD   AMADR4      ;;MEM.LAST ADDRESS,BLK#4
001304  000000                  $VECT1: .WORD   AVECT1      ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
001306  000000                  $VECT2: .WORD   AVECT2      ;;INTERRUPT VECTOR#2BUS PRIORITY#2
001310  000000                  $BASE:  .WORD   ABASE       ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
001312  000000                  $DEVM:  .WORD   ADEVM       ;;DEVICE MAP
001314                          $ETEND:
                                .MEXIT
```

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                                        .SBTTL  USER DEFINED TAGS

        001314  000000                  C.SWR:  .WORD   0               ;CONTROL SWITCHES
        001316  000031                  ERMAX:  .WORD   25.             ;MAXIMUM NUMBER OF ERRORS ALLOWED PER DRIVE
        001320  000000                  SAVCSW: .WORD   0               ;PREVIOUS CONTENTS OF 'C.SWR'
        001322  000000                  CNTRLC: .WORD   0               ;CONTROL ''C'' FLAG
        001324  000000                  BUSADR: .WORD   0               ;GET ADDRESSES FROM THE TTY FLAG (0=NO, -1=YES)
        001326  000000                  LPTAVL: .WORD   0               ;LPT AVAILABLE STATUS (0=NO,1=YES)
        001330  000000                  DRVSEL: .WORD   0               ;DRIVES SELECTED FOR TESTING
        001332  166777  000003          TSTNMS: .WORD   166777,3        ;DEFAULT IS RUN TESTS 0-10,12,13 & 15-21
        001336  000000  000000          OPNFLG: .WORD   0,0             ;MODIFY TEST PARAMETER FLAGS
        001342  000000                  CLKSTA: .WORD   0               ;CLOCK STATUS (0=NO CLOCK,+1=KW11-P,
                                                                        ;AND -1=KW11-L)
        001344  000020                  TICKMS: .WORD   16.             ;16 MILLISECONDS PER CLOCK TICK
        001346  040432                  TICKUS: .WORD   16666.          ;16666 MIRCOSECONDS PER CLOCK TICK
        001350  000000                  BYPASS: .WORD   0
        001352  000000                  CHKDRV: .WORD   0               ;DRIVE UNDER TEST
        001354  000000                  DRVMSK: .WORD   0               ;DRIVE MASK BIT
        001356  000000                  SVSTAT: .WORD   0               ;STATUS/ERROR INDICATOR IS
                                                                        ;SAVED HERE ON AN ERROR
        001360  000000                  CYL.RD: .WORD   0               ;CYLINDER READ
        001362  000000                  TRK.RD: .WORD   0               ;TRACK READ
        001364  000000                  SEC.RD: .WORD   0               ;SECTOR READ
        001366  000000                  CYL.DS: .WORD   0               ;CYLINDER DESIRED
        001370  000000                  SEC.DS: .WORD   0               ;SECTOR DESIRED
        001372  000000                  TRK.DS: .WORD   0               ;TRACK DESIRED
        001374  000000                  LSTRK:  .WORD   0               ;CONTAINS THE LAST TRACK OF THE UNIT UNDER
                                                                        ;TEST. RM02/3 = 4., RM05 = 18.
        001376  000000                  TIM.UP: .WORD   0               ;MINIMUM TIME
        001400  000000                          .WORD   0               ;NUMBER OF COUNTS BELOW MIN. LIMIT
        001402  000000                          .WORD   0               ;MAXIMUM TIME
        001404  000000                          .WORD   0               ;NUMBER OF COUNTS ABOVE MAX. LIMIT
        001406  000000  000000                  .WORD   0,0             ;TOTAL TIME OF ALL SEEKS
        001412  000000                          .WORD   0               ;NUMBER OF SEEKS PERFORMED
        001414  000000                  TIM.DN: .WORD   0               ;MINIMUM TIME
        001416  000000                          .WORD   0               ;NUMBER OF COUNTS BELOW MIN. LIMIT
        001420  000000                          .WORD   0               ;MAXIMUM TIME
        001422  000000                          .WORD   0               ;NUMBER OF COUNTS ABOVE MAX. LIMIT
        001424  000000  000000                  .WORD   0,0             ;TOTAL TIME OF ALL SEEKS
        001430  000000                          .WORD   0               ;NUMBER OF SEEKS PERFORMED
        001432  000000                  TIM.PT: .WORD   0               ;POINTS TO TABLE OF TIMES
        001434  000000                  WCEFLG: .WORD   0               ;FATAL WRITE CHECK ERROR FLAG
        001436  000000                  STALL0: .WORD   0               ;VARIABLE STALL
        001440  000000  000000          SVADR:  .WORD   0,0             ;SAVE DISK ADDRESS
        001444  000000                  SEKTMR: .WORD   0               ;SEEK TIMER
        001446  000000                  SEKCNT: .WORD   0               ;SEEK COUNTER
        001450  000000                  DFLTA:  .WORD   0               ;TESTING RANGE FOR SERVO SETTLE DOWN TEST
        001452  160000                  TRCKWC: .WORD   -<256.*32.>     ;WORD COUNT FOR A FULL TRACK IN 16 BIT MODE
        001454  000012                  STALL1: .WORD   10.             ;10 MILLISECONDS STALL
        001456  000012                  STALL2: .WORD   10.             ;10 MILLISECONDS STALL
        001460  011610                  STALL3: .WORD   5000.           ;5 SEC STALL
        001462  000031                  MXSTAL: .WORD   25.             ;MAX. INCREMENTING STALL ALLOWED IN TEST 4
        001464     020                  ERR.CT: .BYTE   16.             ;NUMBER OF ERRORS ALLOWED IN TESTS 16 - 21
                                                                        ;BEFORE GOING TO THE NEXT TEST
        001465     000                          .BYTE   0               ;RESERVED
        001466  000000                  BASFLG: .WORD   0               ;FLAG FOR DETECTING BAD SECTOR
        001470  000000                  XXDP:   .WORD   0               ;THE LOW BYTE CONTAINS THE DRIVE NUMBER FROM WHICH
```

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                                                          ;THE PROGRAM WAS LOADED. THF HIGH BYTE CONTAINS THE
                                                          ;'XXDP' DEVICE CODE FOR THE RM05/3/2.

001472                          ERRCN:  .BLKB   8.        ;TOTAL ERROR COUNT FOR DRIVES 0-7.

                                ;ADDRESSES AND VECTORS
001502  176700                  RH.ADR: .WORD   176700    ;RH/RM UNIBUS ADDRFSS
001504  000254  000240          RHVEC:  .WORD   254,240   ;VECTOR ADDRESS AND PRIORITY
001510  000104  000106          PKV:    .WORD   104,106   ;KW11-P VECTOR ADDRESS
001514  172540                  PKCS:   .WORD   172540    ;KW11-P CONTROL AND STATUS REG.
001516  172542                  PKB:    .WORD   172542    ;KW11-P COUNT SET BUFFER
001520  172544                  PKC:    .WORD   172544    ;KW11-P COUNTER
001522  000100  000102          LKV:    .WORD   100,102   ;KW11-L VECTOR ADDRESS
001526  177546                  LKS:    .WORD   177546    ;KW11-L STATUS REGISTER
001530  177564                  TPS:    .WORD   177564    ;TTY PRINTER STATUS
001532  177566                  TPB:    .WORD   177566    ;TTY PRINTER BUFFER
001534  177514                  LPS:    .WORD   177514    ;LINE PRINTER STATUS
001536  177516                  LPB:    .WORD   177516    ;LINE PRINTER BUFFER

                                ;BIT TABLE
001540  000001                  BITS:   .WORD   BIT00
001542  000002                          .WORD   BIT01
001544  000004                          .WORD   BIT02
001546  000010                          .WORD   BIT03
001550  000020                          .WORD   BIT04
001552  000040                          .WORD   BIT05
001554  000100                          .WORD   BIT06
001556  000200                          .WORD   BIT07
001560  000400                          .WORD   BIT08
001562  001000                          .WORD   BIT09
001564  002000                          .WORD   BIT10
001566  004000                          .WORD   BIT11
001570  010000                          .WORD   BIT12
001572  020000                          .WORD   BIT13
001574  040000                          .WORD   BIT14
001576  100000                          .WORD   BIT15
001600  000001                          .WORD   BIT00
001602  000002                          .WORD   BIT01
001604  000004                          .WORD   BIT02
001606  000010                          .WORD   BIT03
001610  000020                          .WORD   BIT04
001612  000040                          .WORD   BIT05
001614  000100                          .WORD   BIT06
001616  000200                          .WORD   BIT07

                                .SBTTL  TIMING LIMITS

                                ;ROTATIONAL TEST TABLES FOR RM05/3 DRIVES
                                ;60HZ TABLE
001620  047754                  T7A:    .WORD   ROTATE
001622  000000                          .WORD   0
001624  003142                          .WORD   1634.     ;LO LIMIT (16.67MS - 2%)
001626  003244                          .WORD   1700.     ;HI LIMIT (16.67MS + 2%)

                                ;50HZ TABLE
001630  047754                  T7B:    .WORD   ROTATE
001632  000000                          .WORD   0
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26

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     001634  003131                          .WORD   1625.           ;LO LIMIT (16.67MS - 2.5%)
     001636  003255                          .WORD   1709.           ;HI LIMIT (16.67MS + 2.5%)

                                     ;ROTATIONAL TEST TABLES FOR RM02 DRIVES
                                     ;60HZ TABLE
     001640  047754                  T7A1:   .WORD   ROTATE
     001642  000000                          .WORD   0
     001644  004622                          .WORD   2450.           ;LO LIMIT (25.00MS - 2%)
     001646  004766                          .WORD   2550.           ;HI LIMIT (25.00MS + 2%)

                                     ;50HZ TABLE
     001650  047754                  T7B1:   .WORD   ROTATE
     001652  000000                          .WORD   0
     001654  004605                          .WORD   2437.           ;LO LIMIT (25.00MS - 2.5%)
     001656  005003                          .WORD   2563.           ;HI LIMIT (25.00MS + 2.5%)

                                     ;SEEK TEST TABLES
     001660  050005                  T10:    .WORD   ONECYL          ;FORWARD
     001662  050152                          .WORD   REV             ;REVERSE
     001664  000000                          .WORD   0               ;NO LO LIMIT
     001666  001130                          .WORD   600.            ;HI LIMIT (6.0MS)

     001670  050052                  T11:    .WORD   AVERGE          ;FORWARD
     001672  050152                          .WORD   REV             ;REVERSE
     001674  000000                          .WORD   0               ;NO LO LIMIT
     001676  005670                          .WORD   3000.           ;HI LIMIT (30.0MS)

     001700  050112                  T12:    .WORD   MXSEEK          ;FORWARD
     001702  050152                          .WORD   REV             ;REVERSE
     001704  000000                          .WORD   0               ;NO LO LIMIT
     001706  012574                          .WORD   5500.           ;HI LIMIT (55.0MS)


                                     ;SPECS. MESSAGE TABLES FOR ROTATIONAL AND TIMING TESTS

                                     ;ROTATIONAL MESSAGE AND LO/HI LIMITS FOR RM05/3 DRIVES
                                     ;60HZ TABLE
     001710  050350                  SP7A:   .WORD   MSG7XA
     001712  003142                          .WORD   1634.           ;LO LIMIT (16.67MS - 2%)
     001714  003244                          .WORD   1700.           ;HI LIMIT (16.67MS + 2%)

                                     ;50HZ TABLE
     001716  050350                  SP7B:   .WORD   MSG7XA
     001720  003131                          .WORD   1625.           ;LO LIMIT (16.67MS - 2.5%)
     001722  003255                          .WORD   1709.           ;HI LIMIT (16.67MS + 2.5%)

                                     ;ROTATIONAL MESSAGE AND LO/HI LIMITS FOR RM02 DRIVES
                                     ;60HZ TABLE
     001724  050425                  SP7A1:  .WORD   MSG7XB
     001726  004622                          .WORD   2450.           ;LO LIMIT (25.00MS - 2%)
     001730  004766                          .WORD   2550.           ;HI LIMIT (25.00MS + 2%)

                                     ;50HZ TABLE
     001732  050425                  SP7B1:  .WORD   MSG7XB
     001734  004605                          .WORD   2437.           ;LO LIMIT (25.00MS - 2.5%)
     001736  005003                          .WORD   2563.           ;HI LIMIT (25.00MS + 2.5%)
```

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                                        ;TIMING TESTS MESSAGES AND LO/HI LIMITS
   001740  050500                       SP10:   .WORD   MSG10X
   001742  000000                               .WORD   0               ;NO LO LIMIT
   001744  001130                               .WORD   600.            ;HI LIMIT (6.0MS)

   001746  050542                       SP11:   .WORD   MSG11X
   001750  000000                               .WORD   0               ;NO LO LIMIT
   001752  005670                               .WORD   3000.           ;HI LIMIT (30.0MS)

   001754  050604                       SP12:   .WORD   MSG12X
   001756  000000                               .WORD   0               ;NO LO LIMIT
   001760  012574                               .WORD   5500.           ;HI LIMIT (55.0MS)

                                        ;STATUS/ERROR MESSAGE POINTER TABLE
   001762  051536                       STATBL: .WORD   MSGB14          ;OFFLINE OR UNSAFE DRIVE REQUESTED
   001764  051600                               .WORD   MSGB13          ;UNLOAD DRIVE REQUESTED
   001766  051631                               .WORD   MSGB12          ;PERSISTENT UNSAFE
   001770  051653                               .WORD   MSGB11          ;PARITY ERROR OCCURRED
   001772  051701                               .WORD   MSGB10          ;FATAL PARITY ERROR
   001774  051724                               .WORD   MSGB09          ;SOFTWARE TIMEOUT ON THIS DRIVE
   001776  051763                               .WORD   MSGB08          ;SOFTWARE TIMEOUT ON ANOTHER DRIVE
   002000  052025                               .WORD   MSGB06          ;ERROR OCCURRED DURING I/O OPERATION
   002002  052071                               .WORD   MSGB05          ;ERROR OCCURRED DURING NON-I/O OPERATION
   002004  052141                               .WORD   MSGB04          ;UNSAFE OCCURRED
   002006  052161                               .WORD   MSGB03          ;AUTOMATIC RECALIBRATE SEQUENCE OCCURRED
   002010  052231                               .WORD   MSGB02          ;DRIVE HAS NOT RESPONDED TO PORT REQUEST
   002012  052301                               .WORD   MSGB01          ;DRIVE HAS BECOME NONEXISTENT
```

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                                .SBTTL  ERROR POINTER TABLE

                                ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
                                ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
                                ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
                                ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS ($ERRPC).
                                ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:

                                ;*      EM              ;;POINTS TO THE ERROR MESSAGE
                                ;*      DH              ;;POINTS TO THE DATA HEADER
                                ;*      DT              ;;POINTS TO THE DATA
                                ;*      DF              ;;POINTS TO THE DATA FORMAT


        002014                  $ERRTB:

                                ;*ERROR  1

                                ;*     RH CONTROLLER INTERRUPT OCCURED (RMAS-0)
                                ;*     ERR PC  RMAS
                                ;*     $ERRPC  $REG3

        002014  050660                  EM1
        002016  052337                  DH1
        002020  053714                  DT1
        002022  054346                  DF1

                                ;*ERROR  2

                                ;*     UNEXPECTED ATTENTION OCCURRED
                                ;*     ERR PC  DRIVE   RMAS    RMDS    RMER1     RMMR2     RMER2
                                ;*     $ERRPC  $REG1   $REG3   RMERRS  RMERRS+2  RMERRS+4  RMERRS+6

        002024  050732                  EM2
        002026  052354                  DH2
        002030  053720                  DT2
        002032  054352                  DF2

                                ;*ERROR  3

                                ;*     MASSBUS PARITY ERROR (MCPE=1)
                                ;*     TEST    ERR PC  ADDRESS DATA
                                ;*     $TMPO   $ERRPC  RD.ADR  RD.WRD

        002034  050770                  EM3
        002036  052441                  DH3
        002040  053736                  DT3
        002042  054356                  DF3

                                ;*ERROR  4

                                ;*     MASSBUS PARITY ERROR (PAR=1)
                                ;*     TEST    ERR PC  ADDRESS GDDATA  BDDATA
                                ;*     $TMPO   $ERRPC  WRT.ADR WRT.WD  RD.WRD

        002044  051025                  EM4
        002046  052476                  DH4
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```
002050  053746                  DT4
002052  054362                  DF4

                        ;*ERROR  5

                        ;*      ADDRESS PLUG CHANGE BIT SET
                        ;*      ERR PC  DRIVE   RMAS    RMDS    RMER1     RMMR2    RMER2
                        ;*      $ERRPC  $REG1   $REG3   RMERRS  RMERRS+2  RMERRS+4 RMERRS+6

002054  051061                  EM5
002056  052354                  DH2
002060  053720                  DT2
002062  054352                  DF2

                        ;*ERROR  6 -- NOT USED

002064  000000                  0
002066  000000                  0
002070  000000                  0
002072  000000                  0

                        ;*ERROR  7 -- NOT USED

002074  000000                  0
002076  000000                  0
002100  000000                  0
002102  000000                  0

                        ;*ERROR  10

                        ;*      RH CONTROLLER FAILED TO RESPOND TO ADDRESSING
                        ;*      RMCS1   ERR PC
                        ;*      RH.ADR  $ERRPC

002104  051115                  EM10
002106  052545                  DH10
002110  054000                  DT10
002112  054366                  DF10

                        ;*ERROR  11

                        ;*      DRIVE SELECTED IS NOT ONLINE
                        ;*      DRIVE   ERR PC
                        ;*      $REG2   $ERRPC

002114  051173                  EM11
002116  052564                  DH11
002120  054004                  DT11
002122  054372                  DF11

                        ;*ERROR  12

                        ;*      IMPROPER HEADER DATA
                        ;*      TEST    ERR PC  TST PC  DRIVE   CYLNDR  TRACK   SECTOR
                        ;*      $TMP0   $ERRPC  $REG0   CHKDRV  CYL.DS  TRK.DS  SEC.DS
                        ;*          GDCYL   GDTRK   GDSCTR  BDCYL   BDTRK   BDSCTR
                        ;*          CYL.DS  TRK.DS  SEC.DS  CYL.RD  TRK.RD  SEC.RD
                        ;*      CYLNDR, TRACK, AND SECTOR ARE DECIMAL

002124  051230                    EM12
002126  052603                    DH12
002130  054010                    DT12
002132  054376                    DF12

                        ;*ERROR  13

                        ;*      DATA COMPARE FAILURE
                        ;*      TEST     ERR PC   TST PC   DRIVE    CYLNDR   TRACK    SECTOR
                        ;*      $TMPO    $ERRPC   $REGO    CHKDRV   CYL.DS   TRK.DS   SEC.DS
                        ;*          GDDAT    BDDAT    WRDCNT   GDADR    BDADR
                        ;*          $GDDAT   $BDDAT   $REG4    $GDADR   $BDADR
                        ;*      CYLNDR, TRACK, SECTOR, AND WRDCNT  ARE DECIMAL

002134  051255                    EM13
002136  052603                    DH12
002140  054042                    DT13
002142  054406                    DF13

                        ;*ERROR  14 -- FOLLOWS #13

                        ;*          $GDDAT   $BDDAT   $REG4    $GDADR   $BDADR

002144  000000                    0
002146  000000                    0
002150  054060                    DT13A
002152  054416                    DF14

                        ;*ERROR  15

                        ;*      DATA COMPARE FAILURE
                        ;*      TEST     ERR PC   TST PC   DRIVE    CYLNDR   TRACK    SECTOR
                        ;*      $TMPO    $ERRPC   $REGO    CHKDRV   CYL.DS   TRK.DS   SEC.DS
                        ;*          GDDAT    BDDAT    WRDCNT   GDADR    BDADR
                        ;*          $GDDAT   $BDDAT   $REG4    $GDADR   $BDADR
                        ;*      CYLNDR, TRACK, SECTOR, AND WRDCNT ARE DECIMAL

002154  051255                    EM13
002156  052603                    DH12
002160  054042                    DT13
002162  054406                    DF13

                        ;*ERROR  16 -- FOLLOWS #15

                        ;*   $GDDAT   $BDDAT   $REG4    $GDADR   $BDADR

002164  000000                    0
002166  000000                    0
002170  054060                    DT13A
002172  054416                    DF14

                        ;*ERROR  17

                        ;*      DISK ERROR IN TIMING TEST
                        ;*      TEST     ERR PC   DRIVE    RMCS1    RMDS     RMER1     RMMR2     RMER2
```

```
                               ;*     $TMPO    $ERRPC  CHKDRV  RM.REG  RM.REG+12 RM.REG+14 RM.REG+40 RM.REG+42

    002174  051302                     EM17
    002176  053017                     DH17
    002200  054072                     DT17
    002202  054422                     DF17

                               ;*ERROR  20

                               ;*     CLOCK (KW11-P) OVERFLOW IN TIMING TEST
                               ;*     TEST     ERR PC  DRIVE   RMCS1   RMDS      RMER1     RMMR2     RMER2
                               ;*     $TMPO    $ERRPC  CHKDRV  RM.REG  RM.REG+12 RM.REG+14 RM.REG+40 RM.REG+42

    002204  051334                     EM20
    002206  053017                     DH17
    002210  054072                     DT17
    002212  054422                     DF17

                               ;*ERROR  21

                               ;*     DATA COMPARE FAILURE
                               ;*     TEST       ERR PC  TST PC  DRIVE   CYLNDR  TRACK
                               ;*     $TMPO      $ERRPC  $REG0   CHKDRV  CYL.DS  TRK.DS
                               ;*   GDDAT        BDDAT   WRDCNT  SECTOR
                               ;*   $REG1   $BDDAT  $REG4   $REG1
                               ;*   CYLINDR, TRACK, WRDCNT, AND SECTOR ARE DECIMAL

    002214  051255                     EM13
    002216  053114                     DH21
    002220  054112                     DT21
    002222  054426                     DF21

                               ;*ERROR  22--FOLLOWS #21

                               ;*          $REG1    $BDDAT    $REG4    $REG1

    002224  000000                     0
    002226  000000                     0
    002230  054126                     DT21A
    002232  054436                     DF22

                               ;*ERROR  23

                               ;*     DISK ERROR DURING SEEK
                               ;*     TEST       ERR PC  DRIVE    CYLNDR  RMCS1    RMCS2     RMDS
                               ;*     $TMPO      $ERRPC  CHKDRV   CYL.DS  RM.REG RM.REG+10 RM.REG+12
                               ;*         RMER1     RMMR2     RMER2     RMDC      RMHR
                               ;*         RM.REG+14 RM.REG+40 RM.REG+42 RM.REG+34 RM.REG+36

    002234  051403                     EM23
    002236  053231                     DH23
    002240  054136                     DT23
    002242  054442                     DF23

                               ;*ERROR  24

                               ;*     SEEK NOT COMPLETE WITHIN 120 MS
```

```
                            ;*     TEST        ERR PC   DRIVE    CYLNDR   RMCS1    RMCS2      RMDS
                            ;*     $TMPO       $ERRPC   CHKDRV   CYL.DS   RM.REG RM.REG+10 RM.REG+12
                            ;*         RMER1       RMMR2       RMER2        RMDC        RMHR
                            ;*         RM.REG+14 RM.REG+40 RM.REG+42 RM.REG+34 RM.REG+36

002244  051432                       EM24
002246  053231                       DH23
002250  054136                       DT23
002252  054442                       DF23


                            ;;*******************************************************************
                            ;*   ERRORS  23-40 NOT USED
                            ;*   ERRORS  41-46 WILL HAVE AN EM THAT

                            ;*   VARIES DEPENDING ON THE ERROR, IT WILL BE IN THE FORM:
                            ;*   RH/RM ERROR (MESSAGE)
                            ;*   WHERE MESSAGE WILL BE ONE OR MORE OF THE FOLLOWING:
                            ;*   1)  OFFLINE OR UNSAFE DRIVE REQUESTED
                            ;*   2)  UNLOADED DRIVE REQUESTED
                            ;*   3)  PERSISTENT UNSAFE
                            ;*   4)  PARITY ERROR OCCURRED
                            ;*   5)  FATAL PARITY ERROR
                            ;*   6)  SOFTWARE TIMEOUT ON THIS DRIVE
                            ;*   7)  SOFTWARE TIMEOUT ON ANOTHER DRIVE
                            ;*   8)  ERROR OCCURRED DURING I/O OPERATION
                            ;*   9)  ERROR OCCURRED DURING NON-I/O OPERATION
                            ;*   10) UNSAFE OCCURRED
                            ;*   11) AUTOMATIC RECALIBRATE SEQUENCE OCCURRED
                            ;;*******************************************************************

002254                      ITEM41:

                            ;*ERROR  41

                            ;*     RH/RM ERROR (MESSAGE)
                            ;*     TEST     ERR PC   TST PC   DRIVE
                            ;*     $TMPO    $ERRPC   $REGO    CHKDRV

002254  051472                       EM41
002256  053363                       DH41
002260  054166                       DT41
002262  054452                       DF41

                            ;*ERROR  42

                            ;*     RH/RM ERROR (MESSAGE)
                            ;*     TEST     ERR PC   TST PC   DRIVE    RMCS1    RMCS2    RMDS
                            ;*     $TMPO    $ERRPC   $REGO    CHKDRV   RM.REG   RM.REG+10 RM.REG+12

002264  051472                       EM41
002266  053421                       DH42
002270  054176                       DT42
002272  054456                       DF42

                            ;*ERROR  43

                            ;*     RH/RM ERROR (MESSAGE)
```

```
                                      ;*     TEST     ERR PC  TST PC  DRIVE   RMCS1    RMCS2   RMDS
                                      ;*     $TMPO    $ERRPC  $REGO   CHKDRV  RM.REG   RM.REG+10 RM.REG+12
                                      ;*         RMER1      RMMR2      RMER2
                                      ;*         RM.REG+14 RM.REG+40 RM.REG+42

    002274  051472                             EM41
    002276  053421                             DH42
    002300  054214                             DT43
    002302  054462                             DF43

                                      ;*ERROR  44

                                      ;*     RH/RM ERROR (MESSAGE)
                                      ;*     TEST     ERR PC  TST PC  DRIVE   CYLNDR  TRACK     SECTOR
                                      ;*     $TMPO    $ERRPC  $REGO   CHKDRV  CYL.DS  TRK.DS    SEC.DS
                                      ;*         RMCS1      RMCS2      RMDS       RMHR       RMDC       RMDA
                                      ;*         RM.REG     RM.REG+10 RM.REG+12 RM.REG+36 RM.REG+34 RM.REG+06
                                      ;*     RMER1            RMMR2           RMER2
                                      ;*     RM.REG+14     RM.REG+40     RM.REG+42
                                      ;*     CYLNDR,TRACK, AND SECTOR ARE DECIMAL

    002304  051472                             EM41
    002306  052603                             DH12
    002310  054240                             DT44
    002312  054472                             DF44

                                      ;*ERROR  45

                                      ;*     RH/RM ERROR (MESSAGE)
                                      ;*     TEST     ERR PC  TST PC  DRIVE   CYLNDR  TRACK     SECTOR
                                      ;*     $TMPO    $ERRPC  $REGO   CHKDRV  CYL.DS  TRK.DS    SEC.DS
                                      ;*         RMCS1      RMCS2      RMDS       RMHR       RMDC       RMDA
                                      ;*         RM.REG     RM.REG+10 RM.REG+12 RM.REG+36 RM.REG+34 RM.REG+06
                                      ;*     RMER1          RMMR2          RMER2        RMWC         RMBA       RMDB
                                      ;*     RM.REG+14   RM.REG+40    RM.REG+42    RM.REG+2    RM.REG+4 RM.REG+22
                                      ;*     CYLNDR,TRACK, AND SECTOR ARE DECIMAL

    002314  051472                             EM41
    002316  052603                             DH12
    002320  054300                             DT45
    002322  054506                             DF45

                                      ;*ERROR  46

                                      ;*     FATAL WRITE CHECK ERROR (MESSAGE)
                                      ;*     TEST     ERR PC  TST PC  DRIVE   CYLNDR  TRACK     SECTOR
                                      ;*     $TMPO    $ERRPC  $REGO   CHKDRV  CYL.DS  TRK.DS    SEC.DS
                                      ;*         RMCS1      RMCS2      RMDS       RMHR       RMDC       RMDA
                                      ;*         RM.REG     RM.REG+10 RM.REG+12 RM.REG+36 RM.REG+34 RM.REG+06
                                      ;*     RMER1          RMMR2          RMER2        RMWC         RMBA       RMDB
                                      ;*     RM.REG+14   RM.REG+40    RM.REG+42    RM.REG+2    RM.REG+4 RM.REG+22
                                      ;*     CYLNDR,TRACK, AND SECTOR ARE DECIMAL

    002324  051506                             EM46
    002326  052603                             DH12
    002330  054300                             DT45
    002332  054506                             DF45
```

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                                      .SBTTL  TEST PARAMETER POINTERS AND TABLES

                                      ;COMMON STORAGE FOR TEST PARAMETERS
002334  000000                        PRM:    .WORD   0                ;THIS WORD TELLS WHICH OF THE
                                                                       ;FOLLOWING PARAMETERS ARE TO BE USED
002336  000000                        RPT:    .WORD   0                ;REPEAT COUNTS FOR ALL TESTS
002340  000000                        FC:     .WORD   0                ;FIRST CYLINDER
002342  000000                        LC:     .WORD   0                ;LAST CYLINDER
002344  000000                        IC:     .WORD   0                ;INCREMENT CYLINDER
002346  000000                        FT:     .WORD   0                ;FIRST TRACK
002350  000000                        LT:     .WORD   0                ;LAST TRACK
002352  000000                        IT:     .WORD   0                ;INCREMENT TRACK
002354  000000                        FS:     .WORD   0                ;FIRST SECTOR
002356  000000                        LS:     .WORD   0                ;LAST SECTOR
002360  000000                        PAT:    .WORD   0                ;PATTERN CODE
002362  000000  000000  000000                .WORD   0,0,0            ;FILLER WORDS FOR COMMON TABLE USED BY THE
                                                                       ;'OPNTST' ROUTINE.

002370  000000                        NC1:    .WORD   0                ;NEW CYLINDER ADDRESS
002372  000000                        NC2:    .WORD   0                ;NEW CYLINDER ADDRESS

                                      ;TABLE OF PARAMETER POINTERS
002374  003132                        PRMPT:  .WORD   PRM0
002376  003150                                .WORD   PRM1
002400  003176                                .WORD   PRM2
002402  003216                                .WORD   PRM3
002404  003236                                .WORD   PRM4
002406  003256                                .WORD   PRM5
002410  003276                                .WORD   PRM6
002412  003316                                .WORD   PRM7
002414  003336                                .WORD   PRM10
002416  003354                                .WORD   PRM11
002420  003374                                .WORD   PRM12
002422  003410                                .WORD   PRM13
002424  003420                                .WORD   PRM14
002426  003430                                .WORD   PRM15
002430  003440                                .WORD   PRM16
002432  003452                                .WORD   PRM17
002434  003462                                .WORD   PRM20
002436  003516                                .WORD   PRM21
002440  003526                                .WORD   PRM22
002442  000000                                .WORD   0                ;TERMINATOR

                                      ;TABLE OF PARAMETER UPPER LIMITS
002444  032767                        PRMLMT: .WORD   32767            ;"R"
002446  001466                                .WORD   822.             ;"FC"
002450  001466                                .WORD   822.             ;"LC"
002452  001466                                .WORD   822.             ;"IC"
002454  000004                                .WORD   4                ;"FT"
002456  000004                                .WORD   4                ;"LT"
002460  000004                                .WORD   4                ;"IT"
002462  000022                                .WORD   18.              ;"FT"'
002464  000022                                .WORD   18.              ;"LT"'
002466  000022                                .WORD   18.              ;"IT"'
002470  000037                                .WORD   31.              ;"FS"
002472  000037                                .WORD   31.              ;"LS"
002474  177777                                .WORD   177777           ;"PAT"
```

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                                         ;TABLE OF PARAMETER MESSAGE POINTERS
 002476  047210                          PRMMSG: .WORD   MSG.R
 002500  047212                                  .WORD   MSG.FC
 002502  047215                                  .WORD   MSG.LC
 002504  047220                                  .WORD   MSG.IC
 002506  047223                                  .WORD   MSG.FT
 002510  047226                                  .WORD   MSG.LT
 002512  047231                                  .WORD   MSG.IT
 002514  047234                                  .WORD   MES.FT
 002516  047240                                  .WORD   MES.LT
 002520  047244                                  .WORD   MES.IT
 002522  047250                                  .WORD   MSG.FS
 002524  047253                                  .WORD   MSG.LS

                                         ;STATUS/ERROR INDICATOR MESSAGES POINTER TABLE
                                         ;DEFAULT VALUES OF TEST PARAMETERS

 002526  002227  000310  000000  DFLT:   .WORD   2227,200.,0,822.,0,0,0  ;RECAL/RANDOM SEEK (T0)
 002544  006677  000144  000000          .WORD   6677,100.,0,256.,0,0,0,0,0,0,0 ;SEEK/SEEK (T1)
 002572  002237  000001  000000          .WORD   2237,1,0,822.,1,0,0,0   ;INCREMENT SEEK (T2)
 002612  002237  000010  000000          .WORD   2237,10,0,512.,1,0,0,0  ;STEPPING SEEK (T3)
 002632  002237  000001  000000          .WORD   2237,1,0,822.,1,0,0,0   ;OSCILLATING SEEK (T4)
 002652  002237  000001  000000          .WORD   2237,1,0,822.,1,0,0,0   ;CONVERGING/DIVERGING SEEK (T5)
 002672  002237  000001  000000          .WORD   2237,1,0,822.,1,0,0,0   ;SERVO ADDRESSING LOGIC NOISE (T6)
 002712  000667  011610  000000          .WORD   667,5000.,0,822.,0,4,0,18.      ;RANDOM SEEK TEST (T7)
 002732  000237  000001  000000          .WORD   237,1,0,822.,100.,0,0   ;SERVO SETTLE DOWN TES: (T10)
 002750  002237  000001  000000          .WORD   2237,1,0,822.,1,0,0,0   ;ALL SEEKS TEST (T11)
 002770  002223  000001  000000          .WORD   2223,1,0,0,0,0          ;ROTATIONAL SPEED TIMING TEST (T12)
 003004  000007  000001  000000          .WORD   7,1,0,822.              ;ONE CYLINDER SEEK TIMING TEST (T13)
 003014  000007  000001  000000          .WORD   7,1,0,220.              ;AVERAGE SEEK TIMING TEST (T14)
 003024  000007  000001  000000          .WORD   7,1,0,822.              ;MAXIMUM SEEK TIMING TEST (T15)
 003034  000223  000001  000000          .WORD   223,1,0,0,0             ;SECTOR ADDRESSING TEST (T16)
 003046  002003  000001  000000          .WORD   2003,1,0,0              ;TRACK ADDRESSING TEST (T17)
 003056  017777  000001  000000          .WORD   17777,1,0,821.,64.,0,4,1,0,18.,1,1,0,177777 ;DATA TES: (T20)
 003112  000007  001750  000000          .WORD   7,1000.,0,821.          ;EXERCISER (T21)
 003122  000007  011610  000000          .WORD   7,5000.,0,255.          ;SEEK TIME ADJUSTMENT TEST (T22)

                                         ;PARAMETER TABLES

                                         ;RECAL/RANDOM SEEK (T0)
 003132  002227                          PRM0:   .WORD   2227
 003134  000310                                  .WORD   200.
 003136  000000                                  .WORD   0
 003140  001466                                  .WORD   822.
 003142  000000                                  .WORD   0
 003144  000000                                  .WORD   0
 003146  000000                                  .WORD   0

                                         ;SEEK/SEEK (T1)
 003150  006677                          PRM1:   .WORD   6677
 003152  000144                                  .WORD   100.
 003154  000000                                  .WORD   0
 003156  000400                                  .WORD   256.
 003160  000000                                  .WORD   0
 003162  000000                                  .WORD   0
 003164  000000                                  .WORD   0
```

```
003166  000000                  .WORD   0
003170  000000                  .WORD   0
003172  000000                  .WORD   0
003174  000000                  .WORD   0

                        ;INCREMENT SEEK (T2)
003176  002237          PRM2:   .WORD   2237
003200  000001                  .WORD   1
003202  000000                  .WORD   0
003204  001466                  .WORD   822.
003206  000001                  .WORD   1
003210  000000                  .WORD   0
003212  000000                  .WORD   0
003214  000000                  .WORD   0

                        ;STEPPING SEEK (T3)
003216  002237          PRM3:   .WORD   2237
003220  000001                  .WORD   1
003222  000000                  .WORD   0
003224  001000                  .WORD   512.
003226  000001                  .WORD   1
003230  000000                  .WORD   0
003232  000000                  .WORD   0
003234  000000                  .WORD   0

                        ;OSCILLATING SEEK (T4)
003236  002237          PRM4:   .WORD   2237
003240  000001                  .WORD   1
003242  000000                  .WORD   0
003244  001466                  .WORD   822.
003246  000001                  .WORD   1
003250  000000                  .WORD   0
003252  000000                  .WORD   0
003254  000000                  .WORD   0

                        ;CONVERGING/DIVERGING SEEK (T5)
003256  002237          PRM5:   .WORD   2237
003260  000001                  .WORD   1
003262  000000                  .WORD   0
003264  001466                  .WORD   822.
003266  000001                  .WORD   1
003270  000000                  .WORD   0
003272  000000                  .WORD   0
003274  000000                  .WORD   0

                        ;SERVO ADDRESSING LOGIC NOISE GENERATOR (T6)
003276  002237          PRM6:   .WORD   2237
003300  000001                  .WORD   1
003302  000000                  .WORD   0
003304  001466                  .WORD   822.
003306  000001                  .WORD   1
003310  000000                  .WORD   0
003312  000000                  .WORD   0
003314  000000                  .WORD   0

                        ;RANDOM SEEK TEST (T7)
003316  000667          PRM7:   .WORD   667
```

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 003320  011610                  .WORD   5000.
 003322  000000                  .WORD   0
 003324  001466                  .WORD   822.
 003326  000000                  .WORD   0
 003330  000004                  .WORD   4
 003332  000000                  .WORD   0
 003334  000022                  .WORD   18.

                         ;SERVO SETTLE DOWN TEST (T10)
 003336  000237          PRM10:  .WORD   237
 003340  000001                  .WORD   1
 003342  000000                  .WORD   0
 003344  001466                  .WORD   822.
 003346  000144                  .WORD   100.
 003350  000000                  .WORD   0
 003352  000000                  .WORD   0

                         ;ALL SEEKS TEST (T11)
 003354  002237          PRM11:  .WORD   2237
 003356  000001                  .WORD   1
 003360  000000                  .WORD   0
 003362  001466                  .WORD   822.
 003364  000001                  .WORD   1
 003366  000000                  .WORD   0
 003370  000000                  .WORD   0
 003372  000000                  .WORD   0

                         ;ROTATIONAL SPEED TIMING TEST (T12)
 003374  002223          PRM12:  .WORD   2223
 003376  000001                  .WORD   1
 003400  000000                  .WORD   0
 003402  000000                  .WORD   0
 003404  000000                  .WORD   0
 003406  000000                  .WORD   0

                         ;ONE CYLINDER SEEK TIMING TEST (T13)
 003410  000007          PRM13:  .WORD   7
 003412  000001                  .WORD   1
 003414  000000                  .WORD   0
 003416  001466                  .WORD   822.

                         ;AVERAGE SEEK TIMING TEST (T14)
 003420  000007          PRM14:  .WORD   7
 003422  000001                  .WORD   1
 003424  000000                  .WORD   0
 003426  000334                  .WORD   220.

                         ;MAXIMUM SEEK TIMING TEST (T15)
 003430  000007          PRM15:  .WORD   7
 003432  000001                  .WORD   1
 003434  000000                  .WORD   0
 003436  001466                  .WORD   822.

                         ;SECTOR ADDRESSING TEST (T16)
 003440  000223          PRM16:  .WORD   223
 003442  000001                  .WORD   1
 003444  000000                  .WORD   0
```

```
   214 003446  000000                        .WORD   0
   215 003450  000000                        .WORD   0
   216
   217                               ;TRACK ADDRESSING TEST (T17)
   218 003452  002003                PRM17:  .WORD   2003
   219 003454  000001                        .WORD   1
   220 003456  000000                        .WORD   0
   221 003460  000000                        .WORD   0
   222
   223                               ;DATA TEST (T20)
   224 003462  017777                PRM20:  .WORD   17777
   225 003464  000001                        .WORD   1
   226 003466  000000                        .WORD   0
   227 003470  001465                        .WORD   821.
   228 003472  000100                        .WORD   64.
   229 003474  000000                        .WORD   0
   230 003476  000004                        .WORD   4
   231 003500  000001                        .WORD   1
   232 003502  000000                        .WORD   0
   233 003504  000022                        .WORD   18.
   234 003506  000001                        .WORD   1
   235 003510  000001                        .WORD   1
   236 003512  000000                        .WORD   0
   237 003514  177777                PTRN15: .WORD   177777
   238
   239                               ;EXERCISER (T21)
   240 003516  000007                PRM21:  .WORD   7
   241 003520  001750                        .WORD   1000.
   242 003522  000000                        .WORD   0
   243 003524  001465                        .WORD   821.
   244
   245                               ;SEEK TIME ADJUSTMENT TEST (T22)
   246 003526  000007                PRM22:  .WORD   7
   247 003530  011610                        .WORD   5000.
   248 003532  000000                        .WORD   0
   249 003534  000377                        .WORD   255.
```

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                                        .SBTTL  DATA PATTERN POINTERS AND TABLES

 003536  003576                 PAT.PT: .WORD   PAT0            ;DATA PATTERN 0
 003540  003636                         .WORD   PAT1            ;DATA PATTERN 1
 003542  003676                         .WORD   PAT2            ;DATA PATTERN 2
 003544  003736                         .WORD   PAT3            ;DATA PATTERN 3
 003546  003776                         .WORD   PAT4            ;DATA PATTERN 4
 003550  004036                         .WORD   PAT5            ;DATA PATTERN 5
 003552  004076                         .WORD   PAT6            ;DATA PATTERN 6
 003554  004136                         .WORD   PAT7            ;DATA PATTERN 7
 003556  004176                         .WORD   PAT8            ;DATA PATTERN 8
 003560  004236                         .WORD   PAT9            ;DATA PATTERN 9
 003562  004276                         .WORD   PAT10           ;DATA PATTERN 10
 003564  004336                         .WORD   PAT11           ;DATA PATTERN 11
 003566  004376                         .WORD   PAT12           ;DATA PATTERN 12
 003570  004436                         .WORD   PAT13           ;DATA PATTERN 13
 003572  004476                         .WORD   PAT14           ;DATA PATTERN 14
 003574  004536                         .WORD   PAT15           ;DATA PATTERN 15

 003576  155555                 PAT0:   .WORD   155555          ;PATTERN 0 (WORST CASE)
 003600  133333                         .WORD   133333
 003602  155555                         .WORD   155555
 003604  133333                         .WORD   133333
 003606  155555                         .WORD   155555
 003610  133333                         .WORD   133333
 003612  155555                         .WORD   155555
 003614  133333                         .WORD   133333
 003616  155555                         .WORD   155555
 003620  133333                         .WORD   133333
 003622  155555                         .WORD   155555
 003624  133333                         .WORD   133333
 003626  155555                         .WORD   155555
 003630  133333                         .WORD   133333
 003632  155555                         .WORD   155555
 003634  133333                         .WORD   133333

 003636  000001                 PAT1:   .WORD   000001          ;PATTERN 1
 003640  000003                         .WORD   000003
 003642  000007                         .WORD   000007
 003644  000017                         .WORD   000017
 003646  000037                         .WORD   000037
 003650  000077                         .WORD   000077
 003652  000177                         .WORD   000177
 003654  000377                         .WORD   000377
 003656  000777                         .WORD   000777
 003660  001777                         .WORD   001777
 003662  003777                         .WORD   003777
 003664  007777                         .WORD   007777
 003666  017777                         .WORD   017777
 003670  037777                         .WORD   037777
 003672  077777                         .WORD   077777
 003674  177777                         .WORD   177777

 003676  177776                 PAT2:   .WORD   177776          ;PATTERN 2
 003700  177774                         .WORD   177774
 003702  177770                         .WORD   177770
 003704  177760                         .WORD   177760
 46 003706  177740                          .WORD   177740
 47 003710  177700                          .WORD   177700
 48 003712  177600                          .WORD   177600
 49 003714  177400                          .WORD   177400
 50 003716  177000                          .WORD   177000
 51 003720  176000                          .WORD   176000
 52 003722  174000                          .WORD   174000
 53 003724  170000                          .WORD   170000
 54 003726  160000                          .WORD   160000
 55 003730  140000                          .WORD   140000
 56 003732  100000                          .WORD   100000
 57 003734  000000                          .WORD   000000
 58
 59 003736  000000                  PAT3:   .WORD   000000          ;PATTERN 3
 60 003740  000000                          .WORD   000000
 61 003742  000000                          .WORD   000000
 62 003744  177777                          .WORD   177777
 63 003746  177777                          .WORD   177777
 64 003750  177777                          .WORD   177777
 65 003752  000000                          .WORD   000000
 66 003754  000000                          .WORD   000000
 67 003756  177777                          .WORD   177777
 68 003760  177777                          .WORD   177777
 69 003762  000000                          .WORD   000000
 70 003764  177777                          .WORD   177777
 71 003766  000000                          .WORD   000000
 72 003770  177777                          .WORD   177777
 73 003772  000000                          .WORD   000000
 74 003774  177777                          .WORD   177777
 75
 76 003776  133331                  PAT4:   .WORD   133331          ;PATTERN 4
 77 004000  133331                          .WORD   133331
 78 004002  133331                          .WORD   133331
 79 004004  133331                          .WORD   133331
 80 004006  133331                          .WORD   133331
 81 004010  133331                          .WORD   133331
 82 004012  133331                          .WORD   133331
 83 004014  133331                          .WORD   133331
 84 004016  133331                          .WORD   133331
 85 004020  133331                          .WORD   133331
 86 004022  133331                          .WORD   133331
 87 004024  133331                          .WORD   133331
 88 004026  133331                          .WORD   133331
 89 004030  133331                          .WORD   133331
 90 004032  133331                          .WORD   133331
 91 004034  133331                          .WORD   133331
 92
 93 004036  052525                  PAT5:   .WORD   052525          ;PATTERN 5
 94 004040  052525                          .WORD   052525
 95 004042  052525                          .WORD   052525
 96 004044  125252                          .WORD   125252
 97 004046  125252                          .WORD   125252
 98 004050  125252                          .WORD   125252
 99 004052  052525                          .WORD   052525
100 004054  052525                          .WORD   052525
101 004056  125252                          .WORD   125252
102 004060  125252                          .WORD   125252
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004062  052525                          .WORD   052525
004064  125252                          .WORD   125252
004066  052525                          .WORD   052525
004070  125252                          .WORD   125252
004072  052525                          .WORD   052525
004074  125252                          .WORD   125252

004076  155555                  PAT6:   .WORD   155555          ;PATTERN 6
004100  155555                          .WORD   155555
004102  155555                          .WORD   155555
004104  155555                          .WORD   155555
004106  155555                          .WORD   155555
004110  155555                          .WORD   155555
004112  155555                          .WORD   155555
004114  155555                          .WORD   155555
004116  155555                          .WORD   155555
004120  155555                          .WORD   155555
004122  155555                          .WORD   155555
004124  155555                          .WORD   155555
004126  155555                          .WORD   155555
004130  155555                          .WORD   155555
004132  155555                          .WORD   155555
004134  155555                          .WORD   155555

004136  026455                  PAT7:   .WORD   026455          ;PATTERN 7
004140  026455                          .WORD   026455
004142  026455                          .WORD   026455
004144  151322                          .WORD   151322
004146  151322                          .WORD   151322
004150  151322                          .WORD   151322
004152  026455                          .WORD   026455
004154  026455                          .WORD   026455
004156  151322                          .WORD   151322
004160  151322                          .WORD   151322
004162  026455                          .WORD   026455
004164  151322                          .WORD   151322
004166  026455                          .WORD   026455
004170  151322                          .WORD   151322
004172  026455                          .WORD   026455
004174  151322                          .WORD   151322

004176  155555                  PAT8:   .WORD   155555          ;PATTERN 8 (WORST CASE)
004200  133333                          .WORD   133333
004202  155555                          .WORD   155555
004204  133333                          .WORD   133333
004206  155555                          .WORD   155555
004210  133333                          .WORD   133333
004212  155555                          .WORD   155555
004214  133333                          .WORD   133333
004216  155555                          .WORD   155555
004220  133333                          .WORD   133333
004222  155555                          .WORD   155555
004224  133333                          .WORD   133333
004226  155555                          .WORD   155555
004230  133333                          .WORD   133333
004232  155555                          .WORD   155555
004234  133333                          .WORD   133333
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004236  000001          PAT9:   .WORD   000001          ;PATTERN 9
004240  000002                  .WORD   000002
004242  000004                  .WORD   000004
004244  000010                  .WORD   000010
004246  000020                  .WORD   000020
004250  000040                  .WORD   000040
004252  000100                  .WORD   000100
004254  000200                  .WORD   000200
004256  000400                  .WORD   000400
004260  001000                  .WORD   001000
004262  002000                  .WORD   002000
004264  004000                  .WORD   004000
004266  010000                  .WORD   010000
004270  020000                  .WORD   020000
004272  040000                  .WORD   040000
004274  100000                  .WORD   100000

004276  177776          PAT10:  .WORD   177776          ;PATTERN 10
004300  177775                  .WORD   177775
004302  177773                  .WORD   177773
004304  177767                  .WORD   177767
004306  177757                  .WORD   177757
004310  177737                  .WORD   177737
004312  177677                  .WORD   177677
004314  177577                  .WORD   177577
004316  177377                  .WORD   177377
004320  176777                  .WORD   176777
004322  175777                  .WORD   175777
004324  173777                  .WORD   173777
004326  167777                  .WORD   167777
004330  157777                  .WORD   157777
004332  137777                  .WORD   137777
004334  077777                  .WORD   077777

004336  172666          PAT11:  .WORD   172666          ;PATTERN 11
004340  155555                  .WORD   155555
004342  172666                  .WORD   172666
004344  155555                  .WORD   155555
004346  172666                  .WORD   172666
004350  155555                  .WORD   155555
004352  172666                  .WORD   172666
004354  155555                  .WORD   155555
004356  172666                  .WORD   172666
004360  155555                  .WORD   155555
004362  172666                  .WORD   172666
004364  155555                  .WORD   155555
004366  172666                  .WORD   172666
004370  155555                  .WORD   155555
004372  172666                  .WORD   172666
004374  155555                  .WORD   155555

004376  077777          PAT12:  .WORD   077777          ;PATTERN 12
004400  137777                  .WORD   137777
004402  157777                  .WORD   157777
004404  167777                  .WORD   167777
004406  173777                  .WORD   173777
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004410  175777                   .WORD   175777
004412  176777                   .WORD   176777
004414  177377                   .WORD   177377
004416  177577                   .WORD   177577
004420  177677                   .WORD   177677
004422  177737                   .WORD   177737
004424  177757                   .WORD   177757
004426  177767                   .WORD   177767
004430  177773                   .WORD   177773
004432  177775                   .WORD   177775
004434  177776                   .WORD   177776

004436  153333          PAT13:   .WORD   153333          ;PATTERN 13
004440  066667                   .WORD   066667
004442  153333                   .WORD   153333
004444  066667                   .WORD   066667
004446  153333                   .WORD   153333
004450  066667                   .WORD   066667
004452  153333                   .WORD   153333
004454  066667                   .WORD   066667
004456  153333                   .WORD   153333
004460  066667                   .WORD   066667
004462  153333                   .WORD   153333
004464  066667                   .WORD   066667
004466  153333                   .WORD   153333
004470  066667                   .WORD   066667
004472  153333                   .WORD   153333
004474  066667                   .WORD   066667

004476  000000          PAT14:   .WORD   000000          ;PATTERN 14
004500  177777                   .WORD   177777
004502  177777                   .WORD   177777
004504  177777                   .WORD   177777
004506  177777                   .WORD   177777
004510  177777                   .WOPD   177777
004512  177777                   .WORD   177777
004514  177777                   .WORD   177777
004516  177777                   .WORD   177777
004520  177777                   .WORD   177777
004522  177777                   .WORD   177777
004524  177777                   .WORD   177777
004526  177777                   .WORD   177777
004530  177777                   .WORD   177777
004532  177777                   .WORD   177777
004534  177777                   .WORD   177777

004536  177777          PAT15:   .WORD   177777          ;PATTERN 15
004540  000000                   .WORD   000000
004542  000000                   .WORD   000000
004544  000000                   .WORD   000000
004546  000000                   .WORD   000000
004550  000000                   .WORD   000000
004552  000000                   .WORD   000000
004554  000000                   .WORD   000000
004556  000000                   .WORD   000000
004560  000000                   .WORD   000000
004562  000000                   .WORD   000000
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    274 004564  000000                          .WORD   000000
    275 004566  000000                          .WORD   000000
    276 004570  000000                          .WORD   000000
    277 004572  000000                          .WORD   000000
    278 004574  000000                          .WORD   000000
```

```
                                        ;THIS ROUTINE HANDLES UNEXPECTED TIMEOUTS

004576  011600                          BADTMO: MOV     (SP),R0         ;SAVE PC WHERE THE TIME OUT OCCURED
004600  005740                                  TST     -(R0)           ;ADJUST PC -2
004602  022626                                  CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
004604  104401  004612                          TYPE    ,65$            ;;TYPE ASCIZ STRING
004610  000417                                  BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <CRLF>/UNEXPECTED BUS TIMEOUT, PC=/
004650                                  64$:
004650  010046                                  MOV     R0,-(SP)        ;SETUP FOR TYPING OUT PC
004652  104402                                  TYPOC
004654  000240                                  NOP                     ;PUT 'HALT(0)' INSTRUCTION HERE IF YOU WISH
                                                                        ;TO STOP ON UNEXPECTED TIMEOUT.
004656  000404                                  BR      START1          ;BRANCH TO START1

                                        .SBTTL  START OF PROGRAM

004660  012737  177777  001324          START3: MOV     #-1,BUSADR      ;GET BUSADR FLAG
004666  000402                                  BR      STRT'A

004670  005037  001324                  START1: CLR     BUSADR          ;CLR BUSADR FLAG
004674  005037  001322                  STRT1A: CLR     CNTRLC          ;NO CONTROL ''C''
004700  000411                                  BR      START

004702  012737  177777  001324          START4: MOV     #-1,BUSADR      ;SET BUSADR FLAG
004710  000402                                  BR      STRT2A

004712  005037  001324                  START2: CLR     BUSADR          ;CLR BUSADR FLAG
004716  012737  177777  001322          STRT2A: MOV     #-1,CNTRLC      ;SET CONTROL ''C'' FLAG

004724  000240                          START:  NOP
004726  005227  000000                          INC     #0              ;TTY LOOP, WAIT FOR INCREMENT
004732  001375                                  BNE     .-4             ;OF WORD
004734  000005                                  RESET                   ;CLEAR THE WORLD

                                        .SBTTL  INITIALIZE THE COMMON TAGS
                                        ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
004736  012706  001114                          MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
004742  005026                                  CLR     (R6)+           ;;CLEAR MEMORY LOCATION
004744  022706  001154                          CMP     #SWR,R6         ;;DONE?
004750  001374                                  BNE     .-6             ;;LOOP BACK IF NO
004752  012706  001100                          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                        ;;INITIALIZE A FEW VECTORS
004756  012737  025356  000020                  MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
004764  012737  000340  000022                  MOV     #340,@#IOTVEC+2 ;;LEVEL 7
004772  012737  021620  000030                  MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
005000  012737  000340  000032                  MOV     #340,@#EMTVEC+2 ;;LEVEL 7
005006  012737  026052  000034                  MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
005014  012737  000340  000036                  MOV     #340,@#TRAPVEC+2;;LEVEL 7
005022  013737  021514  021506                  MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
005030  012737  176543  026524                  MOV     #176543,$HINUM  ;;PRIME THE RANDOM NUMBER GENERATOR
005036  012737  123456  026526                  MOV     #123456,$LONUM  ;;BOTH HIGH AND LOW WORDS
005044  005037  001220                          CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
005050  005037  001222                          CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
005054  112737  000001  001131                  MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
005062  012737  005062  001122                  MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
005070  012737  005070  001124                  MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
```

```
                                        ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                        ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
   005076  013746  000004                       MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
   005102  012737  005136  000004               MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
   005110  012737  177570  001154               MOV     #DSWR,SWR       ;;SETUP FOR A HARDWAPE SWICH REGISTER
   005116  012737  177570  001156               MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
   005124  022777  177777  174022               CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
   005132  001012                               BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                        ;;AND  THE HARDWARE SWR IS NOT - -1
   005134  000403                               BR      65$             ;;BRANCH IF NO TIMEOUT
   005136  012716  005144               64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
   005142  000002                               RTI
   005144  012737  000176  001154       65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
   005152  012737  000174  001156               MOV     #DISPREG,DISPLAY
   005160  012637  000004               66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

   005164  005037  001242                       CLR     $PASS           ;;CLEAR PASS COUNT
   005170  132737  000200  001255               BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
   005176  001403                               BEQ     67$             ;;YES,USE NON-APT SWITCH
   005200  012737  001256  001154               MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
   005206                               67$:
                                        ;SETUP "TIMEOUT" TRAP VECTOR FOR UNEXPECTED BUS TIMEOUTS
   005206  012737  004576  000004               MOV     #BADTMO,ERRVEC  ;SETUP FOR UNEXPECTED TIMEOUT
   005214  012737  000300  000006               MOV     #PR6,ERRVEC+2   ;LEVEL 6


                                        .SBTTL  TYPE PROGRAM NAME
                                        ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
   005222  005227  177777                       INC     #-1             ;;FIRST TIME?
   005226  001034                               BNE     68$             ;;BRANCH IF NO
   005230  022737  021560  000042               CMP     #$ENDAD,@#42    ;;ACT-11?
   005236  001430                               BEQ     68$             ;;BRANCH IF YES
   005240  104401  005246                       TYPE    ,69$            ;;TYPE ASCIZ STRING
   005244  000425                               BR      68$             ;;GET OVER THE ASCIZ
                                        ;;69$:  .ASCIZ  <CRLF>@CZRMVBO - RM05/3/2 EXTENDED DRIVE TEST@<CRLF>
   005320                               68$:
                                        .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
   005320  005737  000042                       TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
   005324  001012                               BNE     70$             ;;BRANCH IF YES
   005326  123727  001254  000001               CMPB    $ENV,#1         ;;ARE WE RUNNING UNDER APT?
   005334  001406                               BEQ     70$             ;;BRANCH IF YES
   005336  023727  001154  000176               CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
   005344  001005                               BNE     71$             ;;BRANCH IF NO
   005346  104406                               GTSWR                   ;;GET SOFT-SWR SETTINGS
   005350  000403                               BR      71$
   005352  112737  000001  001150       70$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
   005360                               71$:

   005360  012700  001174                       MOV     #$REGAD,R0      ;FIRST ADDRESS
   005364  005020                       1$:     CLR     (R0)+           ;CLEAR VARIABLE STORAGE
   005366  022700  001224                       CMP     #$BELL,R0       ;DONE?
   005372  001374                               BNE     1$              ;NO--BRANCH
   005374  013737  001530  001164               MOV     TPS,$TPS        ;SETUP THE STATUS AND BUFFER REG'S
   005402  013737  001532  001166               MOV     TPB,$TPB        ;FOR THE TYPE ROUTINE

                                        ;THE FOLLOWING FINDS OUT THE PROGRAM CONTROL MODE:
                                        ;PAPER TAPE (MANUAL), ACT11, XXDP CHAIN OR DUMP

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```
005410  005037  001470                  CLR     XXDP            ;CLEAR 'XXDP' LOAD DEVICE STORAGE
005414  122737  000016  000041          CMPB    #16,@#41        ;LOADED FROM AN RM05/3/2 ?
005422  001160                          BNE     4$              ;BR IF NOT
005424  013737  000040  001470          MOV     @#40,XXDP       ;GET DEVICE INDICATOR AND NUMBER
005432  122737  000007  001470          CMPB    #7,XXDP         ;IS IT A VALID NUMBER ?
005440  103002                          BHIS    2$              ;YES
005442  105037  001470                  CLRB    XXDP            ;NO, DEFAULT TO DRIVE 0
005446  005737  000042          2$:     TST     @#42            ;CHAIN MODE OR ACT11 AUTO ACCEPT ?
005452  001425                          BEQ     3$              ;BR IF NEITHER
005454  104401  005462                  TYPE    ,73$            ;;TYPE ASCIZ STRING
005460  000412                          BR      72$             ;;GET OVER THE ASCIZ
                                ;;73$:  .ASCIZ  <CRLF>/NOT TESTING DRIVE /
005506                          72$:
005506  005046                          CLR     -(SP)           ;CLEAR WORD ON STACK
005510  113716  001470                  MOVB    XXDP,(SP)       ;GET DRIVE ADDRESS
005514  104403                          TYPOS                   ;TYPE THE ADDRESS
005516     001                          .BYTE   1               ;ONLY 1 CHARACTER
005517     000                          .BYTE   0               ;SUPRESS LEADING ZEROS
005520  104401  001231                  TYPE    ,$CRLF          ;CR-LF
005524  000517                          BR      4$              ;GET NUMBER OF DRIVES

005526  005227  177777          3$:     INC     #-1             ;FIRST TIME THRU HERE ?
005532  001114                          BNE     4$              ;NO
005534  104401  005542                  TYPE    ,75$            ;;TYPE ASCIZ STRING
005540  000410                          BR      74$             ;;GET OVER THE ASCIZ
                                ;;75$:  .ASCIZ  <CRLF>/TO TEST DRIVE /
005562                          74$:
005562  005046                          CLR     -(SP)           ;CLEAR WORD ON STACK
005564  113716  001470                  MOVB    XXDP,(SP)       ;GET DRIVE ADDRESS
005570  104403                          TYPOS                   ;TYPE DRIVE ADDRESS
005572     001                          .BYTE   1               ;ONLY 1 CHARACTER
005573     000                          .BYTE   0               ;SUPRESS LEADING ZEROS
005574  104401  005602                  TYPE    ,77$            ;;TYPE ASCIZ STRING
005600  000431                          BR      76$             ;;GET OVER THE ASCIZ
                                ;;77$:  .ASCIZ  /, HALT PROGRAM, REMOVE RRDP PACK AND REPLACE IT/<CRLF>
005664                          76$:
005664  104401  005672                  TYPE    ,78$            ;;TYPE ASCIZ STRING
005670  000435                          BR      4$              ;;GET OVER THE ASCIZ
                                ;;78$:  .ASCIZ  /WITH A WORK PACK, CLEAR LOCATION 40 AND RESTART PROGRAM./<CRLF>
005764                          4$:
005764  004737  024060                  JSR     PC,$TKINT       ;TURN ON THE TTY KEYBOARD INTERRUPT
005770  005227  177777                  INC     #-1             ;SEE IF FIRST START
005774  001002                          BNE     SRTINT          ;BR IF NOT
005776  004737  046624                  JSR     PC,GETADR       ;GET OR CHECK THE RH/RM ADDRESS

006002  105037  001472          SRTINT: CLRB    ERRCN           ;CLEAR DRV 0 ERROR COUNT
006006  105037  001473                  CLRB    ERRCN+1         ;CLEAR DRV 1 ERROR COUNT
006012  105037  001474                  CLRB    ERRCN+2         ;CLEAR DRV 2 ERROR COUNT
006016  105037  001475                  CLRB    ERRCN+3         ;CLEAR DRV 3 ERROR COUNT
006022  105037  001476                  CLRB    ERRCN+4         ;CLEAR DRV 4 ERROR COUNT
006026  105037  001477                  CLRB    ERRCN+5         ;CLEAR DRV 5 ERROR COUNT
006032  105037  001500                  CLRB    ERRCN+6         ;CLEAR DRV 6 ERROR COUNT
006036  105037  001501                  CLRB    ERRCN+7         ;CLEAR DRV 7 ERROR COUNT
006042  004737  027364                  JSR     PC,LP.AVL       ;CHECK FOR A LINE PRINTER
006046  012737  000001  001120          MOV     #1,$ICNT        ;SET ITERATION COUNT TO 1
006054  004737  035450                  JSR     PC,GETSWR       ;GO CHECK FOR CONTROL SWITCHES

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 006060  004737  027426          SETVEC: JSR     PC,ST.CLK          ;INITIALIZE THE CLOCK
 006064  004737  C40660                  JSR     PC,RMINIT          ;CHECK THE DRIVE STATUS
 006070  012737  177777  040610          MOV     #-1,SAVEFG         ;SET THE SAVE REGISTERS FLAG
 006076  004737  027334                  JSR     PC,CNTCLR          ;GO CLEAR MASSBUS CONTROLLER
 006102  005037  177776                  CLR     PS                 ;ENSURE THE PRIORITY = 0
 006106  005227  177777                  INC     #-1                ;FIRST TIME THRU HERE ?
 006112  001403                          BEQ     1$                 ;BR IF NO
 006114  005737  001322                  TST     CNTRLC             ;CONTROL 'C' SWITCH SET ?
 006120  001105                          BNE     SRTDRV             ;CONTINUE IF YES
 006122  005004                  1$:     CLR     R4                 ;DRIVE TABLE POINTER
 006124  104401  047313                  TYPE    ,UNSTAT            ;TYPE 'UNIT STATUS'
 006130  104401  001231          2$:     TYPE    ,$CRLF             ;CR-LF
 006134  010446                          MOV     R4,-(SP)           ;;SAVE R4 FOR TYPEOUT
                                                                    ;;TYPE DRIVE NUMBER
 006136  104403                          TYPOS                      ;;GO TYPE--OCTAL ASCII
 006140     002                          .BYTE   2                  ;;TYPE 2 DIGIT(S)
 006141     000                          .BYTE   0                  ;;SUPPRESS LEADING ZEROS
 006142  104401  050343                  TYPE    ,BLNKS4            ;TYPE 4 SPACFS
 006146  105764  040532                  TSTB    DRVSTA(R4)         ;CHECK DRIVE'S STATUS
 006152  100416                          BMI     5$                 ;BR IF UNSAFE
 006154  001020                          BNE     6$                 ;BR IF ONLINE
 006156  105764  040542                  TSTB    DRVTYP(R4)         ;SEE IF OFFLINE OR NONEXISTENT
 006162  001404                          BEQ     3$                 ;BR IF NONEXISTENT
 006164  100006                          BPL     4$                 ;BR IF OFFLINE
 006166  104401  047377                  TYPE    ,NOTRM             ;DRIVE NOT AN RM05/3/2
 006172  000452                          BR      11$                ;CHECK NEXT DRIVE

 006174  104401  047352          3$:     TYPE    ,NOTPRS            ;DRIVE NOT PRESENT
 006200  000447                          BR      11$                ;CHECK NEXT DRIVE

 006202  104401  047331          4$:     TYPE    ,UNTOFF            ;DRIVE OFFLINE
 006206  000416                          BR      8$                 ;PRINT DRIVE TYPE

 006210  104401  047367          5$:     TYPE    ,NOTSAF            ;DRIVE UNSAFE
 006214  000413                          BR      8$                 ;PRINT DRIVE TYPE

 006216  005737  001470          6$:     TST     XXDP               ;LOADED FROM THIS DEVICE ?
 006222  001406                          BEQ     7$                 ;BR IF NO
 006224  123704  001470                  CMPB    XXDP,R4            ;LOADED FROM THIS DRIVE ?
 006230  001003                          BNE     7$                 ;BR IF NO
 006232  104401  047420                  TYPE    ,LODEV             ;DRIVE IS LOAD DEVICE
 006236  000430                          BR      11$
 006240  104401  047342          7$:     TYPE    ,UNTON             ;DRIVE ONLINE
 006244  104401  050345          8$:     TYPE    ,BLNKS2            ;TYPE 2 SPACES
 006250  005000                          CLR     R0
 006252  116400  040542                  MOVB    DRVTYP(R4),R0      ;GET DRIVE TYPE
 006256  012737  047445  006316          MOV     #$RM03,10$         ;ASSUME ADDRESS OF RM03 MESSAGE
 006264  122700  000004                  CMPB    #4,R0              ;IS DEVICE AN RM03 ?
 006270  001411                          BEQ     9$                 ;TYPE IT IF YES
 006272  012737  047440  006316          MOV     #$RM02,10$         ;ADDRESS OF RM02 MESSAGE
 006300  122700  000005                  CMPB    #5,R0              ;IS DEVICE AN RM02 ?
 006304  001403                          BEQ     9$                 ;BR IF YES
 006306  012737  047452  006316          MOV     #$RM05,10$         ;ADDRESS OF RM05 MESSAGE

 006314  104401                  9$:     TYPE                       ;TYPE THE DRIVE TYPE MESSAGE
 006316  000000                  10$:    .WORD   0                  ;MESSAGE ADDRESS HERE
```

```
  147 006320  005204                  11$:    INC     R4              ;INCREMENT DRIVE NUMBER/TABLE POINTER
  148 006322  020427  000010                  CMP     R4,#8.          ;FINISHED ?
  149 006326  001300                          BNE     2$              ;BR IF NOT
  150 006330  104401  001231                  TYPE    ,$CRLF          ;CR-LF
```

```
                                                .SBTTL  GET UNIT STATUS

006334  005737  001322          SRTDRV: TST     CNTRLC                  ;CONTROL ''C'' START/RESTART?
006340  001427                          BEQ     2$                      ;NO--BRANCH
006342  013746  001320                  MOV     SAVCSW,-(SP)            ;GET THE PREVIOUS 'C.SWR' CONTENTS
006346  063716  001314                  ADD     C.SWR,(SP)              ;SET UP TO SEE IF 'BIT00' IS DIFFERENT
006352  032726  000001                  BIT     #BIT00,(SP)+            ;IS 'BIT00' DIFFERENT ?
006356  001405                          BEQ     1$                      ;BR IF NOT
006360  013737  001314  001320          MOV     C.SWR,SAVCSW            ;STORE PRESENT 'C.SWR' VALUE
006366  004737  027704                  JSR     PC,LODFLT               ;RESET PARAMETERS TO THEIR DEFAULT VALUES
006372  004737  035700          1$:     JSR     PC,GT.PRM               ;GET PARAMETERS
006376  005737  001332                  TST     TSTNMS                  ;ANY TEST SELECTED THIS CYCLE?
006402  001034                          BNE     6$                      ;BR IF YES
006404  005737  001334                  TST     TSTNMS+2                ;ANY TEST SELECTED THIS CYCLE ?
006410  001031                          BNE     6$                      ;BR IF YES
006412  104401  047727                  TYPE    ,NOTEST                 ;TYPE 'NO TESTS SPECIFIED'
006416  000765                          BR      1$
006420  004737  027704          2$:     JSR     PC,LODFLT               ;SETUP DEFAULT PARAMETERS
006424  005037  001330                  CLR     DRVSEL                  ;NO DRIVES SELECTED
006430  005000                          CLR     R0                      ;DETERMINE THE DRIVES THAT
006432  012701  000001                  MOV     #1,R1                   ;ARE AVAILABLE FOR TESTING

006436  105760  040532          3$:     TSTB    DRVSTA(R0)              ;IS DRIVE ON-LINE ?
006442  003411                          BLE     5$                      ;BR IF NO
006444  005737  001470                  TST     XXDP                    ;LOADED FROM THIS DEVICE ?
006450  001403                          BEQ     4$                      ;BR IF NO
006452  123700  001470                  CMPB    XXDP,R0                 ;LOADED FROM THIS DRIVE ?
006456  001403                          BEQ     5$                      ;BR IF YES
006460  156037  040636  001330  4$:     BISB    ATABIT(R0),DRVSEL       ;YES, SELECT DRIVE FOR TESTING
006466  005200                  5$:     INC     R0                      ;TRY NEXT DRIVE
006470  106301                          ASLB    R1                      ;ANY MORE DRIVES TO CHECK ?
006472  001361                          BNE     3$                      ;BR IF YES

006474  005037  040612          6$:     CLR     SEEKFG                  ;CLEAR SEEK FLAG
006500  032737  000400  001314          BIT     #SW08,C.SWR             ;DO SEEK BEFORE DATA TRANSFER?
006506  001002                          BNE     7$                      ;YES--BRANCH
006510  005137  040612                  COM     SEEKFG                  ;NO
006514                          7$:
006514  104401  047457                  TYPE    ,DRIVES                 ;'DRIVES(S) TO BE TESTED'
006520  005037  021514                  CLR     $ENDCT                  ;DETERMINE PASSES TO MAKE AND
006524  005000                          CLR     R0                      ;THE DRIVES TO BE TESTED
006526  013701  001330                  MOV     DRVSEL,R1               ;ANY DRIVES SELECTED?
006532  001017                          BNE     9$                      ;YES--BRANCH
006534  104401  047510                  TYPE    ,NONE                   ;'NONE'
006540  104401  001231                  TYPE    ,$CRLF                  ;CR-LF
006544  005737  000042                  TST     @#42                    ;ANY MONITOR PRESENT ?
006550  001002                          BNE     8$                      ;BR IF YES
006552  000137  004712                  JMP     START2                  ;RETURN TO '^C' INPUT
006556  005300                  8$:     DEC     R0                      ;THESE TWO LOOPS ARE ADDED TO
006560  001376                          BNE     .-2                     ;WAIT FOR TTY
006562  005300                          DEC     R0
006564  001376                          BNE     .-2
006566  000137  021550                  JMP     $GET42                  ;RETURN CONTROL TO MONITOR

006572  006201                  9$:     ASR     R1                      ,REPORT THE DRIVES TO BE TESTED
006574  103011                          BCC     10$
006576  005237  021514                  INC     $ENDCT                  ;GIVE THIS DRIVE A PASS
```

```
   006602  010046                          MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
   006604  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
   006606     001                          .BYTE   1               ;;TYPE 1 DIGIT(S)
   006607     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
   006610  005701                          TST     R1              ;MORE DRIVES?
   006612  001404                          BEQ     11$             ;NO--BRANCH
   006614  104401  047515                  TYPE    ,COMMA          ;','
   006620  005200                  10$:    INC     R0              ;FORM DRIVE NUMBER
   006622  000763                          BR      9$

   006624  104401  001231          11$:    TYPE    ,$CRLF          ;CR-LF
   006630  013737  021514  021506          MOV     $ENDCT,$EOPCT
   006636  005737  001342                  TST     CLKSTA          ;IS KW11-P AVAILABLE ?
   006642  003006                          BGT     12$             ;BR IF YES
   006644  032737  036000  001332          BIT     #36000,TSTNMS   ;ANY TIMING TESTS TO BE PERFORMED ?
   006652  001402                          BEQ     12$             ;BR IF NO
   006654  104401  047520                  TYPE    ,NOCLOK         ;TYPE NO KW11-P CLOCK MESSAGE
   006660  000414                  12$:    BR      RSTRT1
```

```
                                            .SBTTL  PROGRAM RESTARTS HERE

                                            .ENABL  LSB

006662  005737  001330              RSTART: TST     DRVSEL          ;ANY DRIVES SELECTED ?
006666  001022                              BNE     3$              ;BR IF YES
006670  005737  000042                      TST     @#42            ;ANY MONITOR PRESENT ?
006674  001402                              BEQ     1$              ;BR IF NO
006676  000137  021550                      JMP     $GET42          ;RETURN CONTROL TO MONITOR
006702  104401  047703              1$:     TYPE    ,NODRVS         ;TYPE 'NO DRIVES TO TEST'
006706  000137  004712                      JMP     START2          ;NO--GET DRIVE ENTRY & RESTART AT BEGINNING

006712  005037  001352              RSTRT1: CLR     CHKDRV          ;START WITH DRIVE 0 AGAIN
006716  012737  000001  001354              MOV     #1,DRVMSK
006724  033737  001354  001330      2$:     BIT     DRVMSK,DRVSEL   ;IS THIS DRIVE SELECTED?
006732  001006                              BNE     4$              ;YES--GO CHECK IF DRIVE IS READY FOR TESTING
006734  005237  001352              3$:     INC     CHKDRV          ;MOVE TO NEXT DRIVE NUMBER
006740  106337  001354                      ASLB    DRVMSK          ;DONE TESTING ALL DRIVES ?
006744  103762                              BCS     RSTRT1          ;BR IF YES
006746  000766                              BR      2$              ;NO--CHECK DRIVE SELECT

006750  013702  001352              4$:     MOV     CHKDRV,R2       ;PICKUP THE DRIVE NUMBER
006754  105762  040532                      TSTB    DRVSTA(R2)      ;IS DESIRED DRIVE ON-LINE?
006760  003007                              BGT     5$              ;YES, BRANCH
006762  104011                              EMT     11              ;DRIVE SELECTED IS NOT ONLINE
006764  043737  001354  001330              BIC     DRVMSK,DRVSEL   ;DESELECT DRIVE FROM TEST
006772  005337  021506                      DEC     $EOPCT          ;ADJUST 'EOP' COUNT
006776  000731                              BR      RSTART          ;RETURN

007000  004737  027334              5$:     JSR     PC,CNTCLR       ;GO CLEAR MASSBUS CONTROLLER
007004  005037  177776                      CLR     PS              ;ENSURE THE PRIORITY = 0
007010  010237  047016                      MOV     R2,DPB.A        ;SET THE DRIVE NUMBER INTO THE DPB'S
007014  010237  047036                      MOV     R2,DPB.B
007020  010237  047056                      MOV     R2,DPB.C
007024  010237  047076                      MOV     R2,DTADPB
007030  004737  030336                      JSR     PC,LDCMD        ;LOAD COMMAND INTO DPB.B AND DPB.C
007034  012737  021334  001350              MOV     #$EOP,BYPASS    ;IF ERROR GO TO END OF PROGRAM
007042  112737  000020  047017              MOVB    #20,DPB.A+1     ;ASSUME 16 BIT FORMAT
007050  032737  000001  001314              BIT     #BIT00,C.SWR    ;16 BIT FORMAT REQUESTED ?
007056  001402                              BEQ     6$              ;BR IF YES
007060  105037  047017                      CLRB    DPB.A+1         ;CLEAR THE 'FMT16' BIT
007064  112737  000143  047020      6$:     MOVB    #SETFORM,DPB.A+2        ;SET THE FORMAT BIT PER DPB.A+1
007072  004037  030402                      JSR     R0,CALL.A       ;GO EXECUTE THE COMMAND
007076  112737  000107  047020              MOVB    #RECAL,DPB.A+2  ;RECAL=COMMAND
007104  004037  030402                      JSR     R0,CALL.A       ;GO EXECUTE THE COMMAND
007110  104401  001231                      TYPE    ,$CRLF          ;CR-LF
007114  104401  047625                      TYPE    ,MSDRIV         ;TYPE 'DRIVE '
007120  010246                              MOV     R2,-(SP)        ;;SAVE R2 FOR TYPEOUT
007122  104403                              TYPOS                   ;;GO TYPE--OCTAL ASCII
007124     002                              .BYTE   2               ;;TYPE 2 DIGIT(S)
007125     000                              .BYTE   0               ;;SUPPRESS LEADING ZEROS
007126  104401  047515                      TYPE    ,COMMA          ;TYPE ', '
007132  104401  047605                      TYPE    ,SERIAL         ;TYPE 'MBA SN# '
007136  012700  000004                      MOV     #4,R0           ;FOUR DIGITS TO TYPE
007142  013701  047170                      MOV     RM.REG+30,R1    ;SERIAL NUMBER
007146  005002                      7$:     CLR     R2              ;ZERO
007150  006101                              ROL     R1              ;PUT THE NEXT DIGIT
```

```
007152  006102                          ROL     R2              ;INTO R2
007154  006101                          ROL     R1
007156  006102                          ROL     R2
007160  006101                          ROL     R1
007162  006102                          ROL     R2
007164  006101                          ROL     R1
007166  006102                          ROL     R2
007170  062702  000060                  ADD     #'0,R2          ;MAKE IT ASCII
007174  010227                          MOV     R2,(PC)+        ;SAVE IT
007176  000000                  8$:     .WORD   0
007200  104401  007176                  TYPE    ,8$             ;TYPE
007204  005300                          DEC     R0              ;ALL DIGITS TYPED?
007206  003357                          BGT     7$              ;NO -- BRANCH
007210  104401  001231                  TYPE    ,$CRLF          ;CR-LF
007214  113737  001464  001131          MOVB    ERR.CT,$ERMAX   ;SETUP MAX ERROR COUNT

                                .DSABL  LSB
```

```
                                            ;;//////////////////////////////////////////////////////////////
                                            ;*IN THE DESCRIPTIONS OF THE BELOW TESTS THE VARIABLES USED
                                            ;*AND THEIR DEFAULT VALUES (UNLESS SPECIFIED OTHERWISE) ARE:
                                            ;*
                                            ;*MNEMONIC      VALUE           VARIABLE
                                            ;*---------     -----           --------
                                            ;*
                                            ;*R             1               ITERATIONS (REPEATS)
                                            ;*FC            0               FIRST CYLINDER ADDRESS
                                            ;*LC            822.            LAST CYLINDER ADDRESS
                                            ;*IC            1               INCREMENT VALUE
                                            ;*NC OF NC1     FC+IC           NEW OR MODIFIED CYLINDER
                                            ;*                              ADDRRESS
                                            ;*NC2           LC-IC           NEW OR MODIFIED CYLINDER
                                            ;*                              ADDRESS
                                            ;*
                                            ;*FT            0               FIRST TRACK ADDRESS
                                            ;*LT            4 OR 18.        LAST TRACK ADDRESS
                                            ;*IT            1               INCREMENT VALUE
                                            ;*NT            FT+IT           NEW OR MODIFIED TRACK ADDRESS
                                            ;*
                                            ;*FS            0               FIRST SECTOR ADDRESS
                                            ;*LS            31.             LAST SECTOR ADDRESS
                                            ;*
                                            ;;//////////////////////////////////////////////////////////////

                                            .SBTTL  SEEK TESTS

                                            ;;//////////////////////////////////////////////////////////////
                                            ;*THE SEEK TESTS WILL BE EXCUTED USING IMPLIED SEEKS. THESE
                                            ;*IMPLIED SEEKS WILL BE PERFORMED BY 'READ HEADER AND DATA''
                                            ;*COMMANDS TO TRACK 'FT'' SECTOR 'FS'' OF THE DESIRED CYLINDER.
                                            ;*THE WORD COUNT WILL BE SET SUCH THAT ONLY THE CYLINDER AND
                                            ;*TRACK/SECTOR WORDS OF THE HEADER ARE READ.
                                            ;;//////////////////////////////////////////////////////////////


                                            ;;**************************************************************
                                            ;*TEST 0        RECAL/RANDOM SEEK TEST
                                            ;*THIS TEST WILL CAUSE THE DRIVE TO EXECUTE A RECALIBRATE COMMAND
                                            ;*AND THEN SEEK TO A  RANDOM  CYLINDER BETWEEN 'FC'' AND 'LC''.  AT
                                            ;*THE COMPLETION OF BOTH COMMANDS,  STATUS INDICATORS ARE CHECKED
                                            ;*TO ENSURE THAT NO ERRORS OCCURRED.
                                            ;;**************************************************************
      007222                                TST0:
      007222  000240                                NOP
      007224  033737  001540  001332                BIT     BITS+<0*2>,TSTNMS       ;DO THIS TEST?
      007232  001002                                BNE     .+6             ;BR IF YES
      007234  000137  007464                        JMP     TST1            ;NO--JUMP TO TEST1

      007240  012737  000000  001116                MOV     #0,$TSTNM       ;SET TEST #0 AND CLEAR ($ERFLG)
      007246  004737  030142                        JSR     PC,LODPRM       ;LOAD THE PARMETERS FOR THE TEST
      007252  012737  007372  001124                MOV     #TEST0,$LPERR   ;SETUP THE LOOP ON ERROR ADDRESS
      007260  013737  002336  001220                MOV     RPT,$TIMES      ;GET THE ITERATION COUNT
      007266  112737  000031  001131                MOVB    #25.,$ERMAX     ;MAX ERRORS ALLOWED FOR TEST
      007274  012737  000000  001240                MOV     #0,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
      007302  032777  010000  171644            BIT     #SW12,@SWR        ;INHIBIT TYPING TEST NUMBER ?
      007310  001406                            BEQ     .+16              ;BR IF YES
      007312  104401  047617                    TYPE    ,MSGTST           ;TYPE 'TEST'
      007316  013746  001240                    MOV     $TESTN,-(SP)      ;;SAVE $TESTN FOR TYPEOUT
      007322  104403                            TYPOS                     ;;GO TYPE--OCTAL ASCII
      007324     002                            .BYTE   2                 ;;TYPE 2 DIGIT(S)
      007325     000                            .BYTE   0                 ;;SUPPRESS LEADING ZEROS

      007326  112737  000107  047020            MOVB    #RECAL,DPB.A+2    ;RECAL=COMMAND
      007334  113737  002354  047046            MOVB    FS,DPB.B+10       ;FS
      007342  113737  002346  047047            MOVB    FT,DPB.B+11       ;FT
      007350  013737  002342  047050            MOV     LC,DPB.B+12       ;LC
      007356  012737  007462  001350            MOV     #EXITO,BYPASS     ;GO TO EXITO ON ERROR
      007364  012737  007372  001122            MOV     #TESTO,$LPADR     ;SETUP LOOP ADDRESS
      007372                            TESTO:
      007372  012706  001100                    MOV     #STACK,SP         ;SET UP STACK POINTER
      007376  004037  030402                    JSR     R0,CALL.A         ;GO EXECUTE THE COMMAND
      007402  013737  002340  047050            MOV     FC,DPB.B+12       ;INITIAL CYLINDER ADDRESS
      007410  023737  002340  002342            CMP     FC,LC             ;CYLINDER LIMITS THE SAME ?
      007416  001417                            BEQ     1$                ;BR IF THEY ARE
      007420  004737  026426                    JSR     PC,$RAND          ;CYCYLE THE RANDOM NUMBER GENERATOR
      007424  013746  026524                    MOV     $HINUM,-(SP)      ;USE THE HIGH RANDOM NUMBER
      007430  005046                            CLR     -(SP)             ;UPPER DIVIDEND
      007432  013746  002342                    MOV     LC,-(SP)          ;FORM THE DIVISOR
      007436  005216                            INC     (SP)              ;INCREMENT
      007440  163716  002340                    SUB     FC,(SP)           ;SUBTRACT THE LOWER LIMIT
      007444  004737  026530                    JSR     PC,$DIV           ;DIVIDE
      007450  062637  047050                    ADD     (SP)+,DPB.B+12    ;ADD THE REMAINDER TO THE INITIAL CYLINDER
      007454  005726                            TST     (SP)+             ;DISCARD THE QUOTENT
      007456                            1$:
      007456  004037  030550                    JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
      007462  000004                    EXITO:  SCOPE                     ;CALL SCOPE ROUTINE



                                        ;;*****************************************************************
                                        ;;*TEST 1        SEEK/SEEK TEST
                                        ;;*THIS TEST WILL CAUSE THE DRIVE TO EXECUTE A FORWARD SEEK
                                        ;;*CYCLE TO 'LC', 'LT', 'LS' FOLLOWED BY A REVERSE SEEK CYCLE TO
                                        ;;*'FC', 'FT', 'FS'.  AT THE COMPLETION OF EACH SEEK, THE PROPER
                                        ;;*INDICATORS ARE EXAMINED TO ENSURE PROPER OPERATION.
                                        ;;*****************************************************************
      007464                            TST1:
      007464  000240                            NOP
      007466  033737  001542  001332            BIT     BITS+<1*2>,TSTNMS       ;DO THIS TEST?
      007474  001002                            BNE     .+6               ;BR IF YES
      007476  000137  007672                    JMP     TST2              ;NO--JUMP TO TEST2

      007502  012737  000001  001116            MOV     #1,$TSTNM         ;SET TEST #1 AND CLEAR ($ERFLG)
      007510  004737  030142                    JSR     PC,LODPRM         ;LOAD THE PARMETERS FOR THE TEST
      007514  012737  007654  001124            MOV     #TEST1,$LPERR     ;SETUP THE LOOP ON ERROR ADDRESS
      007522  013737  002336  001220            MOV     RPT,$TIMES        ;GET THE ITERATION COUNT
      007530  112737  000031  001131            MOVB    #25.,$ERMAX       ;MAX ERRORS ALLOWED FOR TEST
      007536  012737  000001  001240            MOV     #1,$TESTN         ;;SET TEST NUMBER IN APT MAIL BOX

      007544  032777  010000  171402            BIT     #SW12,@SWR        ;INHIBIT TYPING TEST NUMBER ?
      007552  001406                            BEQ     .+16              ;BR IF YES
      007554  104401  047617                    TYPE    ,MSGTST           ;TYPE 'TEST'
```

```
007560  013746  001240                    MOV     $TESTN,-(SP)     ;;SAVE $TESTN FOR TYPEOUT
007564  104403                            TYPOS                    ;;GO TYPE--OCTAL ASCII
007566     002                            .BYTE   2                ;;TYPE 2 DIGIT(S)
007567     000                            .BYTE   0                ;;SUPPRESS LEADING ZEROS

007570  005037  001466                    CLR     BASFLG           ;CLEAR BAD SECTOR ENCOUNTER FOR THE DRIVE
007574  113737  002354  047046            MOVB    FS,DPB.B+10      ;FS
007602  113737  002356  047066            MOVB    LS,DPB.C+10      ;LS
007610  113737  002346  047047            MOVB    FT,DPB.B+11      ;FT
007616  113737  002350  047067            MOVB    LT,DPB.C+11      ;LT
007624  013737  002340  047050            MOV     FC,DPB.B+12      ;FC
007632  013737  002342  047070            MOV     LC,DPB.C+12      ;LC
007640  012737  007670  001350            MOV     #EXIT1,BYPASS    ;GO TO EXIT1 ON ERROR
007646  012737  007654  001122            MOV     #TEST1,$LPADR    ;SETUP LOOP ADDRESS
007654                            TEST1:
007654  012706  001100                    MOV     #STACK,SP        ;SET THE STACK POINTER
007660  004037  030766                    JSR     R0,CALL.C        ;GO EXECUTE THE COMMAND
007664  004037  030550                    JSR     R0,CALL.B        ;GO EXECUTE THE COMMAND
007670  000004                    EXIT1:  SCOPE                    ;CALL SCOPE ROUTINE



                                  ;;*************************************************************
                                  ;*TEST 2        INCREMENT/SEEK TEST
                                  ;*THIS TEST WILL COMMAND FORWARD SEEK CYCLES TO ADVANCE THE
                                  ;*CYLINDER ADDRESS FROM "FC" TO "LC" BY THE INCREMENT "IC".
                                  ;*WHEN THE RESULTANT CYLINDER ADDRESS (NC) EXCEEDS
                                  ;*"LC" REVERSE SEEK CYCLES ARE INITIATED; STARTING
                                  ;*AT THE LAST LEGAL "NC" AND DECREMENTING BY "IC"
                                  ;*UNTIL "NC" IS LESS THAN "FC". AT THE COMPLETION OF EACH
                                  ;*SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO
                                  ;*ENSURE PROPER OPERATION.
                                  ;;*************************************************************
007672                            TST2:
007672  000240                            NOP
007674  033737  001544  001332            BIT     BITS+<2*2>,TSTNMS      ;DO THIS TEST?
007702  001002                            BNE     .+6              ;BR IF YES
007704  000137  010134                    JMP     TST3             ;NO--JUMP TO TEST3

007710  012737  000002  001116            MOV     #2,$TSTNM        ;SET TEST #2 AND CLEAR ($ERFLG)
007716  004737  030142                    JSR     PC,LODPRM        ;LOAD THE PARMETERS FOR THE TEST
007722  012737  010026  001124            MOV     #TEST2,$LPERR    ;SETUP THE LOOP ON ERROR ADDRESS
007730  013737  002336  001220            MOV     RPT,$TIMES       ;GET THE ITERATION COUNT
007736  112737  000031  001131            MOVB    #25.,$ERMAX      ;MAX ERRORS ALLOWED FOR TEST
007744  012737  000002  001240            MOV     #2,$TESTN        ;;SET TEST NUMBER IN APT MAIL BOX

007752  032777  010000  171174            BIT     #SW12,@SWR       ;INHIBIT TYPING TEST NUMBER ?
007760  001406                            BEQ     .+16             ;BR IF YES
007762  104401  047617                    TYPE    ,MSGTST          ;TYPE 'TEST'
007766  013746  001240                    MOV     $TESTN,-(SP)     ;;SAVE $TESTN FOR TYPEOUT
007772  104403                            TYPOS                    ;;GO TYPE--OCTAL ASCII
007774     002                            .BYTE   2                ;;TYPE 2 DIGIT(S)
007775     000                            .BYTE   0                ;;SUPPRESS LEADING ZEROS

007776  012737  010004  001122            MOV     #1$,$LPADR       ;SETUP LOOP ADDRESS
010004  113737  002354  047046    1$:     MOVB    FS,DPB.B+10      ;FS
010012  113737  002346  047047            MOVB    FT,DPB.B+11      ;FT
010020  012737  010132  001350            MOV     #EXIT2,BYPASS    ;GO TO EXIT2 ON ERROR
```

```
         010026                                    TEST2:
    118  010026  013737  002340  047050                    MOV     FC,DPB.B+12       ;FC
    119  010034  012737  010034  001124                    MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
         010042  012706  001100                            MOV     #STACK,SP         ;LOAD THE STACK POINTER
    120  010046                                    INCSK:
    121  010046  004037  030550                            JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
    122  010052  063737  002344  047050                    ADD     IC,DPB.B+12       ;MOVE TO NEXT CYLINDER
    123  010060  023737  002342  047050                    CMP     LC,DPB.B+12       ;OUT OF CYLINDERS?
    124  010066  002367                                    BGE     INCSK             ;NO--BRANCH
    125  010070  013737  002342  047050                    MOV     LC,DPB.B+12
    126  010076  012737  010076  001124                    MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
         010104  012706  001100                            MOV     #STACK,SP         ;LOAD THE STACK POINTER
    127  010110                                    DECSK:
    128  010110  004037  030550                            JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
    129  010114  163737  002344  047050                    SUB     IC,DPB.B+12
    130  010122  023737  002340  047050                    CMP     FC,DPB.B+12
    131  010130  003767                                    BLE     DECSK
    132  010132  000004                            EXIT2:  SCOPE                     ;CALL SCOPE ROUTINE
    133
    140
    141                                            ;;*************************************************************
                                                   ;;*TEST 3         STEPPING SEEK TEST
                                                   ;;*THIS TEST WILL COMMAND SEEK CYCLES TO CYLINDER 0, 1, 2, 4,
                                                   ;;*8, 16, 32, 64, 128, 256 AND 512. AT THE COMPLETION OF EACH
                                                   ;;*SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO ENSURE
                                                   ;;*PROPER OPERATION.
                                                   ;;*************************************************************
         010134                                    TST3:
         010134  000240                                    NOP
         010136  033737  001546  001332                    BIT     BITS+<3*2>,TSTNMS        ;DO THIS TEST?
         010144  001002                                    BNE     .+6               ;BR IF YES
         010146  000137  010354                            JMP     TST4              ;NO--JUMP TO TEST4

         010152  012737  000003  001116                    MOV     #3,$TSTNM         ;SET TEST #3 AND CLEAR ($ERFLG)
         010160  004737  030142                            JSR     PC,LODPRM         ;LOAD THE PARMETERS FOR THE TEST
         010164  012737  010270  001124                    MOV     #TEST3,$LPERR     ;SETUP THE LOOP ON ERROR ADDRESS
         010172  013737  002336  001220                    MOV     RPT,$TIMES        ;GET THE ITERATION COUNT
         010200  112737  000031  001131                    MOVB    #25.,$ERMAX       ;MAX ERRORS ALLOWED FOR TEST
         010206  012737  000003  001240                    MOV     #3,$TESTN         ;;SET TEST NUMBER IN APT MAIL BOX
    142
         010214  032777  010000  170732                    BIT     #SW12,@SWR        ;INHIBIT TYPING TEST NUMBER ?
         010222  001406                                    BEQ     .+16              ;BR IF YES
         010224  104401  047617                            TYPE    ,MSGTST           ;TYPE 'TEST'
         010230  013746  001240                            MOV     $TESTN,-(SP)      ;;SAVE $TESTN FOR TYPEOUT
         010234  104403                                    TYPOS                     ;;GO TYPE--OCTAL ASCII
         010236     002                                    .BYTE   2                 ;;TYPE 2 DIGIT(S)
         010237     000                                    .BYTE   0                 ;;SUPPRESS LEADING ZEROS

    143  010240  012737  010246  001122                    MOV     #1$,$LPADR        ;SETUP TEST LOOP ADDRESS
    144  010246  113737  002354  047046            1$:     MOVB    FS,DPB.B+10       ;FS
    145  010254  113737  002346  047047                    MOVB    FT,DPB.B+11       ;FT
    149  010262  012737  010352  001350                    MOV     #EXIT3,BYPASS     ;GO TO BYPASS ON ERROR
         010270                                    TEST3:
    150  010270  013737  002340  047050                    MOV     FC,DPB.B+12       ;FC
    151  010276  012737  010276  001124                    MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
         010304  012706  001100                            MOV     #STACK,SP         ;LOAD THE STACK POINTER
    152  010310  004037  030550                            JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
    010314  013701  002344                   MOV     IC,R1             ;CYLINDER 1
    010320  012737  010320  001124           MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
    010326  012706  001100                   MOV     #STACK,SP         ;LOAD THE STACK POINTER
    010332  010137  047050          1$:      MOV     R1,DPB.B+12       ;DESIRED CYLINDER
    010336  004037  030550                   JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
    010342  006301                           ASL     R1                ;MOVE TO NEXT CYLINDER
    010344  020137  002342                   CMP     R1,LC             ;DONE?
    010350  003770                           BLE     1$                ;NO--LOOP
    010352  000004                  EXIT3:   SCOPE                     ;CALL SCOPE ROUTINE



                                    ;;*****************************************************************
                                    ;*TEST 4         OSCILLATING SEEK TEST
                                    ;*THIS TEST WILL COMMAND SEEK CYCLES FROM ''FC'' TO ''NC'' AND BACK
                                    ;*TO ''FC''.  ''NC'' STARTS AT ''FC'' AND INCREMENTS BY ''IC'' UP TO CYLINDER
                                    ;*''LC'', THEN IS DECREMENTED BY ''IC'' BACK TO CYLINDER ''FC''.  AT THE
                                    ;*COMPLETION OF EVERY SEEK COMMAND THE PROPER INDICATORS ARE
                                    ;*EXAMINED TO ENSURE PROPER OPERATION.
                                    ;;*****************************************************************
    010354                          TST4:
    010354  000240                           NOP
    010356  033737  001550  001332           BIT     BITS+<4*2>,TSTNMS       ;DO THIS TEST?
    010364  001002                           BNE     .+6               ;BR IF YES
    010366  000137  010766                   JMP     TST5              ;NO--JUMP TO TEST5

    010372  012737  000004  001116           MOV     #4,$TSTNM         ;SET TEST #4 AND CLEAR ($ERFLG)
    010400  004737  030142                   JSR     PC,LODPRM         ;LOAD THE PARMETERS FOR THE TEST
    010404  012737  010524  001124           MOV     #TEST4,$LPERR     ;SETUP THE LOOP ON ERROR ADDRESS
    010412  013737  002336  001220           MOV     RPT,$TIMES        ;GET THE ITERATION COUNT
    010420  112737  000031  001131           MOVB    #25.,$ERMAX       ;MAX ERRORS ALLOWED FOR TEST
    010426  012737  000004  001240           MOV     #4,$TESTN         ;,SET TEST NUMBER IN APT MAIL BOX

    010434  032777  010000  170512           BIT     #SW12,@SWR        ;INHIBIT TYPING TEST NUMBER ?
    010442  001406                           BEQ     .+16              ;BR IF YES
    010444  104401  047617                   TYPE    ,MSGTST           ;TYPE 'TEST'
    010450  013746  001240                   MOV     $TESTN,-(SP)      ;;SAVE $TESTN FOR TYPEOUT
    010454  104403                           TYPOS                     ;;GO TYPE--OCTAL ASCII
    010456     002                           .BYTE   2                 ;;TYPE 2 DIGIT(S)
    010457     000                           .BYTE   0                 ;;SUPPRESS LEADING ZEROS

    010460  012737  010466  001122           MOV     #1$,$LPADR        ;SETUP LOOP ADDRESS
    010466  113737  002354  047046  1$:      MOVB    FS,DPB.B+10       ;FS
    010474  113737  002346  047047           MOVB    FT,DPB.B+11       ;FT
    010502  012737  010764  001350           MOV     #EXIT4,BYPASS     ;GO TO EXIT4 ON ERROR
    010510  005002                           CLR     R2                ;CLEAR STALL SWITCH (NO STALL)
    010512  032737  010000  001314           BIT     #SW12,C.SWR       ;STALL REQUIRED?
    010520  001401                           BEQ     TEST4             ;NO--BRANCH
    010522  005102                           COM     R2                ;YES--SET SWITCH
    010524                          TEST4:
    010524  013701  002340                   MOV     FC,R1             ;SET NC TO FC
    010530  005037  001436                   CLR     STALL0  ;START AT ZERO IF STALLS REQUIRED
    010534  012737  010534  001124           MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
    010542  012706  001100                   MOV     #STACK,SP         ;LOAD THE STACK POINTER
    010546  010137  047050          1$:      MOV     R1,DPB.B+12       ;NC
    010552  004037  030550                   JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
    010556  005702                           TST     R2                ;STALL?
    010560  001403                           BEQ     2$                ;NO--BRANCH
```

```
010562  004037  032326                  JSR     R0,STALL          ;YES-GO TO STALL ROUTINE
010566  001436                          .WORD   STALL0            ;TIME POINTER
010570  013737  002340  047050  2$:     MOV     FC,DPB.B+12       ;FC
010576  004037  030550                  JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
010602  005702                          TST     R2                ;STALL?
010604  001413                          BEQ     3$                ;NO--BRANCH
010606  004037  032326                  JSR     R0,STALL          ;YES--GO TO STALL ROUTINE
010612  001436                          .WORD   STALL0            ;TIME POINTER
010614  005237  001436                  INC     STALL0  ;UPDATE THE TIME
010620  023737  001462  001436          CMP     MXSTAL,STALL0     ;TIME TO BIG?
010626  003347                          BGT     1$                ;NO--BRANCH
010630  005037  001436                  CLR     STALL0  ;YES--START OVER AT ZERO
010634  063701  002344          3$:     ADD     IC,R1             ;MOVE TO NEXT CYLINDER
010640  020137  002342                  CMP     R1,LC             ;LAST CYLINDER COMPLETED?
010644  003740                          BLE     1$                ;NO--BRANCH
010646  013701  002342                  MOV     LC,R1             ;SET NC TO LC
010652  012737  010652  001124          MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
010660  012706  001100                  MOV     #STACK,SP         ;LOAD THE STACK POINTER
010664  010137  047050          4$:     MOV     R1,DPB.B+12       ;NC
010670  004037  030550                  JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
010674  005702                          TST     R2                ;STALL?
010676  001403                          BEQ     5$                ;NO--BRANCH
010700  004037  032326                  JSR     R0,STALL          ;YES--GO TO STALL ROUTINE
010704  001436                          .WORD   STALL0            ;TIME POINTER
010706  013737  002342  047050  5$:     MOV     LC,DPB.B+12       ;LC
010714  004037  030550                  JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
010720  005702                          TST     R2                ;STALL?
010722  001413                          BEQ     6$                ;NO--BRANCH
010724  004037  032326                  JSR     R0,STALL          ;YES--GO TO STALL ROUTINE
010730  001436                          .WORD   STALL0            ;TIME POINTER
010732  005237  001436                  INC     STALL0  ;UPDATE STALL TIME
010736  023737  001462  001436          CMP     MXSTAL,STALL0     ;TIME TOO BIG?
010744  003347                          BGT     4$                ;NO--BRANCH
010746  005037  001436                  CLR     STALL0  ;YES--SET STALL TIME BACK TO ZERO
010752  163701  002344          6$:     SUB     IC,R1             ;NEXT CYLINDER
010756  020137  002340                  CMP     R1,FC             ;DONE?
010762  002340                          BGE     4$                ;NO--BRANCH
010764  000004                  EXIT4:  SCOPE                     ;CALL SCOPE ROUTINE



                                ;;*************************************************************
                                ;*TEST 5          CONVERGING/DIVERGING SEEK TEST
                                ;*THIS TEST WILL CAUSE THE DRIVE TO EXECUTE FORWARD AND REVERSE
                                ;*SEEKS FROM 'NC1'' AND 'NC2'' RESPECTIVELY. 'NC1'' WILL BE INCREMENTED
                                ;*BY ''IC'' AND 'NC2'' WILL BE DECREMENTED BY ''IC'' UNTIL 'NC1'' IS
                                ;*GREATER THAN THE INITIAL VALUE OF 'NC2'' AND 'NC2'' IS
                                ;*LESS THAN THE INITIAL VALUE OF 'NC1''.  AT THE COMPLETION OF
                                ;*EACH SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO
                                ;*ENSURE PROPER OPERATION.  'NC1'' AND 'NC2'' DEFAULT TO
                                ;*'FC'' AND 'LC'' RESPECTIVELY.
                                ;;*************************************************************
010766                          TST5:
010766  000240                          NOP
010770  033737  001552  001332          BIT     BITS+<5*2>,TSTNMS       ;DO THIS TEST?
010776  001002                          BNE     .+6               ;BR IF YES
011000  000137  011212                  JMP     TST6              ;NO--JUMP TO TEST6
```

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    011004  012737  000005  001116           MOV     #5,$TSTNM         ;SET TEST #5 AND CLEAR ($ERFLG)
    011012  004737  030142                   JSR     PC,LODPRM         ;LOAD THE PARMETERS FOR THE TEST
    011016  012737  011122  001124           MOV     #TEST5,$LPERR     ;SETUP THE LOOP ON ERROR ADDRESS
    011024  013737  002336  001220           MOV     RPT,$TIMES        ;GET THE ITERATION COUNT
    011032  112737  000031  001131           MOVB    #25.,$ERMAX       ;MAX ERRORS ALLOWED FOR TEST
    011040  012737  000005  001240           MOV     #5,$TESTN         ;;SET TEST NUMBER IN APT MAIL BOX

    011046  032777  010000  170100           BIT     #SW12,@SWR        ;INHIBIT TYPING TEST NUMBER ?
    011054  001406                           BEQ     .+16              ;BR IF YES
    011056  104401  047617                   TYPE    ,MSGTST           ;TYPE 'TEST'
    011062  013746  001240                   MOV     $TESTN,-(SP)      ;;SAVE $TESTN FOR TYPEOUT
    011066  104403                           TYPOS                     ;;GO TYPE--OCTAL ASCII
    011070     002                           .BYTE   2                 ;;TYPE 2 DIGIT(S)
    011071     000                           .BYTE   0                 ;;SUPPRESS LEADING ZEROS

    011072  012737  011100  001122           MOV     #1$,$LPADR        ;SETUP LOOP ADDRESS
    011100  113737  002354  047046   1$:     MOVB    FS,DPB.B+10       ;FS
    011106  113737  002346  047047           MOVB    FT,DPB.B+11       ;FT
    011114  012737  011210  001350           MOV     #EXIT5,BYPASS     ;GO TO EXIT5 ON ERROR
    011122                           TEST5:
    011122  013701  002340                   MOV     FC,R1             ;START NC1 AT FC
    011126  013702  002342                   MOV     LC,R2             ;START NC2 AT LC
    011132  012737  011132  001124           MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
    011140  012706  001100                   MOV     #STACK,SP         ;LOAD THE STACK POINTER
    011144  010137  047050           1$:     MOV     R1,DPB.B+12       ;NC1
    011150  004037  030550                   JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
    011154  010237  047050                   MOV     R2,DPB.B+12       ;NC2
    011160  004037  030550                   JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
    011164  063701  002344                   ADD     IC,R1             ;NEXT NC1
    011170  163702  002344                   SUB     IC,R2             ;NEXT NC2
    011174  020137  002342                   CMP     R1,LC             ;DONE?
    011200  003003                           BGT     EXIT5             ;YES--BRANCH
    011202  020237  002340                   CMP     R2,FC    ;?
    011206  002356                           BGE     1$                ;NO--BRANCH
    011210  000004                   EXIT5:  SCOPE                     ;CALL SCOPE ROUTINE



                                     ;;*****************************************************************
                                     ;;*TEST 6        SERVO ADDRESSING LOGIC NOISE GENERATOR
                                     ;;*IN THIS TEST A SEEK IS DONE TO CYL "NC" THEN A SEEK TO
                                     ;;*NC+4 THEN NC+1 THEN NC+3 THEN NC+2 THEN NC+5.  NOW "NC" IS UPDATED
                                     ;;*BY "IC" AND THE ABOVE SEQUENCE IS REPEATED UNITL "LC" IS
                                     ;;*EXCEEDED BY ANY OF THE ABOVE VALUES.  THE INITIAL VALUE OF "NC"
                                     ;;*IS "FC".  AT THE COMPLETION OF EACH SEEK COMMAND THE
                                     ;;*PROPER INDICATORS ARE EXAMINED TO ENSURE PROPER OPERATION.
                                     ;;*****************************************************************
    011212                           TST6:
    011212  000240                           NOP
    011214  033737  001554  001332           BIT     BITS+<6*2>,TSTNMS       ;DO THIS TEST?
    011222  001002                           BNE     .+6               ;BR IF YES
    011224  000137  011502                   JMP     TST7              ;NO--JUMP TO TEST7

    011230  012737  000006  001116           MOV     #6,$TSTNM         ;SET TEST #6 AND CLEAR ($ERFLG)
    011236  004737  030142                   JSR     PC,LODPRM         ;LOAD THE PARMETERS FOR THE TEST
    011242  012737  011346  001124           MOV     #TEST6,$LPERR     ;SETUP THE LOOP ON ERROR ADDRESS
    011250  013737  002336  001220           MOV     RPT,$TIMES        ;GET THE ITERATION COUNT
    011256  112737  000031  001131           MOVB    #25.,$ERMAX       ;MAX ERRORS ALLOWED FOR TEST
    011264  012737  000006  001240            MOV     #6,$TESTN          ;;SET TEST NUMBER IN APT MAIL BOX

    011272  032777  010000  167654            BIT     #SW12,@SWR         ;INHIBIT TYPING TEST NUMBER ?
    011300  001406                            BEQ     .+16               ;BR IF YES
    011302  104401  047617                    TYPE    ,MSGTST            ;TYPE 'TEST'
    011306  013746  001240                    MOV     $TESTN,-(SP)       ;;SAVE $TESTN FOR TYPEOUT
    011312  104403                            TYPOS                      ;;GO TYPE--OCTAL ASCII
    011314     002                            .BYTE   2                  ;;TYPE 2 DIGIT(S)
    011315     000                            .BYTE   0                  ;;SUPPRESS LEADING ZEROS

    011316  012737  011324  001122            MOV     #1$,$LPADR         ;SETUP LOOP ADDRESS
    011324  113737  002354  047046    1$:     MOVB    FS,DPB.B+10        ;FS
    011332  113737  002346  047047            MOVB    FT,DPB.B+11        ;FT
    011340  012737  011500  001350            MOV     #EXIT6,BYPASS      ;GO TO EXIT6 ON ERROR
    011346                            TEST6:
    011346  013701  002340                    MOV     FC,R1              ;PICKUP "FC"
    011352  013702  002342                    MOV     LC,R2              ;FORM LAST CYLINDER THAT
    011356  162702  000005                    SUB     #5,R2              ;IS AVAILABLE FOR TESTING
    011362  012737  011362  001124            MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
    011370  012706  001100                    MOV     #STACK,SP          ;LOAD THE STACK POINTER
    011374  020102                    1$:     CMP     R1,R2              ;LAST CYLINDER
    011376  003040                            BGT     EXIT6              ;YES--BRANCH
    011400  010137  047050                    MOV     R1,DPB.B+12        ;NC
    011404  004037  030550                    JSR     R0,CALL.B          ;GO EXECUTE THE COMMAND
    011410  062737  000004  047050            ADD     #4,DPB.B+12        ;NC+4
    011416  004037  030550                    JSR     R0,CALL.B          ;GO EXECUTE THE COMMAND
    011422  162737  000003  047050            SUB     #3,DPB.B+12        ;NC+1
    011430  004037  030550                    JSR     R0,CALL.B          ;GO EXECUTE THE COMMAND
    011434  062737  000002  047050            ADD     #2,DPB.B+12        ;NC+3
    011442  004037  030550                    JSR     R0,CALL.B          ;GO EXECUTE THE COMMAND
    011446  162737  000001  047050            SUB     #1,DPB.B+12        ;NC+2
    011454  004037  030550                    JSR     R0,CALL.B          ;GO EXECUTE THE COMMAND
    011460  062737  000003  047050            ADD     #3,DPB.B+12        ;NC+5
    011466  004037  030550                    JSR     R0,CALL.B          ;GO EXECUTE THE COMMAND
    011472  063701  002344                    ADD     IC,R1
    011476  000736                            BR      1$
    011500  000004                    EXIT6:  SCOPE                      ;CALL SCOPE ROUTINE



                                      ;;*******************************************************************
                                      ;*TEST 7        RANDOM SEEK TEST
                                      ;*THIS TEST PERFORMS RANDOM SEEK OPERATIONS BETWEEN CYLINDERS 'FC'
                                      ;*'LC'.  AFTER EACH SEEK, THE POSITION OF THE DRIVE IS VERIFIED BY
                                      ;*READING A SECTOR FROM THE CURRENTLY ADDRESSED CYLINDER AND TRACK.
                                      ;*THE TRACK ADDRESS IS INCREMENTED FOR EACH SEEK SO THAT VERIFICATION
                                      ;*OF POSITIONING OCCURS USING EACH HEAD.  TRACK ADDRESSES ARE INCREMENTED
                                      ;*BETWEEN PARAMTERS 'FT' AND 'LT'.
                                      ;;*******************************************************************
    011502                            TST7:
    011502  000240                            NOP
    011504  033737  001556  001332            BIT     BITS+<7*2>,TSTNMS       ;DO THIS TEST?
    011512  001002                            BNE     .+6                ;BR IF YES
    011514  000137  012100                    JMP     TST10              ;NO--JUMP TO TEST10

    011520  012737  000007  001116            MOV     #7,$TSTNM          ;SET TEST #7 AND CLEAR ($ERFLG)
    011526  004737  030142                    JSR     PC,LODPRM          ;LOAD THE PARMETERS FOR THE TEST
    011532  012737  011642  001124            MOV     #TEST7,$LPERR      ;SETUP THE LOOP ON ERROR ADDRESS
```

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        011540  013737  002336  001220              MOV     RPT,$TIMES         ;GET THE ITERATION COUNT
        011546  112737  000031  001131              MOVB    #25.,$ERMAX        ;MAX ERRORS ALLOWED FOR TEST
        011554  012737  000007  001240              MOV     #7,$TESTN          ;;SET TEST NUMBER IN APT MAIL BOX
    317
        011562  032777  010000  167364              BIT     #SW12,@SWR         ;INHIBIT TYPING TEST NUMBER ?
        011570  001406                              BEQ     .+16               ;BR IF YES
        011572  104401  047617                      TYPE    ,MSGTST            ;TYPE 'TEST'
        011576  013746  001240                      MOV     $TESTN,-(SP)       ;;SAVE $TESTN FOR TYPEOUT
        011602  104403                              TYPOS                      ;;GO TYPE--OCTAL ASCII
        011604     002                              .BYTE   2                  ;;TYPE 2 DIGIT(S)
        011605     000                              .BYTE   0                  ;;SUPPRESS LEADING ZEROS

    318 011606  113737  002346  047047              MOVB    FT,DPB.B+11        ;LOAD STARTING TRACK ADDRESS
    319 011614  112737  000105  047020              MOVB    #SEEK,DPB.A+2      ;SEEK=COMMAND
    320 011622  013704  040650                      MOV     RMADR,R4           ;UNIBUS ADDRESS OF THE RH/RM
    325 011626  012737  012076  001350              MOV     #EXIT7,BYPASS      ;ERROR TERMINATION ADDRESS
        011634  012737  011642  001122              MOV     #TEST7,$LPADR      ;SETUP THE LOOP ON TEST ADDRESS
        011642                              TEST7:
    326 011642  012706  001100                      MOV     #STACK,SP          ;SETUP THE STACK POINTER
    327 011646  013737  002340  047050              MOV     FC,DPB.B+12        ;INITIAL CYLINDER ADDRESS
    328 011654  023737  002340  002342              CMP     FC,LC              ;CYLINDER LIMITS THE SAME ?
    329 011662  001422                              BEQ     1$                 ;BR IF THEY ARE
    330 011664  004737  026426                      JSR     PC,$RAND           ;CYCYLE THE RANDOM NUMBER GENERATOR
    331 011670  013746  026524                      MOV     $HINUM,-(SP)       ;USE THE HIGH RANDOM NUMBER
    332 011674  005046                              CLR     -(SP)              ;UPPER DIVIDEND
    333 011676  013746  002342                      MOV     LC,-(SP)           ;FORM THE DIVISOR
    334 011702  005216                              INC     (SP)               ;INCREMENT
    335 011704  163716  002340                      SUB     FC,(SP)            ;SUBTRACT THE LOWER LIMIT
    336 011710  004737  026530                      JSR     PC,$DIV            ;DIVIDE
    337 011714  062637  047050                      ADD     (SP)+,DPB.B+12     ;ADD THE REMAINDER TO THE INITIAL CYLINDER
    338 011720  005726                              TST     (SP)+              ;DISCARD THE QUOTENT
    339 011722  013737  047050  047030              MOV     DPB.B+12,DPB.A+12          ;COPY NEW CYLINDER ADDRESS
    340 011730                              1$:
        011730  012737  011730  001124              MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
        011736  012706  001100                      MOV     #STACK,SP          ;LOAD THE STACK POINTER
    341 011742  004037  030402                      JSR     R0,CALL.A          ;GO EXECUTE THE COMMAND
    342 011746  012737  011746  001124              MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
        011754  012706  001100                      MOV     #STACK,SP          ;LOAD THE STACK POINTER
    343 011760  113764  047016  000010              MOVB    DPB.A,RMCS2(R4)    ;SELECT THE DRIVE
    344 011766  016446  000020                      MOV     RMLA(R4),-(SP)     ;GET THE LOOK AHEAD REGISTER
    345 011772  006316                              ASL     (SP)               ;ALIGN THE SECTOR ADDRESS
    346 011774  006316                              ASL     (SP)               ;ALIGN THE SECTOR ADDRESS
    347 011776  000316                              SWAB    (SP)               ;PUT ADDRESS IN LOWER BYTE
    348 012000  105766  000001                      TSTB    1(SP)              ;IN THE 1ST 20% OF SECTOR ?
    349 012004  001401                              BEQ     2$                 ;BR IF YES
    350 012006  105216                              INCB    (SP)               ;INCREMENT THE SECTOR ADDRESS
    351 012010  105216                      2$:     INCB    (SP)               ;INCREMENT THE SECTOR ADDRESS
    352 012012  112637  047106                      MOVB    (SP)+,DTADPB+10    ;LOAD THE DPB
    353 012016  013746  002470                      MOV     PRMLMT+24,-(SP)    ;PUT LAST SECTOR ADDRESS ON THE STACK
    354 012022  005216                              INC     (SP)               ;INCREMENT IT
    355 012024  122637  047106                      CMPB    (SP)+,DTADPB+10    ;NEW SECTOR ADDRESS TOO LARGE ?
    356 012030  103007                              BHIS    4$                 ;BR IF NOT
    357 012032  103403                              BLO     3$                 ;BR IF ADDRESS IS 2 GREATER
    358 012034  105037  047106                      CLRB    DTADPB+10          ;RESET TO SECTOR ADDRESS 0
    359 012040  000403                              BR      4$                 ;CONTINUE
    360 012042  112737  000001  047106      3$:     MOVB    #1,DTADPB+10       ;RESET ADDRESS TO SECTOR 1
    361 012050                              4$:
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012050  004037  030550                      JSR     R0,CALL.B         ;GO EXECUTE THE COMMAND
012054  105237  047047                      INCB    DPB.B+11          ;INCREMENT THE TRACK ADDRESS
012060  123737  047047  002350              CMPB    DPB.B+11,LT       ;MAXIMUM ?
012066  101403                              BLOS    EXIT7             ;BR IF NOT
012070  113737  002346  047047              MOVB    FT,DPB.B+11       ;RELOAD STARTING TRACK ADDRESS
012076  000004                      EXIT7:  SCOPE                     ;CALL SCOPE ROUTINE



                                    ;;******************************************************************
                                    ;*TEST 10       SERVO SETTLE DOWN TEST
                                    ;*THIS TEST VERIFIES THAT THE SERVO HAS SETTLED DOWN AND THAT
                                    ;*THE DRIVE IS ON CYLINDER WHEN THE DRIVE INDICATES SEEK COMPLETE.
                                    ;*RANDOM SEEKS ARE ISSUED BETWEEN CYLINDERS 'NC1' AND 'NC1+IC'
                                    ;*('NC1' STARTS AT VALUE 'FC').  AT THE COMPLETION OF 1000 (10) SEEKS,
                                    ;*'NC1' IS INCREMENTED BY VALUE 'IC' AND THE SEQUENCE IS REPEATED.
                                    ;*THE TEST IS COMPLETED WHEN 'NC1' HAS BEEN INCREMENTED BEYOND 'LC'.
                                    ;*
                                    ;*WHEN THE SEEK COMPLETES, THE PROGRAM READS THE DRIVE'S LOOK-AHEAD
                                    ;*REGISTER (RMLA) TO DETERMINE THE ADDRESS OF THE SECTOR ROTATING  INTO
                                    ;*POSITION.  THE PROGRAM THEN ISSUES A WRITE HEADER AND DATA COMMAND
                                    ;*FOR THAT SECTOR.
                                    ;*ERRORS IN THIS TEST INDICATE THAT THE SERVO SYSTEM MAY NOT BE ADJUSTED
                                    ;*CORRECTLY, THAT THE DRIVE IS MALFUNCTIONING, OR THAT A PACK WITH
                                    ;*MARGINAL SERVO TRACKS IS MOUNTED ON THE DRIVE.
                                    ;*
                                    ;*THIS TEST IS VALID ONLY IF THE OPERATION IS STARTED WITHIN A FEW
                                    ;*HUNDRED MICRO-SECONDS AFTER SEEK DONE OCCURS.  THE NECESSARY
                                    ;*TIME DEPENDENT PARAMETERS OCCUR FREQUENTLY ENOUGH WITHIN THE REQUIRED
                                    ;*RANGE TO PERMIT THIS TEST TO BE EFFECTIVE.
                                    ;;******************************************************************
012100                              TST10:
012100  000240                              NOP
012102  033737  001560  001332              BIT     BITS+<10*2>,TSTNMS      ;DO THIS TEST?
012110  001002                              BNE     .+6               ;BR IF YES
012112  000137  013254                      JMP     TST11             ;NO--JUMP TO TEST11

012116  012737  000010  001116              MOV     #10,$TSTNM        ;SET TEST #10 AND CLEAR ($ERFLG)
012124  004737  030142                      JSR     PC,LODPRM         ;LOAD THE PARMETERS FOR THE TEST
012130  012737  012356  001124              MOV     #TEST10,$LPERR    ;SETUP THE LOOP ON ERROR ADDRESS
012136  013737  002336  001220              MOV     RPT,$TIMES        ;GET THE ITERATION COUNT
012144  112737  000031  001131              MOVB    #25.,$ERMAX       ;MAX ERRORS ALLOWED FOR TEST
012152  012737  000010  001240              MOV     #10,$TESTN        ;;SET TEST NUMBER IN APT MAIL BOX

012160  032777  010000  166766              BIT     #SW12,@SWR        ;INHIBIT TYPING TEST NUMBER ?
012166  001406                              BEQ     .+16              ;BR IF YES
012170  104401  047617                      TYPE    ,MSGTST           ;TYPE 'TEST'
012174  013746  001240                      MOV     $TESTN,-(SP)      ;;SAVE $TESTN FOR TYPEOUT
012200  104403                              TYPOS                     ;;GO TYPE--OCTAL ASCII
012202     003                              .BYTE   3                 ;;TYPE 3 DIGIT(S)
012203     000                              .BYTE   0                 ;;SUPPRESS LEADING ZEROS

012204  012737  012212  001122              MOV     #1$,$LPADR        ;SETUP THE LOOP ADDRESS
012212                              1$:
012212  112737  000105  047020              MOVB    #SEEK,DPB.A+2     ;SEEK=COMMAND
012220  112737  000161  047100              MOVB    #WRITE,DTADPB+2   ;COMMAND
012226  113737  002346  047107              MOVB    FT,DTADPB+11      ;TRACK ADDRESS FOR THE WRITE
012234  013737  002340  047030              MOV     FC,DPB.A+12       ;CYLINDER ADDRESS FOR THE SEEK
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    012242  013737  002340  047110          MOV     FC,DTADPB+12      ;CYLINDER ADDRESS FOR THE WRITE
    012250  013737  002340  002370          MOV     FC,NC1            ;STARTING CYLINDER
    012256  013737  002342  001450          MOV     LC,DELTA          ;GET LAST CYLINDER
    012264  163737  002340  001450          SUB     FC,DELTA          ;CALCULATE DELTA COUNT
    012272  023737  001450  002344          CMP     DELTA,IC          ;IS CALCULATED COUNT <= 'IC' ?
    012300  003403                          BLE     2$                ;BR IF YES
    012302  013737  002344  001450          MOV     IC,DELTA          ;CYLINDER INCREMENT VALUE
    012310  012737  176000  047102  2$:     MOV     #-<256.*4.>,DTADPB+4     ;WORD COUNT
    012316  012737  054522  047104          MOV     #BUFFER,DTADPB+6         ;BUFFER ADDRESS
    012324  005000                          CLR     R0                ;PATTERN POINTER (WC PATTERN)
    012326  004737  034404                  JSR     PC,SETBUF         ;LOAD THF WRITE BUFFER
    012332  005001                          CLR     R1                ;CLEAR REGISTER
    012334  113701  047016                  MOVB    DPB.A,R1          ;LOAD DRIVE ADDRESS
    012340  013704  040650                  MOV     RMADR,R4          ;UNIBUS ADDRESS OF THE RH/RM
    012344  004737  046336                  JSR     PC,CLRQUE         ;CLEAR THE OPERATION QUEUES
    012350  012737  013252  001350          MOV     #EXIT10,BYPASS    ;ERROR EXIT FROM TEST
    012356                          TEST10:
    012356  012737  012356  001124          MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
    012364  012706  001100                  MOV     #STACK,SP         ;LOAD THE STACK POINTER
    012370  012737  000340  177776          MOV     #PR7,PS           ;SET PRIORITY TO 7
    012376  005737  001342                  TST     CLKSTA            ;SEE WHICH CLOCK ON SYSTEM
    012402  001415                          BEQ     3$                ;BR IF NO CLOCK
    012404  100405                          BMI     1$                ;BR IF KW11-L CLOCK
    012406  017746  167076                  MOV     @PKV,-(SP)        ;SAVE THE VECTOR
    012412  013746  001510                  MOV     PKV,-(SP)         ;SAVE THE VECTOR ADDRESS
    012416  000404                          BR      2$                ;CONTINUE
    012420  017746  167076          1$:     MOV     @LKV,-(SP)        ;SAVE THE 'L' CLOCK VECTOR
    012424  013746  001522                  MOV     LKV,-(SP)         ;SAVE THE VECTOR ADDRESS
    012430  012776  013206  000000  2$:     MOV     #TST10B,@(SP)     ;CHANGE THE VECTOR
    012436  012777  032734  026206  3$:     MOV     #DORTI,@RMVEC     ;CHANGE THE RM VECTOR
    012444  012737  000010  001444          MOV     #8.,SEKTMR        ;LOAD THE SEEK TIMER
    012452  012764  000040  000010          MOV     #CLR,RMCS2(R4)    ;INIT THE MASSBUS
    012460  110164  000010                  MOVB    R1,RMCS2(R4)      ;RESELECT THE DRIVE
    012464  013764  047030  000034          MOV     DPB.A+12,RMDC(R4)        ;LOAD THE CYLINDER ADDRESS
    012472  013737  047030  001366          MOV     DPB.A+12,CYL.DS   ;CYLINDER ADDRESS FOR ERROR MESSAGE
    012500  112764  000105  000000          MOVB    #SEEK,RMCS1(R4)   ;START THE SEEK
    012506  005037  177776                  CLR     PS                ;CLEAR THE PRIORITY
    012512  105764  000012          4$:     TSTB    RMDS(R4)          ;HAS THE DRIVE FINISHED ?
    012516  100402                          BMI     5$                ;BR IF IT HAS
    012520  000001                          WAIT                      ;WAIT FOR THE OPERATION TO COMPLETE
    012522  000773                          BR      4$                ;CONTINUE
    012524  012737  000340  177776  5$:     MOV     #PR7,PS           ;CHANGE PRIORITY TO MAX
    012532  032764  040000  000012          BIT     #ERR,RMDS(R4)     ;ERROR ?
    012540  001412                          BEQ     6$                ;BR IF NO1
    012542  012702  047016                  MOV     #DPB.A,R2         ;DPB POINTER
    012546  004737  045654                  JSR     PC,SVRH70         ;SAVE THE REGISTERS
    012552  104023                          EMT     23                ;ERROR DURING SEEK
    012554  012764  000040  000010          MOV     #CLR,RMCS2(R4)    ;INIT THE MASSBUS
    012562  110164  000010                  MOVB    R1,RMCS2(R4)      ;RESELECT THE DRIVE
    012566  012777  043306  026056  6$:     MOV     #ISR,@RMVEC       ;SETUP THE RM VECTOR
    012574  005737  001342                  TST     CLKSTA            ;WHICH CLOCK
    012600  001405                          BEQ     TST10A            ;BR IF NONE
    012602  016676  000002  000000          MOV     2(SP),@(SP)       ;RELOAD THE CLOCK VECTOR
    012610  062706  000004                  ADD     #4,SP             ;CORRECT THE STACK POINTER
    012614                          TST10A:
    012614  012737  012614  001124          MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
    012622  012706  001100                  MOV     #STACK,SP         ;LOAD THE STACK POINTER
    456 012626  110164  000010                      MOVB    R1,RMCS2(R4)       ;SELECT THE DRIVE
    457 012632  016446  C00020                      MOV •   RMLA(R4),-(SP)     ;GET THE LOOK AHEAD REGISTER
    458 012636  006316                              ASL     (SP)               ;ALIGN THE SECTOR ADDRESS
    459 012640  006316                              ASL     (SP)               ;ALIGN THE SECTOR ADDRESS
    460 012642  000316                              SWAB    (SP)               ;PUT ADDRESS IN LOWER BYTE
    461 012644  122766  000300  000001              CMPB    #300,1(SP)         ;IN THE LAST 20% OR SECTOR ?
    462 012652  001001                              BNE     2$                 ;BR IF NOT
    463 012654  105216                              INCB    (SP)               ;INCREMENT THE SECTOR ADDRESS
    464 012656  105216                      2$:     INCB    (SP)               ;INCREMENT THE SECTOR ADDRESS
    465 012660  112637  047106                      MOVB    (SP)+,DTADPB+10    ;LOAD THE DPB
    466 012664  013746  002470                      MOV     PRMLMT+24,-(SP)    ;PUT MAXIMUM SECTOR ADDRESS ON THE STACK
    467 012670  005216                              INC     (SP)               ;INCREMENT PAST THE MAXIMUM ADDRESS
    468 012672  122637  047106                      CMPB    (SP)+,DTADPB+10    ;NEW SECTOR ADDRESS TOO LARGE ?
    469 012676  101007                              BHI     4$                 ;BR IF NOT
    470 012700  103403                              BLO     3$                 ;BR IF ADDRESS IS 2 GREATER THAN MAXIMUM
    471 012702  105037  047106                      CLRB    DTADPB+10          ;RESET TO SECTOR ADDRESS 0
    472 012706  000403                              BR      4$                 ;CONTINUE
    473 012710  112737  000001  047106      3$:     MOVB    #1,DTADPB+10       ;RESET ADDRESS TO SECTOR 1
    474 012716  012703  047102              4$:     MOV     #DTADPB+4,R3       ;POINTER
    475 012722  012764  000111  000000              MOV     #DRVCLR,RMCS1(R4)          ;CLEAR THE DRIVE
    476 012730  012364  000002                      MOV     (R3)+,RMWC(R4)     ;LOAD THE WORD COUNT
    477 012734  012364  000004                      MOV     (R3)+,RMBA(R4)     ;LOAD THE BUFFER ADDRESS
    478 012740  012364  000006                      MOV     (R3)+,RMDA(R4)     ;LOAD THE TRACK/SECTOR ADDR
    479 012744  005037  047114                      CLR     DTADPB+16          ;RESET 'DONE' INDICATOR
    480 012750  012737  047076  040572              MOV     #DTADPB,TRNSWT     ;LOAD 'TRANSFER' DPB ADDRESS
    481 012756  010137  040634                      MOV     R1,DTUW            ;ADDRESS OF DRIVE TRANSFERING
    482 012762  112761  000001  040522              MOVB    #1,DRVACT(R1)      ;SET DRIVE ACTIVE INDICATOR
    483 012770  006301                              ASL     R1                 ;SHIFT DRIVE ADDRESS
    484 012772  012761  001750  040614              MOV     #1000.,TIMER(R1)           ;SETUP THE OPERATION TIMER
    485 013000  006201                              ASR     R1                 ;RESTORE R1
    486 013002  013764  047100  000000              MOV     DTADPB+2,RMCS1(R4)         ;START THE OPERATION
    487 013010  005037  177776                      CLR     PS                 ;CLEAR THE PRIORITY
    488 013014  004037  031224                      JSR     R0,DRVCL1          ;WAIT FOR OPERATION TO COMPLETE
    489 013020  023727  001446  001750      5$:     CMP.    SEKCNT,#1000.      ;FINISHED SEEKS ?
    490 013026  001026                              BNE     6$                 ;BR IF NOT
    491 013030  005037  001446                      CLR     SEKCNT             ;CLEAR THE SEEK COUNT
    492 013034  063737  002344  002370              ADD     IC,NC1             ;ADD THE INCREMENT
    493 013042  023737  002370  002342              CMP     NC1,LC             ;EXCEEDED THE CYLINDER LIMIT ?
    528 013050  103100                              BHIS    EXIT10             ;BR IF IT HAS
        013052  013737  002342  001450              MOV     LC,DELTA           ;GET THE NEXT 'ZONE' ADDRESS
        013060  163737  002370  001450              SUB     NC1,DELTA          ;CHECK THE DIFFERENCE
        013066  023737  002344  001450              CMP     IC,DELTA           ;DIFFERENCE GREATER THAN THE INCREMENT ?
        013074  101003                              BHI     6$                 ;BR IF IT IS
        013076  013737  002344  001450              MOV     IC,DELTA           ;USE THE ICREMENT PARAMETER
        013104  005237  001446              6$:     INC     SEKCNT             ;COUNT THE NEXT SEEK
        013110  023737  002340  002342              CMP     FC,LC              ;BEGINNING AND ENDING CYLINDERS THE SAME ?
        013116  001002                              BNE     7$                 ;BR IF NOT
        013120  000137  012356                      JMP     TEST10             ;BR IF THEY ARE
        013124  013737  002370  047030      7$:     MOV     NC1,DPB.A+12       ;RESET THE CYLINDER ADDRESS
        013132  004737  026426                      JSR     PC,$RAND           ;CYCLE THE RANDOM NUMBER GENERATOR
        013136  013746  026524                      MOV     $HINUM,-(SP)       ;USE THE HIGH RANDOM NUMBER
        013142  005046                              CLR     -(SP)              ;CLEAR THE UPPER DIVIDEND
        013144  013746  001450                      MOV     DELTA,-(SP)        ;FORM THE DIVISOR
        013150  005216                              INC     (SP)               ;INCREMENT
        013152  004737  026530                      JSR     PC,$DIV            ;DIVIDE
        013156  062637  047030                      ADD     (SP)+,DPB.A+12     ;ADD THE REMAINDER TO THE INITIAL CYLINDER
        013162  005726                              TST     (SP)+              ;DISCARD THE QUOTENT
```

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     013164  023737  047030  047110            CMP     DPB.A+12,DTADPB+12      ;SAME CYLINDER SELECTED AS LAST TIME ?
     013172  001754                            BEQ     7$                      ;BR IF IT WAS
     013174  013737  047030  047110            MOV     DPB.A+12,DTADPB+12      ;COPY NEW CYLINDER ADDRESS
     013202  000137  012356                    JMP     TEST10                  ;CONTINUE
     013206                            TST10B:
     013206  005337  001444                    DEC     SEKTMR                  ;DECREMENT THE SEEK TIMER
     013212  001016                            BNE     1$                      ;CONTINUE IF NOT DONE
     013214  012702  047016                    MOV     #DPB.A,R2               ;DPB ADDRESS
     013220  004737  045654                    JSR     PC,SVRH70               ;SAVE THE REGISTERS
     013224  104024                            EMT     24                      ;TIMEOUT DURING SEEK
     013226  012764  000040  000010            MOV     #CLR,RMCS2(R4)          ;INIT THE MASSBUS
     013234  110164  000010                    MOVB    R1,RMCS2(R4)            ;RESELECT THE DRIVE
     013240  016676  000002  000000            MOV     2(SP),@(SP)             ;RESTORE THE CLOCK VECTOR ADDRESS
     013246  000401                            BR      EXIT10                  ;ABORT THE TEST
 529 013250  000002                    1$:     RTI                             ;RETURN
 530 013252  000004                    EXIT10: SCOPE                           ;CALL SCOPE ROUTINE
 531
 542
 543                                   ;;*************************************************************
                                       ;*TEST 11        ALL SEEKS TEST
                                       ;*THIS TEST VERIFIES THAT THE DISK DRIVE CAN SEEK FROM EACH CYLINDER
                                       ;*TO ALL OTHER CYLINDERS.
                                       ;*
                                       ;*BEGINNING WITH CYLINDER 'FC', THE TEST SEEKS TO EACH CYLINDER
                                       ;*BETWEEN 'FC' AND 'LC' FROM CYINDER 'FC'.  THE BEGINNING CYLINDER
                                       ;*ADDRESS IS INCREMENTED AND THE TEST SEEKS BETWEEN THE NEW CYLINDER
                                       ;*ADDRESS AND ALL CYLINDERS BETWEEN 'FC' AND 'LC'.  THE SEQUENCE
                                       ;*CONTINUES UNTIL ALL CYLINDERS HAVE BEEN CHECKED.
                                       ;;*************************************************************
     013254                            TST11:
     013254  000240                            NOP
     013256  033737  001562  001332            BIT     BITS+<11*2>,TSTNMS      ;DO THIS TEST?
     013264  001002                            BNE     .+6                     ;BR IF YES
     013266  000137  013520                    JMP     TST12                   ;NO--JUMP TO TEST12

     013272  012737  000011  001116            MOV     #11,$TSTNM              ;SET TEST #11 AND CLEAR ($ERFLG)
     013300  004737  030142                    JSR     PC,LODPRM               ;LOAD THE PARMETERS FOR THE TEST
     013304  012737  013440  001124            MOV     #TEST11,$LPERR          ;SETUP THE LOOP ON ERROR ADDRESS
     013312  013737  002336  001220            MOV     RPT,$TIMES              ;GET THE ITERATION COUNT
     013320  112737  000031  001131            MOVB    #25.,$ERMAX             ;MAX ERRORS ALLOWED FOR TEST
     013326  012737  000011  001240            MOV     #11,$TESTN              ;;SET TEST NUMBER IN APT MAIL BOX
 544
     013334  032777  010000  165612            BIT     #SW12,@SWR              ;INHIBIT TYPING TEST NUMBER ?
     013342  001406                            BEQ     .+16                    ;BR IF YES
     013344  104401  047617                    TYPE    ,MSGTST                 ;TYPE 'TEST'
     013350  013746  001240                    MOV     $TESTN,-(SP)            ;;SAVE $TESTN FOR TYPEOUT
     013354  104403                            TYPOS                           ;;GO TYPE--OCTAL ASCII
     013356     003                            .BYTE   3                       ;;TYPE 3 DIGIT(S)
     013357     000                            .BYTE   0                       ;;SUPPRESS LEADING ZEROS

 545 013360  012737  013366  001122            MOV     #1$,$LPADR              ;SETUP THE LOOP ADDRESS
 546 013366  113737  002354  047046    1$:     MOVB    FS,DPB.B+10             ;SECTOR ADDRESS
 547 013374  113737  002354  047066            MOVB    FS,DPB.C+10             ;SECTOR ADDRESS
 548 013402  113737  002346  047047            MOVB    FT,DPB.B+11             ;TRACK ADDRESS
 549 013410  113737  002346  047067            MOVB    FT,DPB.C+11             ;TRACK ADDRESS
 550 013416  013737  002340  047050            MOV     FC,DPB.B+12             ;STARTING CYLINDER ADDRESS
 551 013424  013737  002340  047070            MOV     FC,DPB.C+12             ;STARTING CYLINDER ADDRESS
```

```
    555 013432  012737  013516  001350              MOV     #EXIT11,BYPASS  ;TEST ABORT EXIT
        013440                              TEST11:
    556 013440  012706  001100                      MOV     #STACK,SP       ;SETUP THE STACK POINTER
    557 013444                              1$:
        013444  004037  030766                      JSR     R0,CALL.C       ;GO EXECUTE THE COMMAND
    558 013450  004037  030550                      JSR     R0,CALL.B       ;GO EXECUTE THE COMMAND
    559 013454  063737  002344  047070              ADD     IC,DPB.C+12     ;INCREMENT THE ENDING CYLINDER ADDRESS
    560 013462  023737  002342  047070              CMP     LC,DPB.C+12     ;CHECK IF EXCEEDING MAXIMUM
    561 013470  002365                              BGE     1$              ;BR IF NOT
    562 013472  013737  002340  047070              MOV     FC,DPB.C+12     ;RESET ENDING CYLINDER ADDRESS
    563 013500  063737  002344  047050              ADD     IC,DPB.B+12     ;INCREMENT THE STARTING ADDRESS
    564 013506  023737  002342  047050              CMP     LC,DPB.B+12     ;EXCEEDING MAXIMUM ?
    565 013514  002353                              BGE     1$              ;BR IF NOT
    566 013516  000004                      EXIT11: SCOPE                   ;CALL SCOPE ROUTINE
```

```
                                          .SBTTL  TIMING TESTS

                                          ;;//////////////////////////////////////////////////////////////
                                          ;*THE TIMING TESTS WILL ENSURE THAT THOSE FUNCTIONS BEING
                                          ;*TIMED ARE WITHIN THE TOLERANCES SPECIFIED IN THE 'RM05/3/2
                                          ;*ENGINEERING SPECIFICATIONS''.
                                          ;*THE SEEK TIMING WILL BE PERFORMED USING EXPLICIT SEEK
                                          ;*OPERATIONS. AT THE COMPLETION OF EACH OF THE TIMING
                                          ;*TESTS THE MINIMUM, MAXIMUM AND AVERAGE TIMES WILL BE
                                          ;*TYPED.
                                          ;;//////////////////////////////////////////////////////////////


                                          ;;*************************************************************
                                          ;*TEST 12        ROTATIONAL SPEED TIMING TEST
                                          ;*THIS TEST WILL START A SEARCH TO CYLINDER 'FC', TRACK 'FT',
                                          ;*SECTOR 'FS'.  AS SOON AS THE INTERRUPT OCCURS, THE GO BIT
                                          ;*IS SET AGAIN AND THE OPERATION IS TIMED.  THIS PROCEDURE
                                          ;*IS REPEATED 10 TIMES THEN THE AVERAGE TIME IS CALCULATED
                                          ;*AND CHECKED TO ENSURE IT IS WITHIN TOLERANCE:
                                          ;*
                                          ;*       RM05/3:
                                          ;*               16.67 MS/REV + OR - 2% IF 60HZ
                                          ;*               16.67 MS/REV + OR - 2.5% IF 50HZ.
                                          ;*
                                          ;*       RM02:
                                          ;*               25.00 MS/REV + OR - 2% IF 60HZ
                                          ;*               25.00 MS/REV + OR - 2.5% IF 50HZ.
                                          ;;*************************************************************
 013520                                   TST12:
 013520  000240                                   NOP
 013522  033737  001564  001332                   BIT     BITS+<12+2>,TSTNMS      ;DO THIS TEST?
 013530  001002                                   BNE     .+6             ;BR IF YES
 013532  000137  014442                           JMP     TST13           ;NO--JUMP TO TEST13

 013536  012737  000012  001116                   MOV     #12,$TSTNM      ;SET TEST #12 AND CLEAR ($ERFLG)
 013544  004737  030142                           JSR     PC,LODPRM       ;LOAD THE PARMETERS FOR THE TEST
 013550  012737  014116  001124                   MOV     #TEST12,$LPERR  ;SETUP THE LOOP ON ERROR ADDRESS
 013556  013737  002336  001220                   MOV     RPT,$TIMES      ;GET THE ITERATION COUNT
 013564  112737  000031  001131                   MOVB    #25.,$ERMAX     ;MAX ERRORS ALLOWED FOR TEST
 013572  012737  000012  001240                   MOV     #12,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

 013600  032777  010000  165346                   BIT     #SW12,@SWR      ;INHIBIT TYPING TEST NUMBER ?
 013606  001406                                   BEQ     .+16            ;BR IF YES
 013610  104401  047617                           TYPE    ,MSGTST         ;TYPE 'TEST'
 013614  013746  001240                           MOV     $TESTN,-(SP)    ;;SAVE $TESTN FOR TYPEOUT
 013620  104403                                   TYPOS                   ;;GO TYPE--OCTAL ASCII
 013622     003                                   .BYTE   3               ;;TYPE 3 DIGIT(S)
 013623     000                                   .BYTE   0               ;;SUPPRESS LEADING ZEROS

 013624  005737  001342                           TST     CLKSTA          ;KW11-P CLOCK?
 013630  003002                                   BGT     1$              ;YES--START TEST
 013632  000137  014440                           JMP     EXIT12          ;NO--JUMP TO EXIT12
 013636  012737  013636  001122   1$:             MOV     #.,$LPADR       ;SETUP LOOP ADDRESS
 013644  004037  032552                           JSR     R0,SRCH00       ;DO A MASSBUS INIT & RECAL
 013650  000402                                   BR      2$              ;RETURN HERE IF NO ERROR
 013652  000137  014440                           JMP     EXIT12          ;RETURN HERE IF ERROR
```

```
        013656  012737  013656  001122  2$:     MOV     #.,$LPADR       ;ERROR LOOP ADDRESS
        013664  112737  000105  047020          MOVB    #SEEK,DPB.A+2   ;SEEK=COMMAND
        013672  005037  047026                  CLR     DPB.A+10        ;USE TRACK 0 & SECTOR 0
        013676  013737  002340  047030          MOV     FC,DPB.A+12     ;STARTING CYLINDER
        013704  012737  014440  001350          MOV     #EXIT12,BYPASS  ;GO TO EXIT12 IF ERROR
        013712  004037  030402                  JSR     R0,CALL.A       ;GO EXECUTE THE COMMAND
        013716  013764  002340  000034          MOV     FC,RMDC(R4)     ;FC
        013724  013746  002354                  MOV     FS,-(SP)        ;FS
        013730  113766  002346  000001          MOVB    FT,1(SP)        ;FT
        013736  012664  000006                  MOV     (SP)+,RMDA(R4)  ;LOAD FT/FS
        013742  012737  014440  001222          MOV     #EXIT12,$ESCAPE ;;ESCAPE TO EXIT12 ON ERROR
        013750  005005                          CLR     R5              ;COUNT UP

                                        ;SETUP PARAMETER TABLE FOR RM05/RM03/RM02
        013752  010046                          MOV     R0,-(SP)        ;SAVE R0
        013754  113700  047076                  MOVB    DTADPB,R0       ;DRIVE ADDRESS
        013760  032737  000100  001314          BIT     #SW06,C.SWR     ;CHECK CONTROL SWR FOR 60 HZ.
        013766  001425                          BEQ     3$              ;BR IF YES
        013770  012703  001650                  MOV     #T7B1,R3        ;LOAD 50 HZ. TABLE FOR RM02
        013774  012737  001650  014430          MOV     #T7B1,TP50      ;
        014002  012737  001732  014436          MOV     #SP7B1,TPS50    ;
        014010  122760  000005  040542          CMPB    #5,DRVTYP(R0)   ;AN RM02 DRIVE ?
        014016  001435                          BEQ     4$              ;BRANCH IF SO
        014020  012703  001630                  MOV     #T7B,R3         ;LOAD 50 HZ. TABLE FOR RM05/3
        014024  012737  001630  014430          MOV     #T7B,TP50       ;
        014032  012737  001716  014436          MOV     #SP7B,TPS50     ;
        014040  000424                          BR      4$              ;EXIT
        014042  012737  001640  014412  3$:     MOV     #T7A1,TP60      ;LOAD 60 HZ. TABLE FOR RM02
        014050  012737  001724  014420          MOV     #SP7A1,TPS60    ;
        014056  012703  001640                  MOV     #T7A1,R3        ;
        014062  122760  000005  040542          CMPB    #5,DRVTYP(R0)   ;AN RM02 DRIVE ?
        014070  001410                          BEQ     4$              ;BRANCH IF SO
        014072  012737  001620  014412          MOV     #T7A,TP60       ;LOAD 60 HZ. TABLE FOR RM05/3
        014100  012703  001620                  MOV     #T7A,R3         ;
        014104  012737  001710  014420          MOV     #SP7A,TPS60     ;
        014112  012600                  4$:     MOV     (SP)+,R0        ;RESTORE R0
        014114  000240                          NOP                     ;EXIT
        014116                          TEST12:
        014116  012706  001100                  MOV     #STACK,SP       ;SETUP STACK
        014122  012701  000012                  MOV     #10.,R1         ;TIME 10 SEARCHES
        014126  004737  032736                  JSR     PC,STRTMR       ;INITIALIZE THE TIMERS
        014132  012777  014320  165350          MOV     #7$,@PKV        ;SETUP VECTOR IN CASE OF OVERFLOW
        014140  012777  032734  024504          MOV     #DORTI,@RMVEC   ;SETUP RM VECTOR
        014146  005077  165344          1$:     CLR     @PKB            ;START COUNTING AT ZERO
        014152  012777  000131  165334          MOV     #131,@PKCS      ;INT.EN., COUNT UP AT 100KHZ
        014160  012714  000131                  MOV     #SEARCH,(R4)    ;START A SEARCH
        014164  000001                          WAIT                    ;WAIT ON INTERRUPT
        014166  042777  000101  165320          BIC     #101,@PKCS      ;STOP THE CLOCK
        014174  032764  040000  000012          BIT     #ERR,RMDS(R4)   ;ERROR?
        014202  001411                          BEQ     2$              ;NO--BRANCH
        014204  104412                          SAVREG                  ;SAVE R0-R5
        014206  012702  047076                  MOV     #DTADPB,R2      ;DPB POINTER
        014212  004737  045654                  JSR     PC,SVRH70       ;SAVE ALL THE RH/RM REGISTERS
        014216  004737  027334                  JSR     PC,CNTCLR       ;GO CLEAR MASSBUS CONTROLLER
        014222  104413                          RESREG                  ;RESTORE R0-R5
        014224  104017                          EMT     17              ;DISK ERROR OCCURRED
        014226  005077  165264          2$:     CLR     @PKB            ;START THE COUNT AT ZERO
```

```
    014232  012714  000131                     MOV     #SEARCH,(R4)     ;START A SEARCH
    014236  012777  000131  165250             MOV     #131,@PKCS       ;START THE CLOCK
    014244  000001                             WAIT                     ;WAIT ON INTERRUPT
    014246  042777  000101  165240             BIC     #101,@PKCS       ;STOP THE CLOCK
    014254  032764  040000  000012             BIT     #ERR,RMDS(R4)    ;IS 'ERR=1'?
    014262  001411                             BEQ     3$               ;NO--BRANCH
    014264  104412                             SAVREG                   ;SAVE R0-R5
    014266  012702  047076                     MOV     #DTADPB,R2       ;DPB POINTER
    014272  004737  045654                     JSR     PC,SVRH70        ;SAVE ALL THE RH/RM REGISTERS
    014276  004737  027334                     JSR     PC,CNTCLR        ;GO CLEAR MASSBUS CONTROLLER
    014302  104413                             RESREG                   ;RESTORE R0-R5
    014304  104017                             EMT     17               ;DISK ERROR OCCURRED
    014306  004737  033000          3$:        JSR     PC,COUNT         ;UPDATE THE COUNT
    014312  005301                             DEC     R1               ;DONE?
    014314  003314                             BGT     1$               ;NO--BRANCH
    014316  000420                             BR      8$               ;YES--GO TO THE EXIT
    014320  042777  000101  165166  7$:        BIC     #101,@PKCS       ;STOP THE CLOCK
    014326  005037  177776                     CLR     PS               ;DROP THE PRIORITY
    014332  012600                             MOV     (SP)+,R0         ;PC OF WAIT+2
    014334  005726                             TST     (SP)+            ;POP THE PS FROM THE STACK
    014336  104412                             SAVREG                   ;SAVE R0-R5
    014340  012702  047076                     MOV     #DTADPB,R2       ;DPB POINTER
    014344  004737  045654                     JSR     PC,SVRH70        ;SAVE ALL THE RH/RM REGISTERS
    014350  004737  027334                     JSR     PC,CNTCLR        ;GO CLEAR MASSBUS CONTROLLER
    014354  104413                             RESREG                   ;RESTORE R0-R5
    014356  104020                             EMT     20               ;CLOCK OVERFLOWED
    014360  004737  027334          8$:        JSR     PC,CNTCLR        ;GO CLEAR MASSBUS CONTROLLER
    014364  004737  027426                     JSR     PC,ST.CLK        ;INITIALIZE THE CLOCK
    014370  012777  043306  024254             MOV     #ISR,@RMVEC      ;RESTORE RH/RM INT. VECTOR
    014376  032737  000100  001314             BIT     #SW06,C.SWR      ;60 HZ?
    014404  001007                             BNE     EXIT.A           ;NO-BRANCH
    014406  004037  033240                     JSR     R0,TYPTIM        ;TYPE THE TIMING
    014412  001620                  TP60:      T7A                      ;TABLE ADDRESS
    014414  004037  033132                     JSR     R0,SPTYP         ;TYPE THE SPEC
    014420  001710                  TPS60:     SP7A
    014422  000406                             BR      EXIT12           ;EXIT
    014424  004037  033240          EXIT.A:    JSR     R0,TYPTIM        ;TYPE THE TIMING
    014430  001630                  TP50:      T7B                      ;TABLE ADDRESS
    014432  004037  033132                     JSR     R0,SPTYP         ;
    014436  001716                  TPS50:     SP7B                     ;
    014440  000004                  EXIT12:    SCOPE                    ;CALL SCOPE ROUTINE



                                    ;;*****************************************************************
                                    ;;*TEST 13        ONE CYLINDER SEEK TIMING TEST
                                    ;;*THIS TEST WILL COMMAND FORWARD SEEK CYCLES TO ADVANCE THE
                                    ;;*CYLINDER BY ONE UNTIL THE INCREMENT IS GREATER THAN THE
                                    ;;*CYLINDER 'LC', THEN REVERSE SEEK TO CYLINDER 'FC'.  THE
                                    ;;*TIME TO PERFORM EACH SEEK IS CHECKED TO ENSURE IT DOES NOT
                                    ;;*EXCEED THE MAXIMUM TIME PERMITTED FOR A ONE CYLINDER SEEK.
                                    ;;*MAXIMUM TIME IS 6.0 MS.
                                    ;;*****************************************************************
    014442                          TST13:
    014442  000240                             NOP
    014444  033737  001566  001332             BIT     BITS+<13*2>,TSTNMS       ;DO THIS TEST?
    014452  001002                             BNE     .+6              ;BR IF YES
    014454  000137  015144                     JMP     TST14            ;NO--JUMP TO TEST14
```

```
     014460  012737  000013  001116              MOV     #13,$TSTNM        ;SET TEST #13 AND CLEAR ($ERFLG)
     014466  004737  030142                      JSR     PC,LODPRM         ;LOAD THE PARMETERS FOR THE TEST
     014472  012737  014652  001124              MOV     #TEST13,$LPERR    ;SETUP THE LOOP ON ERROR ADDRESS
     014500  013737  002336  001220              MOV     RPT,$TIMES        ;GET THE ITERATION COUNT
     014506  112737  000031  001131              MOVB    #25.,$ERMAX       ;MAX ERRORS ALLOWED FOR TEST
     014514  012737  000013  001240              MOV     #13,$TESTN        ;;SET TEST NUMBER IN APT MAIL BOX
 155
     014522  032777  010000  164424              BIT     #SW12,@SWR        ;INHIBIT TYPING TEST NUMBER ?
     014530  001406                              BEQ     .+16              ;BR IF YES
     014532  104401  047617                      TYPE    ,MSGTST           ;TYPE 'TEST'
     014536  013746  001240                      MOV     $TESTN,-(SP)      ;;SAVE $TESTN FOR TYPEOUT
     014542  104403                              TYPOS                     ;;GO TYPE--OCTAL ASCII
     014544     003                              .BYTE   3                 ;;TYPE 3 DIGIT(S)
     014545     000                              .BYTE   0                 ;;SUPPRESS LEADING ZEROS

 156 014546  005737  001342                      TST     CLKSTA            ;KW11-P CLOCK?
 157 014552  003002                              BGT     1$                ;YES--START TEST
 160 014554  000137  015142                      JMP     EXIT13            ;NO--JUMP TO EXIT13
 161 014560  012737  014560  001122  1$:         MOV     #.,$LPADR         ;SETUP THE LOOP ADDRESS
 162 014566  004037  032552                      JSR     R0,SRCH00         ;DO A MASSBUS INIT. AND RECAL
 163 014572  000402                              BR      2$                ;NO ERROR RETURN
 175 014574  000137  015142                      JMP     EXIT13            ;ERROR RETURN--SCOPE LOOP CALL
     014600  012737  014600  001122  2$:         MOV     #.,$LPADR         ;ERROR LOOP ADDRESS
     014606  112737  000105  047020              MOVB    #SEEK,DPB.A+2     ;SEEK=COMMAND
     014614  005037  047026                      CLR     DPB.A+10          ;USE TRACK 0 & SECTOR 0
     014620  013737  002340  047030              MOV     FC,DPB.A+12       ;STARTING CYLINDER
     014626  012737  015142  001350              MOV     #EXIT13,BYPASS    ;GO TO EXIT13 IF ERROR
     014634  004037  030402                      JSR     R0,CALL.A         ;GO EXECUTE THE COMMAND
     014640  012703  001660                      MOV     #T10,R3           ;PARAMETER POINTER
     014644  012737  015142  001222              MOV     #EXIT13,$ESCAPE   ;;ESCAPE TO EXIT13 ON ERROR
     014652                          TEST13:
 176 014652  012706  001100                      MOV     #STACK,SP         ;SETUP STACK
 177 014656  013737  002340  047110              MOV     FC,DTADPB+12      ;START WITH BEGINNING CYLINDER
 178 014664  005237  047110                      INC     DTADPB+12         ;INCREMENT THE BEGINNING CYLINDER
 179 014670  005005                              CLR     R5                ;SET THE UP/DOWN SWITCH TO UP
 180 014672  004737  032736                      JSR     PC,STRTMR         ;INITIALIZE THE TIMERS
 181 014676  012777  015050  164604              MOV     #7$,@PKV          ;SETUP INCASE OF OVERFLOW
 182 014704  012777  032734  023740              MOV     #DORTI,@RMVEC     ;SET RM VECTOR
 183 014712  005077  164600          1$:         CLR     @PKB              ;START THE COUNTER AT ZERO
 184 014716  013764  047110  000034              MOV     DTADPB+12,RMDC(R4)        ;LOAD DESIRED CYLINDER
 185 014724  012714  000105                      MOV     #SEEK,(R4)        ;START A SEEK
 186 014730  012777  000131  164556              MOV     #131,@PKCS        ;START THE CLOCK
 187 014736  000001                              WAIT                      ;WAIT ON INTERRUPT
 188 014740  042777  000101  164546              BIC     #101,@PKCS        ;STOP THE CLOCK
 189 014746  032764  040000  000012              BIT     #ERR,RMDS(R4)     ;ANY DISK ERRORS?
 190 014754  001411                              BEQ     2$                ;NO--BRANCH
 191 014756  104412                              SAVREG                    ;SAVE R0-R5
     014760  012702  047076                      MOV     #DTADPB,R2        ;DPB POINTER
     014764  004737  045654                      JSR     PC,SVRH70         ;SAVE ALL THE RH/RM REGISTERS
     014770  004737  027334                      JSR     PC,CNTCLR         ;GO CLEAR MASSBUS CONTROLLER
     014774  104413                              RESREG                    ;RESTORE R0-R5
 192 014776  104017                              EMT     17                ;DISK ERROR OCCURRED
 193 015000  004737  033000          2$:         JSR     PC,COUNT          ;COUNT THIS SEEKS TIME
 194 015004  005705                              TST     R5                ;UP OR DOWN?
 195 015006  001011                              BNE     4$                ;DOWN--BRANCH
 196 015010  005237  047110          3$:         INC     DTADPB+12         ;MOVE TO NEXT CYLINDER
```

```
    015014  023737  047110  002342              CMP     DTADPB+12,LC            ;OUT OF CYLINDERS?
    015022  002733                              BLT     1$                      ;NO--GO DO THE NEXT SEEK
    015024  012705  177777                      MOV     #-1,R5                  ;SET UP/DOWN SWITCH TO DOWN
    015030  000730                              BR      1$                      ;GO DO THE NEXT SEEK
    015032  005337  047110              4$:     DEC     DTADPB+12               ;MOVE TO NEXT CYLINDER
    015036  023737  047110  002340              CMP     DTADPB+12,FC            ;OUT OF CYLINDERS?
    015044  003322                              BGT     1$                      ;NO--GO DO THE NEXT SEEK
    015046  000420                              BR      8$                      ;GO TO THE EXIT
    015050  042777  000101  164436      7$:     BIC     #101,@PKCS              ;STOP THE CLOCK
    015056  005037  177776                      CLR     PS                      ;DROP THE PRIORITY
    015062  012600                              MOV     (SP)+,R0                ;PC OF WAIT+2
    015064  005726                              TST     (SP)+                   ;POP THE PS FROM THE STACK
    015066  104412                              SAVREG                          ;SAVE R0-R5
    015070  012702  047076                      MOV     #DTADPB,R2              ;DPB POINTER
    015074  004737  045654                      JSR     PC,SVRH70               ;SAVE ALL THE RH/RM REGISTERS
    015100  004737  027334                      JSR     PC,CNTCLR               ;GO CLEAR MASSBUS CONTROLLER
    015104  104413                              RESREG                          ;RESTORE R0-R5
    015106  104020                              EMT     20                      ;REPORT CLOCK OVERFLOW
    015110  004737  027334              8$:     JSR     PC,CNTCLR               ;GO CLEAR MASSBUS CONTROLLER
    015114  004737  027426                      JSR     PC,ST.CLK               ;INITIALIZE THE CLOCK
    015120  012777  043306  023524              MOV     #ISR,@RMVEC             ;RESTORE RH/RM INT. VECTOR
    015126  004037  033240                      JSR     R0,TYPTIM               ;GO TYPE THE TIMES
    015132  001660                              T10                             ;POINTER
    015134  004037  033132                      JSR     R0,SPTYP
    015140  001740                              SP10
    015142  000004                      EXIT13: SCOPE                           ;CALL SCOPE ROUTINE



                                        ;;*****************************************************************
                                        ;;*TEST 14        AVERAGE SEEK TIMING TEST
                                        ;;*THIS TEST WILL COMMAND A FORWARD SEEK FROM CYLINDER 'FC' TO
                                        ;;*CYLINDER 'LC', THEN A REVERSE  SEEK FROM CYLINDER 'LC' TO
                                        ;;*CYLINDER 'FC'.  BOTH SEEKS ARE TIMED AND CHECKED TO ENSURE THEY
                                        ;;*ARE WITHIN THE TOLERANCE ALLOWED FOR THE AVERAGE SEEK TIME.
                                        ;;*THIS SEQUENCE IS REPEATED 128 TIMES (FOR A TOTAL OF 256 SEEKS).
                                        ;;*MAXIMUM TIME IS 30.0 MS.
                                        ;;*
                                        ; THERE ARE NO SPECIFICATIONS GIVEN  FOR AN AVERAGE SEEK TIME
                                        ; ON  THIS PARTICULAR  DRIVE.  THEREFORE, THIS TEST SHOULD BE
                                        ; USED FOR REFERENCE ONLY.
                                        ;;*
                                        ;;*****************************************************************
    015144                              TST14:
    015144  000240                              NOP
    015146  033737  001570  001332              BIT     BITS+<14*2>,TSTNMS      ;DO THIS TEST?
    015154  001002                              BNE     .+6                     ;BR IF YES
    015156  000137  015704                      JMP     TST15                   ;NO--JUMP TO TEST15

    015162  012737  000014  001116              MOV     #14,$TSTNM              ;SET TEST #14 AND CLEAR ($ERFLG)
    015170  004737  030142                      JSR     PC,LODPRM               ;LOAD THE PARMETERS FOR THE TEST
    015174  012737  015354  001124              MOV     #TEST14,$LPERR          ;SETUP THE LOOP ON ERROR ADDRESS
    015202  013737  002336  001220              MOV     RPT,$TIMES              ;GET THE ITERATION COUNT
    015210  112737  000031  001131              MOVB    #25.,$ERMAX             ;MAX ERRORS ALLOWED FOR TEST
    015216  012737  000014  001240              MOV     #14,$TESTN              ;;SET TEST NUMBER IN APT MAIL BOX

    015224  032777  010000  163722              BIT     #SW12,@SWR              ;INHIBIT TYPING TEST NUMBER ?
    015232  001406                              BEQ     .+16                    ;BR IF YES
```

```
        015234  104401  047617                  TYPE    ,MSGTST         ;TYPE 'TEST'
        015240  013746  001240                  MOV     $TESTN,-(SP)    ;;SAVE $TESTN FOR TYPEOUT
        015244  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
        015246     003                          .BYTE   3               ;;TYPE 3 DIGIT(S)
        015247     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS

    235 015250  005737  001342                  TST     CLKSTA          ;KW11-P CLOCK?
    236 015254  003002                          BGT     1$              ;YES--START TEST
    239 015256  000137  015702                  JMP     EXIT14          ;NO--JUMP TO EXIT14
    240 015262  012737  015262  001122  1$:     MOV     #.,$LPADR       ;SET THE LOOP ADDRESS
    241 015270  004037  032552                  JSR     R0,SRCH00       ;DO A MASSBUS INIT & RECAL
    242 015274  000402                          BR      2$              ;RETURN HERE IF NO ERROR
    254 015276  000137  015702                  JMP     EXIT14          ;RETURN HERE ON ERROR
        015302  012737  015302  001122  2$:     MOV     #.,$LPADR       ;ERROR LOOP ADDRESS
        015310  112737  000105  047020          MOVB    #SEEK,DPB.A+2   ;SEEK=COMMAND
        015316  005037  047026                  CLR     DPB.A+10        ;USE TRACK 0 & SECTOR 0
        015322  013737  002340  047030          MOV     FC,DPB.A+12     ;STARTING CYLINDER
        015330  012737  015702  001350          MOV     #EXIT14,BYPASS  ;GO TO EXIT14 IF ERROR
        015336  004037  030402                  JSR     R0,CALL.A       ;GO EXECUTE THE COMMAND
        015342  012703  001670                  MOV     #T11,R3         ;PARAMETER POINTER
        015346  012737  015702  001222          MOV     #EXIT14,$ESCAPE ;;ESCAPE TO EXIT14 ON ERROR
        015354                          TEST14:
    255 015354  012706  001100                  MOV     #STACK,SP       ;SETUP STACK
    256 015360  012701  000200                  MOV     #128.,R1        ;REPEAT '"FC'-'LC'-'FC"' 128 TIMES
    257 015364  004737  032736                  JSR     PC,STRTMR       ;INIT. THE COUNTERS
    258 015370  012777  015610  164112          MOV     #7$,@PKV        ;SET UP VECTOR IN CASE OF OVERFLOW
    259 015376  012777  032734  023246          MOV     #DORTI,@RMVEC   ;SETUP RM VECTOR
    260 015404  005077  164106          1$:     CLR     @PKB            ;START COUNT AT ZERO
    261 015410  013764  002342  000034          MOV     LC,RMDC(R4)     ;'MIDDLE' CYLINDER
    262 015416  012764  000105  000000          MOV     #SEEK,RMCS1(R4) ;START A SEEK
    263 015424  012777  000131  164062          MOV     #131,@PKCS      ;START THE CLOCK
    264 015432  000001                          WAIT                    ;WAIT ON INTERRUPT
    265 015434  042777  000101  164052          BIC     #101,@PKCS      ;STOP CLOCK
    266 015442  032764  040000  000012          BIT     #ERR,RMDS(R4)   ;ERR=1?
    267 015450  001411                          BEQ     2$              ;NO--BRANCH
    268 015452  104412                          SAVREG                  ;SAVE R0-R5
        015454  012702  047076                  MOV     #DTADPB,R2      ;DPB POINTER
        015460  004737  045654                  JSR     PC,SVRH70       ;SAVE ALL THE RH/RM REGISTERS
        015464  004737  027334                  JSR     PC,CNTCLR       ;GO CLEAR MASSBUS CONTROLLER
        015470  104413                          RESREG                  ;RESTORE R0-R5
    269 015472  104017                          EMT     17              ;DISK ERROR OCCURRED
    270 015474  005005                  2$:     CLR     R5              ;SET UP/DOWN SWITCH TO UP
    271 015476  004737  033000                  JSR     PC,COUNT        ;UPDATE THE COUNT
    272 015502  005077  164010                  CLR     @PKB            ;START THE COUNT AT ZERO
    273 015506  013764  002340  000034          MOV     FC,RMDC(R4)     ;BEGINNING CYLINDER
    274 015514  012764  000105  000000          MOV     #SEEK,RMCS1(R4) ;START A SEEK
    275 015522  012777  000131  163764          MOV     #131,@PKCS      ;START THE CLOCK
    276 015530  000001                          WAIT                    ;WAIT ON INTERRUPT
    277 015532  042777  000101  163754          BIC     #101,@PKCS      ;STOP THE CLOCK
    278 015540  032764  040000  000012          BIT     #ERR,RMDS(R4)   ;ERR=1?
    279 015546  001411                          BEQ     3$              ;NO--BRANCH
    280 015550  104412                          SAVREG                  ;SAVE R0-R5
        015552  012702  047076                  MOV     #DTADPB,R2      ;DPB POINTER
        015556  004737  045654                  JSR     PC,SVRH70       ;SAVE ALL THE RH/RM REGISTERS
        015562  004737  027334                  JSR     PC,CNTCLR       ;GO CLEAR MASSBUS CONTROLLER
        015566  104413                          RESREG                  ;RESTORE R0-R5
    281 015570  104017                          EMT     17              ;DISK ERROR OCCURRED
```

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282 015572  012705  177777          3$:     MOV     #-1,R5                  ;SET UP/DOWN SWITCH TO DOWN
283 015576  004737  033000                  JSR     PC,COUNT                ;UPDATE THE COUNT
284 015602  005301                          DEC     R1                      ;DONE?
285 015604  003277                          BGT     1$                      ;NO--BRANCH
286 015606  000420                          BR      8$                      ;YES--EXIT
287 015610  042777  000101  163676  7$:     BIC     #101,@PKCS              ;STOP THE CLOCK
288 015616  005037  177776                  CLR     PS                      ;DROP THE PRIORITY
289 015622  012600                          MOV     (SP)+,R0                ;PC OF WAIT+2
290 015624  005726                          TST     (SP)+                   ;POP THE PS FROM THE STACK
291 015626  104412                          SAVREG                          ;SAVE R0-R5
    015630  012702  047076                  MOV     #DTADPB,R2              ;DPB POINTER
    015634  004737  045654                  JSR     PC,SVRH70               ;SAVE ALL THE RH/RM REGISTERS
    015640  004737  027334                  JSR     PC,CNTCLR               ;GO CLEAR MASSBUS CONTROLLER
    015644  104413                          RESREG                          ;RESTORE R0-R5
292 015646  104020                          EMT     20                      ;CLOCK OVERFLOWED
293 015650  004737  027334          8$:     JSR     PC,CNTCLR               ;GO CLEAR MASSBUS CONTROLLER
294 015654  004737  027426                  JSR     PC,ST.CLK               ;INITIALIZE THE CLOCK
295 015660  012777  043306  022764          MOV.    #ISR,@RMVEC             ;RESTORE RH/RM INT. VECTOR
296 015666  004037  033240                  JSR     R0,TYPTIM               ;GO TYPE THE TIMES
    015672  001670                          T11                             ;POINTER
297 015674  004037  033132                  JSR     R0,SPTYP
298 015700  001746                          SP11
299 015702  000004                  EXIT14: SCOPE                           ;CALL SCOPE ROUTINE
300
317
318                                 ;;*************************************************************************
                                    ;*TEST 15        MAXIMUM SEEK TIMING TEST
                                    ;*THIS TEST WILL COMMAND A FORWARD SEEK FROM CYLINDER 'FC' TO
                                    ;*CYLINDER 'LC', THEN A REVERSE SEEK FROM CYLINDER 'LC' TO
                                    ;*CYLINDER 'FC'.  BOTH SEEKS ARE TIMED, BUT ONLY THE FORWARD SEEKS
                                    ;*ARE CHECKED TO ENSURE THEY ARE WITHIN THE TOLERANCE ALLOWED FOR
                                    ;*THE MAXIMUM SEEK TIME.  THIS SEQUENCE IS REPEATED 128 TIMES (FOR
                                    ;*A TOTAL OF 256. SEEKS). MAXIMUM (FORWARD) TIME IS 55.0 MS.
                                    ;*
                                    ; THERE IS  NO SPECIFICATION  GIVEN FOR THE  MAXIMUM REVERSE
                                    ; SEEK TIME ON THIS PARTICULAR DRIVE. THEREFORE, ANY REVERSE
                                    ; SEEK TIMES ABOVE THE  MAXIMUM TIME OF 55.0 MS WILL  NOT BE
                                    ; TYPED  IN THE  TIMING REPORT.  HOWEVER,  THE TIMING REPORT
                                    ; WILL STILL  TYPE THE  MINIMUM, MAXIMUM  AND  AVERAGE TIMES
                                    ; FOR THE REVERSE SEEKS.
                                    ;*
                                    ;;*************************************************************************
    015704                          TST15:
    015704  000240                          NOP
    015706  033737  001572  001332          BIT     BITS+<15*2>,TSTNMS      ;DO THIS TEST?
    015714  001002                          BNE     .+6                     ;BR IF YES
    015716  000137  016454                  JMP     TST16                   ;NO--JUMP TO TEST16

    015722  012737  000015  001116          MOV     #15,$TSTNM              ;SET TEST #15 AND CLEAR ($ERFLG)
    015730  004737  030142                  JSR     PC,LODPRM               ;LOAD THE PARMETERS FOR THE TEST
    015734  012737  016114  001124          MOV     #TEST15,$LPERR          ;SETUP THE LOOP ON ERROR ADDRESS
    015742  013737  002336  001220          MOV     RPT,$TIMES              ;GET THE ITERATION COUNT
    015750  112737  000031  001131          MOVB    #25.,$ERMAX             ;MAX ERRORS ALLOWED FOR TEST
    015756  012737  000015  001240          MOV     #15,$TESTN              ;;SET TEST NUMBER IN APT MAIL BOX
319
    015764  032777  010000  163162          BIT     #SW12,@SWR              ;INHIBIT TYPING TEST NUMBER ?
    015772  001406                          BEQ     .+16                    ;BR IF YES
    015774  104401  047617                   TYPE     ,MSGTST           ;TYPE 'TEST'
    016000  013746  001240                   MOV      $TESTN,-(SP)      ;;SAVE $TESTN FOR TYPEOUT
    016004  104403                           TYPOS                      ;;GO TYPE--OCTAL ASCII
    016006     003                           .BYTE    3                 ;;TYPE 3 DIGIT(S)
    016007     000                           .BYTE    0                 ;;SUPPRESS LEADING ZEROS

    016010  005737  001342                   TST      CLKSTA            ;KW11-P CLOCK
    016014  003002                           BGT      1$                ;YES--START TEST
    016016  000137  016452                   JMP      EXIT15            ;NO--JUMP TO EXIT15
    016022  012737  016022  001122   1$:     MOV      #.,$LPADR         ;SETUP THE LOOP ADDRESS
    016030  004037  032552                   JSR      R0,SRCH00         ;DO A MASSBUS INIT & RECAL
    016034  000402                           BR       2$                ;RETURN HERE IF NO ERROR
    016036  000137  016452                   JMP      EXIT15            ;RETURN HERE ON ERROR
    016042  012737  016042  001122   2$:     MOV      #.,$LPADR         ;ERROR LOOP ADDRESS
    016050  112737  000105  047020           MOVB     #SEEK,DPB.A+2     ;SEEK=COMMAND
    016056  005037  047026                   CLR      DPB.A+10          ;USE TRACK 0 & SECTOR 0
    016062  013737  002340  047030           MOV      FC,DPB.A+12       ;STARTING CYLINDER
    016070  012737  016452  001350           MOV      #EXIT15,BYPASS    ;GO TO EXIT15 IF ERROR
    016076  004037  030402                   JSR      R0,CALL.A         ;GO EXECUTE THE COMMAND
    016102  012703  001700                   MOV      #T12,R3           ;PARAMETER POINTER
    016106  012737  016452  001222           MOV      #EXIT15,$ESCAPE   ;;ESCAPE TO EXIT15 ON ERROR
    016114                           TEST15:
    016114  012706  001100                   MOV      #STACK,SP         ;SETUP STACK
    016120  012701  000200                   MOV      #128.,R1          ;REPEAT '"FC'-'LC'-'FC"' 128 TIMES
    016124  004737  032736                   JSR      PC,STRTMR         ;INIT. THE TIMERS
    016130  012777  016360  163352           MOV      #7$,@PKV          ;SETUP VECTOR IN CASE OF OVERFLOW
    016136  012777  032734  022506           MOV      #DORTI,@RMVEC     ;SETUP RM VECTOR
    016144  005077  163346           1$:     CLR      @PKB              ;START COUNTING FROM ZERO
    016150  013764  002342  000034           MOV      LC,RMDC(R4)       ;MAXIMUM CYLINDER
    016156  012764  000105  000000           MOV      #SEEK,RMCS1(R4)   ;START A SEEK
    016164  012777  000131  163322           MOV      #131,@PKCS        ;START THE CLOCK
    016172  000001                           WAIT                       ;WAIT ON INTERRUPT
    016174  042777  000101  163312           BIC      #101,@PKCS        ;STOP THE CLOCK
    016202  032764  040000  000012           BIT      #ERR,RMDS(R4)     ;ERR=1?
    016210  001411                           BEQ      2$                ;NO--BRANCH
    016212  104412                           SAVREG                     ;SAVE R0-R5
    016214  012702  047076                   MOV      #DTADPB,R2        ;DPB POINTER
    016220  004737  045654                   JSR      PC,SVRH70         ;SAVE ALL THE RH/RM REGISTERS
    016224  004737  027334                   JSR      PC,CNTCLR         ;GO CLEAR MASSBUS CONTROLLER
    016230  104413                           RESREG                     ;RESTORE R0-R5
    016232  104017                           EMT      17                ;DISK ERROR OCCURRED
    016234  005005                   2$:     CLR      R5                ;SET THE UP/DOWN SWITCH TO UP
    016236  004737  033000                   JSR      PC,COUNT          ;UP THE COUNT
    016242  005077  163250                   CLR      @PKB              ;START COUNT AT ZERO
    016246  013764  002340  000034           MOV      FC,RMDC(R4)       ;BEGINNING CYLINDER
    016254  012764  000105  000000           MOV      #SEEK,RMCS1(R4)   ;START A SEEK
    016262  012777  000131  163224           MOV      #131,@PKCS        ;START THE CLOCK
    016270  000001                           WAIT                       ;WAIT ON INTERRUPT
    016272  042777  000101  163214           BIC      #101,@PKCS        ;STOP THE CLOCK
    016300  032764  040000  000012           BIT      #ERR,RMDS(R4)     ;'ERR'=1?
    016306  001411                           BEQ      3$                ;NO--BRANCH
    016310  104412                           SAVREG                     ;SAVE R0-R5
    016312  012702  047076                   MOV      #DTADPB,R2        ;DPB POINTER
    016316  004737  045654                   JSR      PC,SVRH70         ;SAVE ALL THE RH/RM REGISTERS
    016322  004737  027334                   JSR      PC,CNTCLR         ;GO CLEAR MASSBUS CONTROLLER
    016326  104413                           RESREG                     ;RESTORE R0-R5
    016330  104017                           FMT      17                ;DISK ERROR OCCURRED
```

```
016332  012705  177777           3$:     MOV     #-1,R5          ;SET THE UP/DOWN SWITCH TO DOWN
016336  004737  033000                   JSR     PC,COUNT        ;UPDATE THE COUNT
016342  005037  001416                   CLR     TIM.DN+2        ;FORGET ABOUT # OF SEEKS BELOW MINIMUM TIME
016346  005037  001422                   CLR     TIM.DN+6        ;FORGET ABOUT # OF SEEKS ABOVE MAXIMUM TIME
016352  005301                           DEC     R1              ;DONE?
016354  003273                           BGT     1$              ;NO--BRANCH
016356  000420                           BR      8$              ;YES--EXIT
016360  042777  000101  163126   7$:     BIC     #101,@PKCS      ;STOP THE CLOCK
016366  005037  177776                   CLR     PS              ;DROP THE PRIORITY
016372  012600                           MOV     (SP)+,R0        ;PC OF WAIT+2
016374  005726                           TST     (SP)+           ;POP THE PS FROM THE STACK
016376  104412                           SAVREG                  ;SAVE R0-R5
016400  012702  047076                   MOV     #DTADPB,R2      ;DPB POINTER
016404  004737  045654                   JSR     PC,SVRH70       ;SAVE ALL THE RH/RM REGISTERS
016410  004737  027334                   JSR     PC,CNTCLR       ;GO CLEAR MASSBUS CONTROLLER
016414  104413                           RESREG                  ;RESTORE R0-R5
016416  104020                           EMT     20              ;CLOCK OVERFLOWED
016420  004737  027334           8$:     JSR     PC,CNTCLR       ;GO CLEAR MASSBUS CONTROLLER
016424  004737  027426                   JSR     PC,ST.CLK       ;INITIALIZE THE CLOCK
016430  012777  043306  022214           MOV     #ISR,@RMVEC     ;RESTORE RH/RM INT. VECTOR
016436  004037  033240                   JSR     R0,TYPTIM       ;GO TYPE THE TIMES
016442  001700                           T12                     ;POINTER
016444  004037  033132                   JSR     R0,SPTYP        ;
016450  001754                           SP12
016452  000004                   EXIT15: SCOPE                   ;CALL SCOPE ROUTINE
```

```
                                        .SBTTL  ADDRESSING TESTS

                                        ;;//////////////////////////////////////////////////////////////
                                        ;*THE ADDRESSING TESTS ENSURES PROPER OPERATION OF THE TRACK
                                        ;*AND SECTOR ADDRESS CIRCUITRY.  BOTH ADDRESSING TESTS WILL
                                        ;*BE PERFORMED ON CYLINDER FC.
                                        ;;//////////////////////////////////////////////////////////////


                                        ;;**************************************************************
                                        ;*TEST 16       SECTOR ADDRESSING TEST
                                        ;*THIS TEST WRITES DATA INTO ALL SECTORS OF TRACK 'FT'.  THE
                                        ;*DATA WILL BE 256 WORDS OF THE SECTOR ADDRESS OF THE SECTOR
                                        ;*BEING WRITTEN.  A WRITE CHECK IS PERFORMED, THE BUFFER IS
                                        ;*CLEARED (TO 177400) AND THE DATA IS READ AND COMPARED.  THEN
                                        ;*SECTOR 0 IS REWRITTEN AND SECTORS 0 - 31 ARE WRITE CHECKED.
                                        ;*THEN SECTOR 1 IS REWRITTEN AND SECTORS 0 - 31 ARE WRITE CHECKED.
                                        ;*THIS REWRITE AND WRITE CHECK PROCEDURE IS CONTINUED UP THROUGH
                                        ;*REWRITE SECTOR 31 AND WRITE CHECK SECTORS 0-31.
                                        ;;**************************************************************
 016454                                 TST16:
 016454  000240                                 NOP
 016456  033737  001574  001332                 BIT     BITS+<16*2>,TSTNMS      ;DO THIS TEST?
 016464  001002                                 BNE     .+6                     ;BR IF YES
 016466  000137  017076                         JMP     TST17                   ;NO--JUMP TO TEST17

 016472  012737  000016  001116                 MOV     #16,$TSTNM              ;SET TEST #16 AND CLEAR ($ERFLG)
 016500  004737  030142                         JSR     PC,LODPRM               ;LOAD THE PARMETERS FOR THE TEST
 016504  012737  016574  001124                 MOV     #TEST16,$LPERR          ;SETUP THE LOOP ON ERROR ADDRESS
 016512  013737  002336  001220                 MOV     RPT,$TIMES              ;GET THE ITERATION COUNT
 016520  113737  001464  001131                 MOVB    ERR.CT,$ERMAX           ;MAX ERRORS ALLOWED FOR TEST
 016526  012737  000016  001240                 MOV     #16,$TESTN              ;;SET TEST NUMBER IN APT MAIL BOX

 016534  032777  010000  162412                 BIT     #SW12,@SWR              ;INHIBIT TYPING TEST NUMBER ?
 016542  001406                                 BEQ     .+16                    ;BR IF YES
 016544  104401  047617                         TYPE    ,MSGTST                 ;TYPE 'TEST'
 016550  013746  001240                         MOV     $TESTN,-(SP)            ;;SAVE $TESTN FOR TYPEOUT
 016554  104403                                 TYPOS                           ;;GO TYPE--OCTAL ASCII
 016556     003                                 .BYTE   3                       ;;TYPE 3 DIGIT(S)
 016557     000                                 .BYTE   0                       ;;SUPPRESS LEADING ZEROS

 016560  012737  017074  001350                 MOV     #EXIT16,BYPASS
 016566  012737  016574  001122                 MOV     #TEST16,$LPADR          ;SETUP THE LOOP ADDRESS
 016574                                 TEST16:
 016574  012706  001100                         MOV     #STACK,SP               ;SET THE STACK POINTER
 016600  004737  033730                         JSR     PC,FILBUF               ;FILL THE BUFFER WITH SECTOR ADDRESSES
 016604  013737  002340  047110                 MOV     FC,DTADPB+12            ;CYLINDER
 016612  113737  002346  047107                 MOVB    FT,DTADPB+11            ;TRACK
 016620  105037  047106                         CLRB    DTADPB+10               ;SECTOR
 016624  013737  001452  047102                 MOV     TRCKWC,DTADPB+4 ;WORD COUNT
 016632  012737  054522  047104                 MOV     #BUFFER,DTADPB+6        ;BUFFER ADDRESS
 016640  012737  016640  001124                 MOV     #.,$LPERR               ;SETUP THE ERROR LOOP ADDRESS
 016646  012706  001100                         MOV     #STACK,SP               ;LOAD THE STACK POINTER
 016652  012737  000161  047100                 MOV     #WRITE,DTADPB+2 ;COMMAND=WRITE DATA
 016660  004037  031204                         JSR     R0,DRVCAL               ;START A DATA TRANSFER
 016664  012737  000151  047100                 MOV     #WRCKD,DTADPB+2 ;COMMAND=WRITE CHECK DATA
 016672  012737  016672  001124                 MOV     #.,$LPERR               ;SETUP THE ERROR LOOP ADDRESS
```

```
   016700  012706  001100                         MOV     #STACK,SP          ;LOAD THE STACK POINTER
   016704  004037  031204                         JSR     R0,DRVCAL          ;START A DATA TRANSFER
   016710  012737  016710  001124                 MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
   016716  012706  001100                         MOV     #STACK,SP          ;LOAD THE STACK POINTER
   016722  004037  033766                         JSR     R0,CLRBUF          ;CLEAR BUFFER
   016726  012737  000171  047100                 MOV     #READ,DTADPB+2     ;COMMAND = READ
   016734  004037  031204                         JSR     R0,DRVCAL          ;START A DATA TRANSFER
   016740  004037  034034                         JSR     R0,CKSCTR          ;CHECK THE SECTOR DATA READ
   016744  012700  054522                         MOV     #BUFFER,R0         ;BUFFER ADDRESS
   016750  005001                                 CLR     R1                 ;FIRST SECTOR
   016752  012737  016752  001124                 MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
   016760  012706  001100                         MOV     #STACK,SP          ;LOAD THE STACK POINTER
   016764  012737  000161  047100  1$:            MOV     #WRITE,DTADPB+2    ;COMMAND=WRITE DATA
   016772  012737  177400  047102                 MOV     #SCTRWC,DTADPB+4          ;WORD COUNT
   017000  010037  047104                         MOV     R0,DTADPB+6        ;BUFFER ADDRESS
   017004  110137  047106                         MOVB    R1,DTADPB+10       ;SECTOR
   017010  004037  031204                         JSR     R0,DRVCAL          ;START A DATA TRANSFER
   017014  012737  017014  001124                 MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
   017022  012706  001100                         MOV     #STACK,SP          ;LOAD THE STACK POINTER
   017026  012737  000151  047100                 MOV     #WRCKD,DTADPB+2    ;COMMAND=WRITE CHECK DATA
   017034  013737  001452  047102                 MOV     TRCKWC,DTADPB+4    ;WORD COUNT
   017042  012737  054522  047104                 MOV     #BUFFER,DTADPB+6          ;BUFFER ADDRESS
   017050  105037  047106                         CLRB    DTADPB+10          ;SECTOR
   017054  004037  031204                         JSR     R0,DRVCAL          ;START A DATA TRANSFER
   017060  062700  001000                         ADD     #512.,R0           ;MOVE TO NEXT SECTOR
   017064  005201                                 INC     R1
   017066  023701  002470                         CMP     PRMLMT+24,R1       ;DONE?
   017072  103334                                 BHIS    1$                 ;NO--BRANCH
   017074  000004                         EXIT16: SCOPE                      ;CALL SCOPE ROUTINE



                                        ;;*************************************************************
                                        ;;*TEST 17        TRACK ADDRESSING TEST
                                        ;;*THIS TEST WILL WRITE DATA IN THE FORM OF TRACK ADDRESSES
                                        ;;*IN CYLINDER 'FC' SECTOR 'FS' OF EVERY TRACK WITH EACH TRACK
                                        ;;*GETTING ITS OWN TRACK ADDRESS.
                                        ;;*A WRITE CHECK IS THEN PERFORMED ON EACH TRACK TO ENSURE
                                        ;;*THE DATA IS VALID.  THEN TRACK 0 IS REWRITTEN AND TRACK 1
                                        ;;*THROUGH LAST TRACK IS WRITE CHECKED.  THEN TRACK 1 IS
                                        ;;*REWRITTEN AND TRACK 2 THROUGH LAST TRACK IS WRITE CHECKED.
                                        ;;*THIS PROCEDURE IS CONTINUED UP THROUGH REWRITING NEXT TO LAST
                                        ;;*TRACK AND WRITE CHECKING LAST TRACK.
                                        ;;*************************************************************
   017076                               TST17:
   017076  000240                                 NOP
   017100  033737  001576  001332                 BIT     BITS+<17*2>,TSTNMS        ;DO THIS TEST?
   017106  001002                                 BNE     .+6                ;BR IF YES
   017110  000137  017542                         JMP     TST20              ;NO--JUMP TO TEST20

   017114  012737  000017  001116                 MOV     #17,$TSTNM         ;SET TEST #17 AND CLEAR ($ERFLG)
   017122  004737  030142                         JSR     PC,LODPRM          ;LOAD THE PARMETERS FOR THE TEST
   017126  012737  017216  001124                 MOV     #TEST17,$LPERR     ;SETUP THE LOOP ON ERROR ADDRESS
   017134  013737  002336  001220                 MOV     RPT,$TIMES         ;GET THE ITERATION COUNT
   017142  113737  001464  001131                 MOVB    ERR.CT,$ERMAX      ;MAX ERRORS ALLOWED FOR TEST
   017150  012737  000017  001240                 MOV     #17,$TESTN         ;;SET TEST NUMBER IN APT MAIL BOX

   017156  032777  010000  161770                 BIT     #SW12,@SWR         ;INHIBIT TYPING TEST NUMBER ?
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```
        017164  001406                          BEQ     .+16            ;BR IF YES
        017166  104401  047617                  TYPE    ,MSGTST         ;TYPE 'TEST'
        017172  013746  001240                  MOV     $TESTN,-(SP)    ;;SAVE $TESTN FOR TYPEOUT
        017176  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
        017200     003                          .BYTE   3               ;;TYPE 3 DIGIT(S)
        017201     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS

     83 017202  012737  017540  001350          MOV     #EXIT17,BYPASS
        017210  012737  017216  001122          MOV     #TEST17,$LPADR  ;SETUP THE LOOP ADDRESS
        017216                          TEST17:
     84 017216  012706  001100                  MOV     #STACK,SP       ;SET THE STACK POINTER
     85 017222  004737  033730                  JSR     PC,FILBUF       ;FILL THE BUFFER WITH TRACK ADDRESS
     86 017226  012737  000161  047100          MOV     #WRITE,DTADPB+2 ;COMMAND=WRITE DATA
     87 017234  013737  002340  047110          MOV     FC,DTADPB+12    ;CYLINDER
     88 017242  113737  002354  047106          MOVB    FS,DTADPB+10    ;SECTOR
     89 017250  012737  177400  047102          MOV     #SCTRWC,DTADPB+4        ;WORD COUNT
     90 017256  012737  054522  047104          MOV     #BUFFER,DTADPB+6        ;BUFFER ADDRESS
     91 017264  005000                          CLR     R0              ;TRACK=0
     92 017266  012737  017266  001124          MOV     #.,$LPERR       ;SETUP THE ERROR LOOP ADDRESS
        017274  012706  001100                  MOV     #STACK,SP       ;LOAD THE STACK POINTER
     93
     94 017300  110037  047107          1$:     MOVB    R0,DTADPB+11    ;TRACK ADDRESS
     95 017304  004037  031204                  JSR     R0,DRVCAL       ;START A DATA TRANSFER
     96 017310  062737  001000  047104          ADD     #256.*2.,DTADPB+6       ;UPDATE BUFFER ADDRESS
     97 017316  005200                          INC     R0              ;UPDATE TRACK NUMBER
     98 017320  023700  001374                  CMP     LSTRK,R0        ;OUT OF TRACKS?
     99 017324  002365                          BGE     1$              ;NO--BRANCH
    100 017326  012737  054522  047104          MOV     #BUFFER,DTADPB+6        ;BUFFER ADDRESS
    101 017334  005000                          CLR     R0
    102 017336  012737  017336  001124          MOV     #.,$LPERR       ;SETUP THE ERROR LOOP ADDRESS
        017344  012706  001100                  MOV     #STACK,SP       ;LOAD THE STACK POINTER
    103
    104 017350  012737  000151  047100          MOV     #WRCKD,DTADPB+2 ;COMMAND=WRITE CHECK
    105 017356  110037  047107          2$:     MOVB    R0,DTADPB+11    ;TRACK ADDRESS
    106 017362  004037  031204                  JSR     R0,DRVCAL       ;START A DATA TRANSFER
    107 017366  062737  001000  047104          ADD     #256.*2.,DTADPB+6       ;UPDATE BUFFER ADDRESS
    108 017374  005200                          INC     R0              ;UPDATE TRACK NUMBER
    109 017376  023700  001374                  CMP     LSTRK,R0        ;OUT OF TRACKS?
    110 017402  002365                          BGE     2$              ;NO--BRANCH
    111 017404  005000                          CLR     R0              ;FIRST TRACK ADDRESS
    112
    113 017406  110037  047107          3$:     MOVB    R0,DTADPB+11    ;TRACK
    114 017412  010001                          MOV     R0,R1           ;FORM BUFFER ADDRESS
    115 017414  012737  054522  047104          MOV     #BUFFER,DTADPB+6        ;BUFFER ADDRESS
    116 017422  005301                  4$:     DEC     R1
    117 017424  002411                          BLT     5$
    118 017426  062737  001000  047104          ADD     #256.*2.,DTADPB+6
    119 017434  000772                          BR      4$
    120 017436  012737  017436  001124          MOV     #.,$LPERR       ;SETUP THE ERROR LOOP ADDRESS
        017444  012706  001100                  MOV     #STACK,SP       ;LOAD THE STACK POINTER
    121 017450  012737  000161  047100  5$:     MOV     #WRITE,DTADPB+2 ;COMMAND=WRITE DATA
    122 017456  004037  031204                  JSR     R0,DRVCAL       ;START A DATA TRANSFER
    123
    124 017462  062737  001000  047104  6$:     ADD     #256.*2.,DTADPB+6       ;UPDATE BUFFER ADDRESS
    125 017470  105237  047107                  INCB    DTADPB+11       ;MOVE TO NEXT TRACK
    126 017474  012737  017474  001124          MOV     #.,$LPERR       ;SETUP THE ERROR LOOP ADDRESS
        017502  012706  001100                  MOV     #STACK,SP       ;LOAD THE STACK POINTER
    017506  012737  000151  047100          MOV     #WRCKD,DTADPB+2 ;COMMAND=WRITE CHECK DATA
    017514  004037  031204                  JSR     R0,DRVCAL       ;START A DATA TRANSFER
    017520  123737  001374  047107          CMPB    LSTRK,DTADPB+11 ;OUT OF TRACKS?
    017526  003355                          BGT     6$              ;NO--BRANCH
    017530  005200                          INC     R0              ;NEXT TRACK TO WRITE
    017532  023700  001374                  CMP     LSTRK,R0        ;OUT OF TRACKS?
    017536  003323                          BGT     3$              ;NO--BRANCH
    017540  000004                  EXIT17: SCOPE                   ;CALL SCOPE ROUTINE



                                    ;;*************************************************************
                                    ;*TEST 20       DATA TEST
                                    ;*THIS TEST PERFORMS DATA STORAGE AND RETRIEVAL ON CYLINDERS
                                    ;*''FC'' THROUGH ''LC'' BY THE INCREMENT ''IC'' USING THE DATA PATTERNS
                                    ;*SPECIFIED. THE FOLLOWING SEQUENCE OCCURS FOR EACH CYLINDER:
                                    ;* (1.  SET ''NT'' TO ''FT'' THEN REPEAT 2-4 UNTIL ''NT'' > ''LT''
                                    ;* (2.  WRITE THEN WRITE CHECK ''FS'' THROUGH ''LS'' OF TRACK ''NT''
                                    ;* (3.  READ THEN SOFTWARE COMPARE ''FS'' THROUGH ''LS'' OF TRACK ''NT''
                                    ;* (4.  INCREMENT ''NT'' BY ''IT''
                                    ;* (5.  REPEAT STEPS 1-4 FOR EACH DATA PATTERN
                                    ;* (6.  REPEAT STEPS 1-5 FOR ''FC'' THROUGH ''LC'' ADVANCING BY ''IC''
                                    ;*
                                    ;*IF A WRITE CHECK ERROR OCCURS THE ERROR IS REPORTED AND
                                    ;*THE TRACK IN ERROR IS REWRITTEN AND CHECKED. THIS CHFCK IS
                                    ;*ACCOMPLISHED BY PERFORMING TWO(2) SUCCESSIVE ERROR FREE
                                    ;*WRITE CHECKS. IF THE CHECK FAILS THE ERROR IS REPORTED AS
                                    ;*FATAL AND NO READ OCCURS.
                                    ;*FS DEFAULTS TO 1 AND LS DEFAULTS TO 0
                                    ;*PAT DEFAULTS TO 177777 (ALL POSSIBLE PATTERNS)
                                    ;;*************************************************************
        017542                      TST20:
        017542  000240                          NOP
        017544  033737  001540  001334          BIT     BITS+<20*2-40>,TSTNMS+2 ;DO THIS TEST ?
        017552  001002                          BNE     .+6             ;BR IF YES
        017554  000137  020322                  JMP     TST21           ;NO--JUMP TO TEST21

        017560  012737  000020  001116          MOV     #20,$TSTNM      ;SET TEST #20 AND CLEAR ($ERFLG)
        017566  004737  030142                  JSR     PC,LODPRM       ;LOAD THE PARMETERS FOR THE TEST
        017572  012737  017770  001124          MOV     #TEST20,$LPERR  ;SETUP THE LOOP ON ERROR ADDRESS
        017600  013737  002336  001220          MOV     RPT,$TIMES      ;GET THE ITERATION COUNT
        017606  113737  001464  001131          MOVB    ERR.CT,$ERMAX   ;MAX ERRORS ALLOWED FOR TEST
        017614  012737  000020  001240          MOV     #20,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

        017622  032777  010000  161324          BIT     #SW12,@SWR      ;INHIBIT TYPING TEST NUMBER ?
        017630  001406                          BEQ     .+16            ;BR IF YES
        017632  104401  047617                  TYPE    ,MSGTST         ;TYPE 'TEST'
        017636  013746  001240                  MOV     $TESTN,-(SP)    ;;SAVE $TESTN FOR TYPEOUT
        017642  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
        017644     003                          .BYTE   3               ;;TYPE 3 DIGIT(S)
        017645     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS


                                                ;SET UP THE TRACK WORD COUNT FOR DATA TRANFER

    017646  012737  017646  001122              MOV     #.,$LPADR       ;SETUP THE LOOP ADDRESS
    017654  005000                              CLR     R0              ;CLEAR SWITCH
    017656  005004                              CLR     R4              ;FORM WORD COUNT IN R4
    164 017660  013701  002356                    MOV     LS,R1             ;LOAD LAST SECTOR
    165 017664  163701  002354                    SUB     FS,R1             ;COMPARE WITH FIRST SECTOR
    166 017670  002004                            BGE     1$                ;SKIP NEXT IF FS < OR = LS
    167
    168 017672  063701  002470                    ADD     PRMLMT+24,R1      ;ADD MAXIMUM SECTOR ADDRESS TO
    169 017676  005201                            INC     R1                ;MAKE THE DIFFERENCE POSITIVE
    170 017700  005100                            COM     R0                ;SET SWITCH FOR FS > LS
    171
    172 017702  062704  000400          1$:       ADD     #256.,R4          ;WORDS/SECTOR
    173 017706  005301                            DEC     R1                ;LS - FS SECTORS MINUS ONE
    174 017710  002374                            BGE     1$                ;INCR. WORD COUNT IF NO. SECTORS STILL +
    175 017712  005404                            NEG     R4                ;FORM NEGATIVE WORD COUNT
    176 017714  010405                            MOV     R4,R5             ;COPY NORMAL WORD COUNT INTO SMALL WC
    177 017716  005700                            TST     R0                ;FS > LS SWITCH SET?
    178 017720  001412                            BEQ     3$                ;NO, SKIP NEXT
    179
    180 017722  005005                            CLR     R5                ;FORM WORD COUNT FOR FS > LS
    181 017724  013701  002470                    MOV     PRMLMT+24,R1      ;MAX SECTOR ADDRESS
    182 017730  163701  002354                    SUB     FS,R1             ;SUBTRACT THE FIRST SECTOR
    183 017734  062705  000400          2$:       ADD     #256.,R5          ;WORDS/SECTOR
    184 017740  005301                            DEC     R1                ;NO SECTORS MINUS ONE
    185 017742  002374                            BGE     2$                ;INCR. WORD COUNT IF NO. SECTORS STILL +
    186 017744  005405                            NEG     R5                ;FORM NEGATIVE WORD COUNT FOR THIS CASE
    187
    188                                           ;SET UP FOR DATA TRANSFERS AND PATTERN VARIATIONS
    189
    190 017746  113737  002354  047106  3$:       MOVB    FS,DTADPB+10      ;SECTOR
    191 017754  012737  054522  047104            MOV     #BUFFER,DTADPB+6          ;DATA BUFFER
    220 017762  012737  020320  001350            MOV     #EXIT20,BYPASS
        017770                          TEST20:
        017770  012706  001100                    MOV     #STACK,SP         ;LOAD THE STACK POINTER
        017774  005037  001434                    CLR     WCEFLG  ;CLEAR THE WRITE CHECK ERROR FLAG
        020000  013701  002340                    MOV     FC,R1             ;PICKUP FIRST CYLINDER
        020004  000407                            BR      2$                ;SKIP PATTERN SET-UP FIRST TIME THRU

        020006  005720                  1$:       TST     (R0)+             ;MOVE TO NEXT DATA PATTERN
        020010  022700  000040                    CMP     #16.*2.,R0        ;OUT OF PATTERNS?
        020014  003004                            BGT     3$                ;NO, STAY ON THIS CYLINDER UNTIL DONE
        020016  004037  033654                    JSR     R0,INCCYL         ;MOVE TO NEXT CYLINDER
        020022  000536                            BR      EXIT20            ;OUT OF CYLINDERS

                                                  ;DO NEXT CYLINDER

        020024  005000                  2$:       CLR     R0                ;START WITH PATTERN 0
        020026  036037  001540  002360  3$:       BIT     BITS(R0),PAT              ;THIS PATTERN SELECTED?
        020034  001764                            BEQ     1$                ;NO, GO BACK AND GET ONE THAT WAS
        020036  013702  002346                    MOV     FT,R2             ;FIRST TRACK
        020042  010137  047110                    MOV     R1,DTADPB+12      ;LOAD THE CYLINDER
        020046  110237  047107          4$:       MOVB    R2,DTADPB+11      ;LOAD THE TRACK

        020052  020127  001466                    CMP     R1,#822.          ;CHECK FOR LAST DISK CYLINDER (DEC144 FILE)
        020056  001003                            BNE     10$               ;SKIP LAST TRACK CHECK IF NOT
        020060  020237  001374                    CMP     R2,LSTRK          ;LAST DISK TRACK ?
        020064  001515                            BEQ     EXIT20            ;DON'T TEST LAST TRACK AS IT HAS BAD
                                                                            ;BLOCK INFORMATION STORED ON IT
    221 020066  010437  047102          10$:      MOV     R4,DTADPB+4       ;LOAD THE WORD COUNT
    222 020072  023701  002342                    CMP     LC,R1             ;LAST DISK CYLINDER TO TEST ?
```

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020076  003005                                BGT     5$                ;NO, SKIP TRACK CHECK
020100  023702  001374                        CMP     LSTRK,R2          ;LAST DISK TRACK TO TEST ?
020104  002002                                BGE     5$                ;NO, SKIP NEXT
020106  010537  047102                        MOV     R5,DTADPB+4       ;SHORT WORD COUNT
020112  017703  161036                5$:     MOV     @SWR,R3           ;INHIBIT WRITE AND
020116  005103                                COM     R3                ;WRITE CHECK?
020120  032703  000030                        BIT     #SW04!SW03,R3
020124  001436                                BEQ     7$                ;YES--BRANCH
020126  004737  034404                        JSR     PC,SETBUF         ;MOVE DATA PATTERN INTO THE BUFFER
020132  032777  000020  161014                BIT     #SW04,@SWR        ;INHIBIT WRITE?
020140  001012                                BNE     6$                ;YES, DO NEXT PORTION OF TESTING
020142  012737  020142  001124                MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
020150  012706  001100                        MOV     #STACK,SP         ;LOAD THE STACK POINTER
020154  012737  000161  047100                MOV     #WRITE,DTADPB+2 ;COMMAND=WRITE DATA

                                              ;DO A DATA TRANSFER

020162  004037  031204                        JSR     R0,DRVCAL         ;START A DATA TRANSFEP
020166  032777  000010  160760        6$:     BIT     #SW03,@SWR        ;INHIBIT WRITE CHECK?
020174  001012                                BNE     7$                ;YES--BRANCH
020176  012737  020176  001124                MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
020204  012706  001100                        MOV     #STACK,SP         ;LOAD THE STACK POINTER
020210  012737  000151  047100                MOV     #WRCKD,DTADPB+2 ;COMMAND=WRITE CHECK DATA
020216  004037  031204                        JSR     R0,DRVCAL         ;START A DATA TRANSFER
020222  005737  001434                7$:     TST     WCEFLG  ;WRITE CHECK ERROR FLAG SET?
020226  001404                                BEQ     8$                ;NO--BRANCH
020230  032777  000001  160716                BIT     #SW00,@SWR        ;PERFORM READ AFTER FATAL 'WCE''?
020236  001424                                BEQ     9$                ;NO--BRANCH
020240  032777  000004  160706        8$:     BIT     #SW02,@SWR        ;INHIBIT READ DATA AND SOFTWARE COMPARE?
020246  001020                                BNE     9$                ;YES--BRANCH
020250  012737  020250  001124                MOV     #.,$LPERR         ;SETUP THE ERROR LOOP ADDRESS
020256  012706  001100                        MOV     #STACK,SP         ;LOAD THE STACK POINTER
020262  012737  000171  047100                MOV     #READ,DTADPB+2    ;COMMAND=READ
020270  004037  031204                        JSR     R0,DRVCAL         ;START A DATA TRANSFER
020274  032777  000002  160652                BIT     #SW01,@SWR        ;COMPARE THE DATA?
020302  001002                                BNE     9$                ;NO--BRANCH
020304  004737  034474                        JSR     PC,DATCMP         ;YES--DO IT
020310  004037  033624                9$:     JSR     R0,INCTRK         ;MOVE TO NEXT TRACK
020314  000634                                BR      1$                ;OUT OF TRACKS GO TO NEXT PATTERN
020316  000653                                BR      4$                ;LOOP
020320  000004                        EXIT20: SCOPE                     ;CALL SCOPE ROUTINE



                                      ;;*************************************************************
                                      ;*TEST 21          RANDOM ADDRESS AND RANDOM PATTERN TEST
                                      ;*STARTING AT 'FC'' AND GOING SEQUENTIALLY TO 'LC'' THE DISK
                                      ;*PACK IS WRITTEN WITH A RANDOM PATTERN. THE FIRST TWO WORDS
                                      ;*OF EACH SECTOR WILL BE THE BASE OF THE RANDOM GENERATOR
                                      ;*FOR THAT SECTOR.

                                      ;*THE TEST THEN PERFORMS THE FOLLOWING SEQUENCE 'R'' TIMES
                                      ;*'R'' DEFAULTS TO 1000.
                                      ;*
                                      ;*1)     GENERATE A RANDOM SECTOR ADDRESS
                                      ;*2)     WRITE A RANDOM PATTERN AT THE ADDRESS
                                      ;*       GENERATED IN 1.
                                      ;*3)     GENERATE A NEW RANDOM SECTOR ADDRESS
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                                ;*4)    READ THE SECTOR AT THE ADDRESS
                                ;*      GENERATED IN 3.
                                ;*5)    DO A SOFTWARE CHECK OF THE DATA READ IN 4 AGAINST
                                ;*      THE ORIGINAL RANDOM PACK DATA.
                                ;*6)    DO A WRITE CHECK OF THE DATA WRITTEN IN 2
                                ;*7)    GENERATE A NEW RANDOM SECTOR ADDRESS
                                ;*8)    READ THE SECTOR AT THE ADDRESS
                                ;*      GENERATED IN 7.
                                ;*9)    DO A SOFTWARE CHECK OF THE DATA READ IN 8
                                ;*10)   DO A WRITE CHECK OF THE DATA WRITTEN IN 2
                                ;;**************************************************************
020322                          TST21:
020322  000240                          NOP
020324  033737  001542  001334          BIT     BITS+<21*2-40>,TSTNMS+2 ;DO THIS TEST ?
020332  001002                          BNE     .+6                     ;BR IF YES
020334  000137  021140                  JMP     TST22                   ;NO--JUMP TO TEST22

020340  012737  000021  001116          MOV     #21,$TSTNM              ;SET TEST #21 AND CLEAR ($ERFLG)
020346  004737  030142                  JSR     PC,LODPRM               ;LOAD THE PARMETERS FOR THE TEST
020352  012737  020616  001124          MOV     #TEST21,$LPERR          ;SETUP THE LOOP ON ERROR ADDRESS
020360  013737  002336  001220          MOV     RPT,$TIMES              ;GET THE ITERATION COUNT
020366  113737  001464  001131          MOVB    ERR.CT,$ERMAX           ;MAX ERRORS ALLOWED FOR TEST
020374  012737  000021  001240          MOV     #21,$TESTN              ;;SET TEST NUMBER IN APT MAIL BOX

020402  032777  010000  160544          BIT     #SW12,@SWR              ;INHIBIT TYPING TEST NUMBER ?
020410  001406                          BEQ     .+16                    ;BR IF YES
020412  104401  047617                  TYPE    ,MSGTST                 ;TYPE 'TEST'
020416  013746  001240                  MOV     $TESTN,-(SP)            ;;SAVE $TESTN FOR TYPEOUT
020422  104403                          TYPOS                           ;;GO TYPE--OCTAL ASCII
020424     003                          .BYTE   3                       ;;TYPE 3 DIGIT(S)
020425     000                          .BYTE   0                       ;;SUPPRESS LEADING ZEROS

020426  012737  020426  001122          MOV     #.,$LPADR               ;SETUP THE LOOP ADDRESS
020434  012737  021136  001350          MOV     #EXIT21,BYPASS
020442  012737  176543  026524          MOV     #176543,$HINUM          ;PRIME THE RANDOM NUMBER GENERATOR
020450  012737  123456  026526          MOV     #123456,$LONUM
020456  013737  002340  047110          MOV     FC,DTADPB+12            ;CYLINDER
020464  013737  001452  047102          MOV     TRCKWC,DTADPB+4 ;WORD COUNT FOR 32/30 SECTORS (FULL TRACK
020472  012737  054522  047104          MOV     #BUFFER,DTADPB+6                ;BUFFER ADDRESS
020500  012737  000161  047100          MOV     #WRITE,DTADPB+2 ;COMMAND
020506  032737  100000  001314          BIT     #SW15,C.SWR             ;WRITE THE DISK PACK BEFORE TESTING?
020514  001027                          BNE     3$                      ;NO--BEGIN TESTING
020516  004037  035012                  JSR     R0,FILRAN               ;FILL DATA BUFFER WITH RANDOM DATA
020522  005037  047106          1$:     CLR     DTADPB+10               ;SECTOR AND TRACK
020526  012737  020526  001124          MOV     #.,$LPERR               ;SETUP THE ERROR LOOP ADDRESS
020534  012706  001100                  MOV     #STACK,SP               ;LOAD THE STACK POINTER
020540                          2$:
020540  004037  031204                  JSR     R0,DRVCAL               ;START A DATA TRANSFER
020544  105237  047107                  INCB    DTADPB+11               ;NEXT TRACK
020550  123737  001374  047107          CMPB    LSTRK,DTADPB+11                 ;TIME FOR NEXT CYLINDER ?
020556  002370                          BGE     2$                      ;NO--DO NEXT TRACK ON THIS CYL.
020560  005237  047110                  INC     DTADPB+12               ;INCR CYLINDER ADDRESS
020564  023737  002342  047110          CMP     LC,DTADPB+12            ;OUT OF CYLINDERS?
020572  002353                          BGE     1$                      ;NO--CONTINUE SEQUENTIAL RANDOM WRITE


020574  012737  177400  047102  3$:     MOV     #SCTRWC,DTADPB+4                ;WORD COUNT
```

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 318 020602  012737  020616  001122          MOV     #TEST21,$LPADR
     020610  012737  020616  001124          MOV     #TEST21,$LPERR
     020616                          TEST21:
 319 020616  012706  001100                  MOV     #STACK,SP          ;SET STACK POINTER
 320 020622  004037  035266                  JSR     R0,RANADR          ;GENERATE A RANDOM ADDRESS
 321 020626  013737  047106  001440          MOV     DTADPB+10,SVADR    ;SAVE THE TRACK/SECTOR
 322 020634  013737  047110  001442          MOV     DTADPB+12,SVADR+2          ;SAVE THE CYLINDER
 323 020642  012737  000161  047100          MOV     #WRITE,DTADPB+2    ;COMMAND=WRITE DATA
 324 020650  012701  054522                  MOV     #BUFFER,R1         ;WRITE BUFFER ADDRESS FOR "RANPAT"
 325 020654  010137  047104                  MOV     R1,DTADPB+6        ;INTO THE DATA PARAMETER BLOCK
 326 020660  004037  035232                  JSR     R0,RANPAT          ;GENERATE RANDOM 256 WORD PATTERN
 327                                                                    ;AND PUT INTO THE WRITE BUFFER
 328 020664  012737  020664  001124          MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
     020672  012706  001100                  MOV     #STACK,SP          ;LOAD THE STACK POINTER
 329 020676  004037  031204                  JSR     R0,DRVCAL          ;START A DATA TRANSFER
 330
 331 020702  004037  035266                  JSR     R0,RANADR          ;GENERATE A NEW RANDOM ADDRESS
 332 020706  012737  000171  047100          MOV     #READ,DTADPB+2     ;COMMAND=READ DATA
 333 020714  012737  055522  047104          MOV     #BUFFER+512.,DTADPB+6      ;READ BUFFER ADDRESS
 334 020722  012737  020722  001124          MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
     020730  012706  001100                  MOV     #STACK,SP          ;LOAD THE STACK POINTER
 335 020734  004037  031204                  JSR     R0,DRVCAL          ;START A DATA TRANSFER
 336 020740  005737  001466                  TST     BASFLG             ;IF BAD SECTOR ENCOUNTERED,SKIP NEXT CALL
 337 020744  100402                          BMI     .+6                ;DON'T COMPARE DATA
 338 020746  004037  035034                  JSR     R0,RANCK           ;SOFTWARE CHECK THE DATA
 339
 340 020752  013737  001440  047106          MOV     SVADR,DTADPB+10    ;GET ADDRESS OF WHERE THE LAST
 341 020760  013737  001442  047110          MOV     SVADR+2,DTADPB+12          ;WRITE WAS PERFORMED
 342 020766  012737  000151  047100          MOV     #WRCKD,DTADPB+2    ;COMMAND=WRITE CHECK DATA
 343 020774  012737  054522  047104          MOV     #BUFFER,DTADPB+6           ;DATA BUFFER ADDRESS FOR HARDWARE
 344                                                                    ;CHECK OF THE DATA
 345 021002  012737  021002  001124          MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
     021010  012706  001100                  MOV     #STACK,SP          ;LOAD THE STACK POINTER
 346 021014  004037  031204                  JSR     R0,DRVCAL          ;START A DATA TRANSFER
 347
 348 021020  004037  035266                  JSR     R0,RANADR          ;GENERATE A NEW RANDOM ADDRESS
 349 021024  012737  000171  047100          MOV     #READ,DTADPB+2     ;COMMAND=READ
 350 021032  012737  055522  047104          MOV     #BUFFER+512.,DTADPB+6      ;DATA BUFFER ADDRESS
 351 021040  012737  021040  001124          MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
     021046  012706  001100                  MOV     #STACK,SP          ;LOAD THE STACK POINTER
 352 021052  004037  031204                  JSR     R0,DRVCAL          ;START A DATA TRANSFER
 353 021056  005737  001466                  TST     BASFLG             ;ENCOUNTER BAD SECTOR ?
 354 021062  100402                          BMI     .+6                ;DON'T COMPARE DATA IF SO
 355 021064  004037  035034                  JSR     R0,RANCK           ;SOFTWARE CHECK THE DATA
 356
 357 021070  013737  001440  047106          MOV     SVADR,DTADPB+10    ;GET DISK ADDRESS OF THE
 358 021076  013737  001442  047110          MOV     SVADR+2,DTADPB+12          ;LAST WRITE
 359 021104  012737  000151  047100          MOV     #WRCKD,DTADPB+2    ;COMMAND=WRITE CHECK DATA
 360 021112  012737  054522  047104          MOV     #BUFFER,DTADPB+6           ;DATA BUFFER ADDRESS
 361 021120  012737  021120  001124          MOV     #.,$LPERR          ;SETUP THE ERROR LOOP ADDRESS
     021126  012706  001100                  MOV     #STACK,SP          ;LOAD THE STACK POINTER
 362 021132  004037  031204                  JSR     R0,DRVCAL          ;START A DATA TRANSFER
 363 021136  000004                  EXIT21: SCOPE                      ;CALL SCOPE ROUTINE
 364
 371
 372                                 ;;*****************************************************************
                                     ;*TEST 22        SEEK TIME ADJUSTMENT TEST
```

```
                                                 ;*THIS TEST PERFORMS SEEKS BETWEEN CYLINDERS 0 & 255 TO ALLOW THE
                                                 ;*OPERATOR TO ADJUST THE AVERAGE SEEK TIME ON AN RM05/3/2 USING THE
                                                 ;*DDU.  THE PROGRAM STALLS APPROXIMATELY 5 SECONDS BETWEEN SEEKS
                                                 ;*SO THAT THE AVERAGE SEEK TIME INDICATORS ON THE DDU MAY BE OBSERVED.
                                                 ;;*****************************************************************
    021140                                       TST22:
    021140  000240                                       NOP
    021142  033737  001544  001334                        BIT     BITS+<22*2-40>,TSTNMS+2 ;DO THIS TEST ?
    021150  001002                                       BNE     .+6             ;BR IF YES
    021152  000137  021334                                JMP     $EOP            ;NO--GO TO THE END OF THE PROGRAM

    021156  012737  000022  001116                        MOV     #22,$TSTNM      ;SET TEST #22 AND CLEAR ($ERFLG)
    021164  004737  030142                                JSR     PC,LODPRM       ;LOAD THE PARMETERS FOR THE TEST
    021170  012737  021252  001124                        MOV     #TEST22,$LPERR  ;SETUP THE LOOP ON ERROR ADDRESS
    021176  013737  002336  001220                        MOV     RPT,$TIMES      ;GET THE ITERATION COUNT
    021204  112737  000144  001131                        MOVB    #100.,$ERMAX    ;MAX ERRORS ALLOWED FOR TEST
    021212  012737  000022  001240                        MOV     #22,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

    021220  032777  010000  157726                        BIT     #SW12,@SWR      ;INHIBIT TYPING TEST NUMBER ?
    021226  001406                                        BEQ     .+16            ;BR IF YES
    021230  104401  047617                                TYPE    ,MSGTST         ;TYPE 'TEST'
    021234  013746  001240                              . MOV     $TESTN,-(SP)    ;;SAVE $TESTN FOR TYPEOUT
    021240  104403                                        TYPOS                   ;;GO TYPE--OCTAL ASCII
    021242     003                                        .BYTE   3               ;;TYPE 3 DIGIT(S)
    021243     000                                        .BYTE   0               ;;SUPPRESS LEADING ZEROS

    021244  012737  021252  001122                        MOV     #TEST22,$LPADR  ;SETUP THE LOOP ADDRESS
    021252                                       TEST22:
    021252  012706  001100                                MOV     #STACK,SP       ;SETUP THE STACK POINTER
    021256  013737  002342  047030                        MOV     LC,DPB.A+12     ;ENDING CYLINDER
    021264  112737  000105  047020                        MOVB    #SEEK,DPB.A+2   ;SEEK=COMMAND
    021272  004037  030402                                JSR     R0,CALL.A       ;GO EXECUTE THE COMMAND
    021276  004037  032326                                JSR     R0,STALL        ;STALL
    021302  001460                                        .WORD   STALL3          ;ADDRESS OF STALL VALUE
    021304  013737  002340  047030                        MOV     FC,DPB.A+12     ;STARTING CYLINDER
    021312  112737  000105  047020                        MOVB    #SEEK,DPB.A+2   ;SEEK=COMMAND
    021320  004037  030402                                JSR     R0,CALL.A       ;GO EXECUTE THE COMMAND
    021324  004037  032326                                JSR     R0,STALL        ;STALL
    021330  001460                                        .WORD   STALL3          ;ADDRESS OF STALL VALUE
    021332  000004                               EXIT22:  SCOPE                   ;CALL SCOPE ROUTINE
```

```
                                    .SBTTL  END OF PASS ROUTINE

                                    ;;*****************************************************************
                                    ;*INCREMENT THE PASS NUMBER ($PASS)
                                    ;*INDICATE END-OF-PROGRAM AFTER 8. PASSES THRU THE PROGRAM
                                    ;*IF THERES A MONITOR GO TO IT
                                    ;*IF THERE ISN'T JUMP TO RTURN

      021334                        $EOP:
      021334  104401  021342                TYPE    ,65$                ;;TYPE ASCIZ STRING
      021340  000407                        BR      64$                 ;;GET OVER THE ASCIZ
                                    ;;65$:  .ASCIZ  <CRLF><LF>/END OF PASS/
      021360                        64$:
      021360  104401  021366                TYPE    ,67$                ;;TYPE ASCIZ STRING
      021364  000405                        BR      66$                 ;;GET OVER THE ASCIZ
                                    ;;67$:  .ASCIZ  / ON DRIVE/
      021400                        66$:
      021400  013746  001352                MOV     CHKDRV,-(SP)        ;;SAVE CHKDRV FOR TYPEOUT
      021404  104403                        TYPOS                       ;;GO TYPE--OCTAL ASCII
      021406     002                        .BYTE   2                   ;;TYPE 2 DIGIT(S)
      021407     000                        .BYTE   0                   ;;SUPPRESS LEADING ZEROS
      021410  005737  001126                TST     $ERTTL              ;ANY ERRORS DETECTED ?
      021414  001420                        BEQ     1$                  ;BR IF NO
      021416  104401  021424                TYPE    ,69$                ;;TYPE ASCIZ STRING
      021422  000412                        BR      68$                 ;;GET OVER THE ASCIZ
                                    ;;69$:  .ASCIZ  /   ERRORS DETECTED=/
      021450                        68$:
      021450  013746  001126                MOV     $ERTTL,-(SP)        ;;SAVE $ERTTL FOR TYPEOUT
      021454  104402                        TYPOC                       ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
      021456  005037  001126        1$:     CLR     $ERTTL              ;ZERO ERROR TOTAL
      021462  005037  001116                CLR     $TSTNM              ;;ZERO THE TEST NUMBER
      021466  005037  001220                CLR     $TIMES              ;;ZERO THE NUMBER OF ITERATIONS
      021472  005237  001242                INC     $PASS               ;;INCREMENT THE PASS NUMBER
      021476  042737  100000  001242        BIC     #100000,$PASS       ;;DON'T ALLOW A NEG. NUMBER
      021504  005327                        DEC     (PC)+               ;;LOOP?
      021506  000010                $EOPCT: .WORD   8.
      021510  003027                        BGT     $DOAGN              ;;YES
      021512  012737                        MOV     (PC)+,@(PC)+        ;;RESTORE COUNTER
      021514  000010                $ENDCT: .WORD   8.
      021516  021506                        $EOPCT
      021520  104401  021526                TYPE    ,65$                ;;TYPE ASCIZ STRING
      021524  000407                        BR      64$                 ;;GET OVER THE ASCIZ
                                    ;;65$:  .ASCIZ  <CRLF>/END OF TEST/<CRLF>
      021544                        64$:
      021544  104401  021574                TYPE    ,$ENULL             ;TYPE NULL CHARACTER
      021550  013700  000042        $GET42: MOV     @#42,R0             ;;GET MONITOR ADDRESS
      021554  001405                        BEQ     $DOAGN              ;;BRANCH IF NO MONITOR
      021556  000005                        RESET                       ;;CLEAR THE WORLD
      021560  004710                $ENDAD: JSR     PC,(R0)             ;;GO TO MONITOR
      021562  000240                        NOP                         ;;SAVE ROOM
      021564  000240                        NOP                         ;;FOR
      021566  000240                        NOP                         ;;ACT11
      021570                        $DOAGN:
      021570  000137                        JMP     @(PC)+              ;;RETURN
      021572  021600                $RTNAD: .WORD   RTURN
      021574     377     377     000 $ENULL: .BYTE   -1,-1,0             ;;NULL CHARACTER STRING
                                            .EVEN
```

```
  021600  012706  001100          RTURN:  MOV     #STACK,SP       ;RESTORE STACK
  021604  004737  024060                  JSR     PC,$TKINT       ;MAKE SURE KEYBOARD INTERRUPT AND
  021610  004737  027426                  JSR     PC,ST.CLK       ;INITIALIZE THE CLOCK
  021614  000137  006662                  JMP     RSTART          ;RETURN TO RESTART
```

```
                                        .SBTTL  ERROR HANDLER ROUTINE

                                        ;;*****************************************************************
                                        ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                        ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
                                        ;*AND GO TO TYPERR ON ERROR
                                        ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                        ;*SW15=1         HALT ON ERROR
                                        ;*SW13=1         INHIBIT ERROR TYPEOUTS
                                        ;*SW10=1         BELL ON ERROR
                                        ;*SW09=1         LOOP ON ERROR
                                        ;*CALL
                                        ;*       ERROR   N        ;;ERROR=EMT AND N=ERROR ITEM NUMBER

021620  105037  022260                  $ERROR: CLRB    IBSAVE            ;;CLEAR THE ITEM BYTE SAVE LOCATION
021624  104407                                  CKSWR                     ;;TEST FOR CHANGE IN SOFT-SWR
021626  032777  000400  157320                  BIT     #SW08,@SWR        ;SEND ERROR MESSAGE TO TTY?
021634  001411                                  BEQ     7$                ;YES--BRANCH
021636  005737  001326                          TST     LPTAVL            ;IS THERE A LINE PRINTER AVAILABLE?
021642  001406                                  BEQ     7$                ;NO--BRANCH
021644  013737  001534  001164                  MOV     LPS,$TPS          ;YES--SETUP STATUS
021652  013737  001536  001166                  MOV     LPB,$TPB          ;AND BUFFER REG.'S FOR LINE PRINTER
021660  105237  001117                  7$:     INCB    $ERFLG            ;;SET THE ERROR FLAG
021664  001775                                  BEQ     7$                ;;DON'T LET THE FLAG GO TO ZERO
021666  013777  001116  157262                  MOV     $TSTNM,@DISPLAY   ;;DISPLAY TEST NUMBER AND ERROR FLAG
021674  032777  002000  157252                  BIT     #BIT10,@SWR       ;;BELL ON ERROR?
021702  001402                                  BEQ     1$                ;;NO - SKIP
021704  104401  001224                          TYPE    ,$BELL            ;;RING BELL
021710  005237  001126                  1$:     INC     $ERTTL            ;;COUNT THE NUMBER OF ERRORS
021714  011637  001132                          MOV     (SP),$ERRPC       ;;GET ADDRESS OF ERROR INSTRUCTION
021720  162737  000002  001132                  SUB     #2,$ERRPC
021726  117737  157200  001130                  MOVB    @$ERRPC,$ITEMB    ;;STRIP AND SAVE THE ERROR ITEM CODE
021734  032777  001000  157212                  BIT     #BIT09,@SWR       ;;SEE IF LOOP ON ERROR IS SET
021742  001060                                  BNE     1004$             ;;BRANCH AROUND ROUTINE IF SO
021744  122737  000177  001130                  CMPB    #177,$ITEMB       ;;SEE IF THIS IS THE POWER FAIL CALL
021752  001454                                  BEQ     1004$             ;;BRANCH AROUND ROUTINE IF IT IS
021754  105737  022260                          TSTB    IBSAVE            ;;SEE IF THIS IS THE 2ND ERROR CALL IN THIS ROUTINE
021760  001047                                  BNE     1003$             ;;BRANCH IF SO
021762  022737  177777  022256                  CMP     #-1,CPSAVE        ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
021770  001445                                  BEQ     1004$             ;;BRANCH IF SO
021772  013746  000004                          MOV     ERRVEC,-(SP)      ;;SAVE CONTENTS OF ERROR VECTOR
021776  012737  022014  000004                  MOV     #1000$,ERRVEC     ;;SETUP 'TRAP' RETURN ADDRESS
022004  013737  177766  022256                  MOV     177766,CPSAVE     ;;MOVE CPU ERROR REGISTER TO CPSAVE FOR TEST
022012  000406                                  BR      1001$
022014  012737  177777  022256          1000$:  MOV     #-1,CPSAVE        ;;SET CPU ERROR REGISTER TIMEOUT INDICATOR
022022  012716  022030                          MOV     #1001$,(SP)       ;;SETUP RETURN ADDRESS
022026  000002                                  RTI
022030  012637  000004                  1001$:  MOV     (SP)+,ERRVEC      ;;RESTORE CONTENTS OF ERROR VECTOR

022034  022737  177777  022256          1002$:  CMP     #-1,CPSAVE        ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
022042  001420                                  BEQ     1004$             ;;BRANCH IF SO
022044  032737  000001  022256                  BIT     #BIT00,CPSAVE     ;;SEE IF POWER MONITOR BIT IS SET IN CPU ERR REG
022052  001414                                  BEQ     1004$             ;;BRANCH IF OK
022054  042737  000001  177766                  BIC     #BIT00,177766     ;;CLEAR THE BIT FOUND SET
022062  113737  001130  022260                  MOVB    $ITEMB,IBSAVE     ;;MAKE IBSAVE NON-ZERO FOR DUAL ERROR CALL
022070  112737  000177  001130                  MOVB    #177,$ITEMB       ;;SET $ITEMB TO SPECIAL POWER FAIL POINTER
022076  000402                                  BR      1004$             ;;BRANCH OVER IBSAVE CLEARING
```

```
022100  105037  022260          1003$:  CLRB    IBSAVE          ;;CLEAR IBSAVF SO 2ND TIME THROUGH EXITS
022104                          1004$:
022104  032777  020000  157042          BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
022112  001004                          BNE     20$             ;;SKIP TYPEOUTS
022114  004737  022262                  JSR     PC,TYPERR       ;;GO TO USER ERROR ROUTINE
022120  104401  001231                  TYPE    ,$CRLF
022124                          20$:
022124  122737  000001  001254          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
022132  001007                          BNE     2$              ;;NO,SKIP APT ERROR REPORT
022134  113737  001130  022146          MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
022142  004737  026766                  JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
022146     000                  21$:    .BYTE   0
022147     000                          .BYTE   0
022150  000777                  22$:    BR      22$             ;;APT ERROR LOOP
022152  105737  022260          2$:     TSTB    IBSAVE          ;;SEE IF IBSAVE IS LOADED
022156  001005                          BNE     3$              ;;BRANCH IF NOT - NO HALT ON PWR MON BIT ERROR
022160  005777  156770                  TST     @SWR            ;;HALT ON ERROR
022164  100002                          BPL     3$              ;;SKIP IF CONTINUE
022166  000000                          HALT                    ;;HALT ON ERROR!
022170  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
022172                          3$:
022172  105737  022260                  TSTB    IBSAVE          ;;SEE IF ITEM BYTE SAVE LOCATION HAS AN ERROR CALL
022176  001230                          BNE     7$              ;;BRANCH BACK TO CALL ORIGINAL ERROR
022200  032777  001000  156746          BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
022206  001402                          BEQ     4$              ;;BR IF NO
022210  013716  001124                  MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
022214  005737  001222          4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
022220  001402                          BEQ     5$              ;;BR IF NONE
022222  013716  001222                  MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
022226                          5$:
022226  022737  021560  000042          CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
022234  001001                          BNE     6$              ;;BRANCH IF NO
022236  000000                          HALT                    ;;YES
022240                          6$:
022240  013737  001530  001164          MOV     TPS,$TPS        ;SET STATUS AND BUFFER REG.'S
022246  013737  001532  001166          MOV     TPB,$TPB        ;FOR TTY
022254  000002                          RTI                     ;RETURN FROM ERROR CALL
022256  000000                  CPSAVE: .WORD   0               ;. OCATION TO SAVE CPU ERROR REG CONTENTS
022260  000000                  IBSAVE: .WORD   0               ;;LOCATION TO SAVE ITEM BYTE
```

```
                                        .SBTTL  TYPERR - TYPE ERROR ROUTINE

                                        ;THIS ROUTINE USES THE ''ITEM CONTROL BYTE'' ($ITEMB) TO DETERMINE
                                        ;WHICH ERROR IS TO BE REPORTED, IT THEN OBTAINS, FROM THE ''ERROR
                                        ;T^BLE'' ($ERRTB), AND REPORTS THE APPROPIATE INFORMATION
                                        ;CONCERNING THE ERROR.
                                        ;CALL
                                        ;       JSR     PC,TYPERR
                                        ;       RETURN

022262  113737  001116  001212  TYPERR: MOVB    $TSTNM,$TMP0        ;SAVE THE TEST NUMBER
022270  104412                          SAVREG                      ;SAVE R0 - R5
022272  162700  000004                  SUB     #4,R0               ;FORM TEST PC
022276  010037  001176                  MOV     R0,$REG0            ;COPY R0-R5 IN $REG0-$REG5
022302  010137  001200                  MOV     R1,$REG1
022306  010237  001202                  MOV     R2,$REG2
022312  010337  001204                  MOV     R3,$REG3
022316  010437  001206                  MOV     R4,$REG4
022322  010537  001210                  MOV     R5,$REG5
022326  113700  001130                  MOVB    $ITEMB,R0           ;PICKUP ERROR ITEM NUMBER
022332  122700  000177                  CMPB    #177,R0             ;SEE IF THIS ERROR CALL IS SPECIAL POWER FAIL CALL
022336  001007                          BNE     1$                  ;BRANCH IF NOT
022340  005001                          CLR     R1
022342  013737  001240  023040          MOV     $TESTN,PFTSTN       ;GET TEST NUMBER
022350  012700  022700                  MOV     #PFECH,R0           ;MOVE POWER FAIL ERROR CALL TABLE TO R0
022354  000412                          BR      3$
022356  010001                  1$:     MOV     R0,R1               ;AND COPY IT INTO R1
022360  005300                          DEC     R0                  ;FORM INDEX FOR ERROR TABLE
022362  106300                          ASLB    R0
022364  106300                          ASLB    R0
022366  106300                          ASLB    R0
022370  103002                          BCC     2$                  ;IS ERROR > 37?
022372  062700  000240                  ADD     #ITEM41-$ERRTB,R0           ;YES--FORM OFFSET
022376  062700  002014          2$:     ADD     #$ERRTB,R0          ;FORM ADDRESS
022402  012037  022422          3$:     MOV     (R0)+,4$            ;GET ERROR MESSAGE (EM) POINTER
022406  001451                          BEQ     9$                  ;BRANCH IF THERE ISN'T ONE
022410  004737  027216                  JSR     PC,INCEC            ;INCREMENT ERROR COUNT
022414  104401  001231                  TYPE    ,$CRLF              ;''CARRIAGE RETURN - LINE FEED
022420  104401                          TYPE
022422  000000                  4$:     .WORD   0                   ;''EM'' POINTER GOES HERE
022424  162701  000041                  SUB     #41,R1              ;SPECIAL ERROR ITEM NUMBER?
022430  100440                          BMI     9$                  ;NO--BRANCH
022432  013701  001356                  MOV     SVSTAT,R1           ;GET STATUS/ERROR INDICATOR
022436  106301                          ASLB    R1                  ;STRIP ''DONE'' BIT (BIT07)
022440  006301                          ASL     R1                  ;STRIP ''ERROR'' BIT (BIT15)
022442  012702  001762                  MOV     #STATBL,R2          ;1ST ADDRESS ON STATUS MESSAGE POINTERS
022446  005003                          CLR     R3                  ;CARRIAGE RETURN-LINE FEED SWITCH
022450  104401  022456                  TYPE    ,65$                ;;TYPE ASCIZ STRING
022454  000402                          BR      64$                 ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  / (/
022462                          64$:
022462  012237  022504          5$:     MOV     (R2)+,7$            ;MESSAGE POINTER
022466  006301                          ASL     R1                  ;TYPE THIS MESSAGE?
022470  103013                          BCC     8$                  ;NO--BRANCH
022472  005103                          COM     R3                  ;YES--TYPE A ''CR'' & ''LF''?
022474  001002                          BNE     6$                  ;NO--BRANCH
022476  104401  001231                  TYPE    ,$CRLF              ;YES
022502  104401                          6$:     TYPE
022504  000000                          7$:     .WORD   0               ;MESSAGE POINTER GOES HERE
022506  005701                                  TST     R1              ;MORE TO TYPE?
022510  001403                                  BEQ     8$              ;NO--BRANCH
022512  104401  050345                          TYPE    ,BLNKS2         ;TYPE 2 SPACES
022516  000761                                  BR      5$              ;LOOP
022520  001360                          8$:     BNE     5$              ;BRANCH IF NOT FINISHED
022522  104401  022530                          TYPE    ,67$            ;;TYPE ASCIZ STRING
022526  000401                                  BR      66$             ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  /)/
022532                                  66$:
022532  012037  022546                  9$:     MOV     (R0)+,10$       ;PICK UP DATA HEADER (DH) POINTER
022536  001404                                  BEQ     11$             ;BRANCH IF NONE
022540  104401  001231                          TYPE    ,$CRLF          ;CARRIAGE RETURN-LINE FEED
022544  104401                                  TYPE
022546  000000                          10$:    .WORD   0               ;'DH'' POINTER GOES HERE
022550  012001                          11$:    MOV     (R0)+,R1        ;PICKUP DATA TABLE (DT) POINTER
022552  001450                                  BEQ     20$             ;BRANCH IF NONE
022554  005005                                  CLR     R5              ;SET INDENT SWITCH
022556  012000                                  MOV     (R0)+,R0        ;DATA FORMAT (DF) POINTER
022560  012002                                  MOV     (R0)+,R2        ;NUMBER OF DH'S TO TYPE
022562  001441                                  BEQ     19$             ;BRANCH IF DH NUMBER IS 0
022564  005105                                  COM     R5              ;NO INDENT
022566  104401  001231                          TYPE    ,$CRLF          ;CARRIAGE RETURN-LINE FEED
022572  112003                          12$:    MOVB    (R0)+,R3        ;NUMBER OF DATA WORDS TO TYPE
022574  112004                                  MOVB    (R0)+,R4        ;AND HOW TO TYPE THEM
022576  006004                          13$:    ROR     R4              ;OCTAL OR DECIMAL?
022600  103403                                  BCS     14$             ;DECIMAL--BRANCH
022602  013146                                  MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
022604  104402                                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
022606  000402                                  BR      15$
022610                                  14$:
022610  013146                                  MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
022612  104405                                  TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
022614  005303                          15$:    DEC     R3              ;MORE NUMBERS TO TYPE?
022616  001403                                  BEQ     16$             ;NO--BRANCH
022620  104401  050345                          TYPE    ,BLNKS2         ;TYPE 2 SPACES
022624  000764                                  BR      13$             ;LOOP
022626  005302                          16$:    DEC     R2              ;MORE DH'S?
022630  003421                                  BLE     20$             ;NO--BRANCH
022632  104401  001231                          TYPE    ,$CRLF          ;YES--START A NEW LINE
022636  005105                                  COM     R5              ;INDENT?
022640  001002                                  BNE     17$             ;NO--BRANCH
022642  104401  050345                          TYPE    ,BLNKS2         ;TYPE 2 SPACES
022646  012037  022654                  17$:    MOV     (R0)+,18$       ;GET NEXT DH
022652  104401                                  TYPE                    ;AND TYPE IT
022654  000000                          18$:    .WORD   0               ;DH POINTER GOES HERE
022656  104401  001231                          TYPE    ,$CRLF          ;CARRIAGE RETURN-LINE FEED
022662  005705                                  TST     R5              ;INDENT?
022664  001342                                  BNE     12$             ;NO--BRANCH
022666  104401  050345                  19$:    TYPE    ,BLNKS2         ;TYPE 2 SPACES
022672  000737                                  BR      12$             ;LOOP
022674  104413                          20$:    RESREG                  ;RESTORE R0 - R5
022676  000207                                  RTS     PC              ;RETURN
022700  022710  022772  023024          PFECH:  PFECH1,PFECH2,PFECH3,PFECH4 ;WORDS DEFINING TABLES BELOW
022710     120     117     127          PFECH1: .ASCIZ  ?POWER MONITOR BIT IN CPU ERROR REGISTER FOUND SET?
022772     124     105     123          PFECH2: .ASCIZ  ?TESTNO  ERR PC  CPUERREG?
```

```
                                                    .EVEN
    023024  023040  001132  022256  PFECH3: .WORD   PFTSTN,$ERRPC,CPSAVE,0
    023034  000001                  PFECH4: .WORD   1                       ;NUMBER OF DATA HEADERS
    023036     003                          .BYTE   3                       ;NUMBER OF WORDS IN DATA TABLE
    023037     000                          .BYTE   0                       ;ALL 3 NUMBERS ARE OCTAL
    023040  000000                  PFTSTN: .WORD   0                       ;CONTAINS TEST NUMBER FOR PF BIT ERROR
```

```
      1                                    .SBTTL  TYPE ROUTINE

                                           ;;*********************************************************************
                                           ;;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                           ;;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                           ;;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                           ;;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                           ;;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                           ;;*
                                           ;;*CALL:
                                           ;;*1) USING A TRAP INSTRUCTION
                                           ;;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                           ;;*OR
                                           ;;*      TYPE
                                           ;;*      MESADR
                                           ;;*

   023042  105737  001173                  $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
   023046  100002                                  BPL     1$              ;;BR IF YES
   023050  000000                                  HALT                    ;;HALT HERE IF NO TERMINAL
   023052  000430                                  BR      3$              ;;LEAVE
   023054  010046                          1$:     MOV     R0,-(SP)        ;;SAVE R0
   023056  017600  000002                          MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
   023062  122737  000001  001254                  CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
   023070  001011                                  BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
   023072  132737  000100  001255                  BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
   023100  001405                                  BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
   023102  010037  023112                          MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
   023106  004737  026756                          JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
   023112  000000                          61$:    .WORD   0               ;;MESSAGE ADDRESS
   023114  132737  000040  001255          62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
   023122  001003                                  BNE     60$             ;;YES,SKIP TYPE OUT
   023124  112046                          2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
   023126  001005                                  BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
   023130  005726                                  TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
   023132  012600                          60$:    MOV     (SP)+,R0        ;;RESTORE R0
   023134  062716  000002                  3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
   023140  000002                                  RTI                     ;;RETURN
   023142  122716  000011                  4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
   023146  001430                                  BEQ     8$
   023150  122716  000200                          CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
   023154  001006                                  BNE     5$
   023156  005726                                  TST     (SP)+           ;;POP  <CR><LF> EQUIV
   023160  104401                                  TYPE                    ;;TYPE A CR AND LF
   023162  001231                                  $CRLF
   023164  105037  023372                          CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
   023170  000755                                  BR      2$              ;;GET NEXT CHARACTER
   023172  004737  023254                  5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
   023176  123726  001172                  6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
   023202  001350                                  BNE     2$              ;;IF NO GO GET NEXT CHAR.
   023204  013746  001170                          MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                           ;;AND THE NULL CHAR.
   023210  105366  000001                  7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
   023214  002770                                  BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
   023216  004737  023254                          JSR     PC,$TYPEC       ;;GO TYPE A NULL
   023222  105337  023372                          DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
   023226  000770                                  BR      7$              ;;LOOP
```

```
                                         ;HORIZONTAL TAB PROCESSOR

023230  112716  000040           8$:      MOVB    #' ,(SP)          ;;REPLACE TAB WITH SPACE
023234  004737  023254           9$:      JSR     PC,$TYPEC         ;;TYPE A SPACE
023240  132737  000007  023372            BITB    #7,$CHARCNT       ;;BRANCH IF NOT AT
023246  001372                            BNE     9$                ;;TAB STOP
023250  005726                            TST     (SP)+             ;;POP SPACE OFF STACK
023252  000724                            BR      2$                ;;GET NEXT CHARACTER
023254                           $TYPEC:
023254  105777  155700                    TSTB    @$TKS             ;;CHAR IN KYBD BUFFER?
023260  100022                            BPL     10$               ;;BR IF NOT
023262  017746  155674                    MOV     @$TKB,-(SP)       ;;GET CHAR
023266  042716  177600                    BIC     #177600,(SP)      ;;STRIP EXTRANEOUS BITS
023272  122716  000023                    CMPB    #$XOFF,(SP)       ;;WAS CHAR XOFF
023276  001012                            BNE     102$              ;;BR IF NOT
023300                           101$:
023300  105777  155654                    TSTB    @$TKS             ;;WAIT FOR CHAR
023304  100375                            BPL     101$
023306  117716  155650                    MOVB    @$TKB,(SP)        ;;GET CHAR
023312  042716  177600                    BIC     #177600,(SP)      ;;STRIP IT
023316  122716  000021                    CMPB    #$XON,(SP)        ;;WAS IT XON?
023322  001366                            BNE     101$              ;;BR IF NOT
023324                           102$:
023324  005726                            TST     (SP)+             ;;FIX STACK
023326                           10$:
023326  105777  155632                    TSTB    @$TPS             ;;WAIT UNTIL PRINTER IS READY
023332  100375                            BPL     10$
023334  116677  000002  155624            MOVB    2(SP),@$TPB       ;;LOAD CHAR TO BE TYPED INTO DATA REG.
023342  122766  000015  000002            CMPB    #CR,2(SP)         ;;IS CHARACTER A CARRIAGE RETURN?
023350  001003                            BNE     1$                ;;BRANCH IF NO
023352  105037  023372                    CLRB    $CHARCNT          ;;YES--CLEAR CHARACTER COUNT
023356  000406                            BR      $TYPEX            ;;EXIT
023360  122766  000012  000002   1$:      CMPB    #LF,2(SP)         ;;IS CHARACTER A LINE FEED?
023366  001402                            BEQ     $TYPEX            ;;BRANCH IF YES
023370  105227                            INCB    (PC)+             ;;COUNT THE CHARACTER
023372  000000                   $CHARCNT:.WORD   0                 ;;CHARACTER COUNT STORAGE
023374  000207                   $TYPEX:  RTS     PC
```

```
                                        .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE

                                        ;;*****************************************************************
                                        ;;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                                        ;;*OCTAL (ASCII) NUMBER AND TYPE IT.
                                        ;;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                                        ;;*CALL:
                                        ;;*       MOV     NUM,-(SP)          ;;NUMBER TO BE TYPED
                                        ;;*       TYPOS                      ;;CALL FOR TYPEOUT
                                        ;;*       .BYTE   N                  ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                                        ;;*       .BYTE   M                  ;;M=1 OR 0
                                        ;;*                                          ;;1=TYPE LEADING ZEROS
                                        ;;*                                          ;;0=SUPPRESS LEADING ZEROS
                                        ;;*
                                        ;;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                                        ;;*$TYPOS OR $TYPOC
                                        ;;*CALL:
                                        ;;*       MOV     NUM,-(SP)          ;;NUMBER TO BE TYPED
                                        ;;*       TYPON                      ;;CALL FOR TYPEOUT
                                        ;;*
                                        ;;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                        ;;*CALL:
                                        ;;*       MOV     NUM,-(SP)          ;;NUMBER TO BE TYPED
                                        ;;*       TYPOC                      ;;CALL FOR TYPEOUT

023376  017646  000000                  $TYPOS: MOV     @(SP),-(SP)        ;;PICKUP THE MODE
023402  116637  000001  023621                  MOVB    1(SP),$0FILL       ;;LOAD ZERO FILL SWITCH
023410  112637  023623                          MOVB    (SP)+,$0MODE+1     ;;NUMBER OF DIGITS TO TYPE
023414  062716  000002                          ADD     #2,(SP)            ;;ADJUST RETURN ADDRESS
023420  000406                                  BR      $TYPON
023422  112737  000001  023621          $TYPOC: MOVB    #1,$0FILL          ;;SET THE ZERO FILL SWITCH
023430  112737  000006  023623                  MOVB    #6,$0MODE+1        ;;SET FOR SIX(6) DIGITS
023436  112737  000005  023620          $TYPON: MOVB    #5,$0CNT           ;;SET THE ITERATION COUNT
023444  010346                                  MOV     R3,-(SP)           ;;SAVE R3
023446  010446                                  MOV     R4,-(SP)           ;;SAVE R4
023450  010546                                  MOV     R5,-(SP)           ;;SAVE R5
023452  113704  023623                          MOVB    $0MODE+1,R4        ;;GET THE NUMBER OF DIGITS TO TYPE
023456  005404                                  NEG     R4
023460  062704  000006                          ADD     #6,R4              ;;SUBTRACT IT FOR MAX. ALLOWED
023464  110437  023622                          MOVB    R4,$0MODE          ;;SAVE IT FOR USE
023470  113704  023621                          MOVB    $0FILL,R4          ;;GET THE ZERO FILL SWITCH
023474  016605  000012                          MOV     12(SP),R5          ;;PICKUP THE INPUT NUMBER
023500  005003                                  CLR     R3                 ;;CLEAR THE OUTPUT WORD .
023502  006105                          1$:     ROL     R5                 ;;ROTATE MSB INTO "C"
023504  000404                                  BR      3$                 ;;GO DO MSB
023506  006105                          2$:     ROL     R5                 ;;FORM THIS DIGIT
023510  006105                                  ROL     R5
023512  006105                                  ROL     R5
023514  010503                                  MOV     R5,R3
023516  006103                          3$:     ROL     R3                 ;;GET LSB OF THIS DIGIT
023520  105337  023622                          DECB    $0MODE             ;;TYPE THIS DIGIT?
023524  100016                                  BPL     7$                 ;;BR IF NO
023526  042703  177770                          BIC     #177770,R3         ;;GET RID OF JUNK
023532  001002                                  BNE     4$                 ;;TEST FOR 0
023534  005704                                  TST     R4                 ;;SUPPRESS THIS 0?
023536  001403                                  BEQ     5$                 ;;BR IF YES
023540  005204                          4$:     INC     R4                 ;;DON'T SUPPRESS ANYMORE 0'S
```

```
        023542  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
        023546  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
        023552  110337  023616                  MOVB    R3,8$           ;;SAVE FOR TYPING
        023556  104401  023616                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
        023562  105337  023620          7$:     DECB    $OCNT           ;;COUNT BY 1
        023566  003347                          BGT     2$              ;;BR IF MORE TO DO
        023570  002402                          BLT     6$              ;;BR IF DONE
        023572  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
        023574  000744                          BR      2$              ;;GO DO THE LAST DIGIT
        023576  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
        023600  012604                          MOV     (SP)+,R4        ;;RESTORE R4
        023602  012603                          MOV     (SP)+,R3        ;;RESTORE R3
        023604  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
        023612  012616                          MOV     (SP)+,(SP)
        023614  000002                          RTI                     ;;RETURN
        023616     000                  8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
        023617     000                          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
        023620     000                  $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
        023621     000                  $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
        023622  000000                  $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
```

```
                                                  .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

                                                  ;;*******************************************************************
                                                  ;;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
                                                  ;;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
                                                  ;;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
                                                  ;;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
                                                  ;;*REPLACED WITH SPACES.
                                                  ;;*CALL:
                                                  ;;*       MOV     NUM,-(SP)         ;;PUT THE BINARY NUMBER ON THE STACK
                                                  ;;*       TYPDS                     ;;GO TO THE ROUTINE

        023624                                    $TYPDS:
        023624  010046                                    MOV     R0,-(SP)          ;;PUSH R0 ON STACK
        023626  010146                                    MOV     R1,-(SP)          ;;PUSH R1 ON STACK
        023630  010246                                    MOV     R2,-(SP)          ;;PUSH R2 ON STACK
        023632  010346                                    MOV     R3,-(SP)          ;;PUSH R3 ON STACK
        023634  010546                                    MOV     R5,-(SP)          ;;PUSH R5 ON STACK
        023636  012746  020200                            MOV     #20200,-(SP)      ;;SET BLANK SWITCH AND SIGN
        023642  016605  000020                            MOV     20(SP),R5         ;;GET THE INPUT NUMBER
        023646  100004                                    BPL     1$                ;;BR IF INPUT IS POS.
        023650  005405                                    NEG     R5                ;;MAKE THE BINARY NUMBER POS.
        023652  112766  000055  000001                    MOVB    #'-,1(SP)         ;;MAKE THE ASCII NUMBER NEG.
        023660  005000                            1$:     CLR     R0                ;;ZERO THE CONSTANTS INDEX
        023662  012703  024040                            MOV     #$DBLK,R3         ;;SETUP THE OUTPUT POINTER
        023666  112723  000040                            MOVB    #' ,(R3)+         ;;SET THE FIRST CHARACTER TO A BLANK
        023672  005002                            2$:     CLR     R2                ;;CLEAR THE BCD NUMBER
        023674  016001  024030                            MOV     $DTBL(R0),R1      ;;GET THE CONSTANT
        023700  160105                            3$:     SUB     R1,R5             ;;FORM THIS BCD DIGIT
        023702  002402                                    BLT     4$                ;;BR IF DONE
        023704  005202                                    INC     R2                ;;INCREASE THE BCD DIGIT BY 1
        023706  000774                                    BR      3$
        023710  060105                            4$:     ADD     R1,R5             ;;ADD BACK THE CONSTANT
        023712  005702                                    TST     R2                ;;CHECK IF BCD DIGIT=0
        023714  001002                                    BNE     5$                ;;FALL THROUGH IF 0
        023716  105716                                    TSTB    (SP)              ;;STILL DOING LEADING 0'S?
        023720  100407                                    BMI     7$                ;;BR IF YES
        023722  106316                            5$:     ASLB    (SP)              ;;MSD?
        023724  103003                                    BCC     6$                ;;BR IF NO
        023726  116663  000001  177777                    MOVB    1(SP),-1(R3)      ;;YES--SET THE SIGN
        023734  052702  000060                    6$:     BIS     #'0,R2            ;;MAKE THE BCD DIGIT ASCII
        023740  052702  000040                    7$:     BIS     #' ,R2            ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
        023744  110223                                    MOVB    R2,(R3)+          ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
        023746  005720                                    TST     (R0)+             ;;JUST INCREMENTING
        023750  020027  000010                            CMP     R0,#10            ;;CHECK THE TABLE INDEX
        023754  002746                                    BLT     2$                ;;GO DO THE NEXT DIGIT
        023756  003002                                    BGT     8$                ;;GO TO EXIT
        023760  010502                                    MOV     R5,R2             ;;GET THE LSD
        023762  000764                                    BR      6$                ;;GO CHANGE TO ASCII
        023764  105726                            8$:     TSTB    (SP)+             ;;WAS THE LSD THE FIRST NON-ZERO?
        023766  100003                                    BPL     9$                ;;BR IF NO
        023770  116663  177777  177776                    MOVB    -1(SP),-2(R3)     ;;YES--SET THE SIGN FOR TYPING
        023776  105013                            9$:     CLRB    (R3)              ;;SET THE TERMINATOR
        024000  012605                                    MOV     (SP)+,R5          ;;POP STACK INTO R5
        024002  012603                                    MOV     (SP)+,R3          ;;POP STACK INTO R3
        024004  012602                                    MOV     (SP)+,R2          ;;POP STACK INTO R2
        024006  012601                                    MOV     (SP)+,R1          ;;POP STACK INTO R1
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024010  012600                              MOV     (SP)+,R0         ;;POP STACK INTO R0
024012  104401  024040                      TYPE    ,$DBLK           ;;NOW TYPE THE NUMBER
024016  016666  000002  000004              MOV     2(SP),4(SP)      ;;ADJUST THE STACK
024024  012616                              MOV     (SP)+,(SP)
024026  000002                              RTI                      ;;RETURN TO USER
024030  023420                    $DTBL:    10000.
024032  001750                              1000.
024034  000144                              100.
024036  000012                              10.
024040                            $DBLK:    .BLKW   4
```

```
                                        .SBTTL  TTY INPUT ROUTINE

                                        ;;*************************************************************
                                        .ENABL  LSB
   024050  000000                       $TKCNT: .WORD   0               ;;NUMBER OF ITEMS IN QUEUE
   024052  000000                       $TKQIN: .WORD   0               ;;INPUT POINTER
   024054  000000                       $TKQOUT: .WORD  0               ;;OUTPUT POINTER
   024056                               $TKQSRT: .BLKB  1               ;;TTY KEYBOARD QUEUE
           024057                       $TKQEND=.
                                        .EVEN

                                        ;*TK INITIALIZE ROUTINE
                                        ;*THIS ROUTINE WILL INITIALIZE THE TTY KEYBOARD INPUT QUEUE
                                        ;*SETUP THE INTERRUPT VECTOR AND TURN ON THE KEYBOARD INTERRUPT
                                        ;
                                        ;*CALL:
                                        ;*       JSR     PC,$TKINT
                                        ;*       RETURN
                                        ;
   024060  005037  024050               $TKINT: CLR     $TKCNT          ;;CLEAR COUNT OF ITEMS IN QUEUE
   024064  012737  024056  024052               MOV     #$TKQSRT,$TKQIN ;;MOVE THE STARTING ADDRESS OF THE
   024072  013737  024052  024054               MOV     $TKQIN,$TKQOUT  ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
   024100  012737  024130  000060               MOV     #$TKSRV,@#TKVEC ;;INITIALIZE THE KEYBOARD VECTOR
   024106  012737  000200  000062               MOV     #200,@#TKVEC+2  ;;'BR'' LEVEL 4
   024114  005777  155042                       TST     @$TKB           ;;CLEAR DONE FLAG
   024120  012777  000100  155032               MOV     #100,@$TKS      ;;ENABLE TTY KEYBOARD INTERRUPT
   024126  000207                               RTS     PC              ;;RETURN TO CALLER

                                        ;*TK SERVICE ROUTINE
                                        ;*THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT
                                        ;*BY READING THE CHARACTER FROM THE INPUT BUFFER AND PUTTING
                                        ;*IT IN THE QUEUE.
                                        ;*IF THE CHARACTER IS A ''CONTROL-C'' (^C) $TKINT IS CALLED AND
                                        ;*UPON RETURN EXIT IS MADE TO THE ''CONTROL-C'' RESTART ADDRESS (SHUT)
                                        ;
   024130  117746  155026               $TKSRV: MOVB    @$TKB,-(SP)     ;;PICKUP THE CHARACTER
   024134  042716  177600                       BIC     #^C177,(SP)     ;;STRIP THE JUNK
   024140  021627  000021                       CMP     (SP),#$XON      ;;IS IT A RANDOM XON?
   024144  001002                               BNE     30$             ;;BRANCH IF NO
   024146  005726                               TST     (SP)+           ;;CLEAN RANDOM XON OFF STACK
   024150  000002                               RTI                     ;;RETURN
   024152                               30$:
   024152  021627  000003                       CMP     (SP),#3         ;;IS IT A CONTROL C?
   024156  001007                               BNE     1$              ;;BRANCH IF NO
   024160  104401  025272                       TYPE    ,$CNTLC         ;;TYPE A CONTROL-C (^C)
   024164  004737  024060                       JSR     PC,$TKINT       ;;INIT THE KEYBOARD
   024170  005726                               TST     (SP)+           ;;CLEAN UP STACK
   024172  000137  025334                       JMP     SHUT            ;;CONTROL C RESTART
   024176  021627  000007               1$:     CMP     (SP),#7         ;;IS IT A CONTROL G?
   024202  001004                               BNE     2$              ;;BRANCH IF NO
   024204  022737  000176  001154               CMP     #SWREG,SWR      ;;IS SOFT-SWR SELECTED?
   024212  001500                               BEQ     6$              ;.GO TO SWR CHANGE

   024214                               2$:
   024214  022737  000001  024050               CMP     #1,$TKCNT       ;;IS THE QUEUE FULL?
   024222  001004                               BNE     4$              ;;BRANCH IF NO
   024224  104401  001224                       TYPE    ,$BELL          ;;RING THE TTY BELL
```

```
024230  005726                          TST     (SP)+            ;;CLEAN CHARACTER OFF OF STACK
024232  000451                          BR      5$               ;;EXIT
024234  021627  000023          3$:     CMP     (SP),#23         ;;IS IT A CONTROL-S?
024240  001021                          BNE     32$              ;;BRANCH IF NO
024242  005077  154712                  CLR     @$TKS            ;;DISABLE TTY KEYBOARD INTERRUPTS
024246  005726                          TST     (SP)+            ;;CLEAN CHAR OFF STACK
024250  105777  154704          31$:    TSTB    @$TKS            ;;WAIT FOR A CHAR
024254  100375                          BPL     31$              ;;LOOP UNTIL ITS THERE
024256  117746  154700                  MOVB    @$TKB,-(SP)      ;;GET THE CHARACTER
024262  042716  177600                  BIC     #^C177,(SP)      ;;MAKE IT 7-BIT ASCII
024266  022627  000021                  CMP     (SP)+,#21        ;;IS IT A CONTROL-Q?
024272  001366                          BNE     31$              ;;BRANCH IF NO
024274  012777  000100  154656          MOV     #100,@$TKS       ;;REENABLE TTY KEYBOARD INTERRUPTS
024302  000002                          RTI                      ;;RETURN
024304  005237  024050          32$:    INC     $TKCNT           ;;COUNT THIS CHARACTER
024310  021627  000140                  CMP     (SP),#140        ;;IS IT UPPER CASE?
024314  002405                          BLT     4$               ;;BRANCH IF YES
024316  021627  000175                  CMP     (SP),#175        ;;IS IT A SPECIAL CHAR?
024322  003002                          BGT     4$               ;;BRANCH IF YES
024324  042716  000040                  BIC     #40,(SP)         ;;MAKE IT UPPER CASE
024330  112677  177516          4$:     MOVB    (SP)+,@$TKQIN    ;;AND PUT IT IN QUEUE
024334  005237  024052                  INC     $TKQIN           ;;UPDATE THE POINTER
024340  023727  024052  024057          CMP     $TKQIN,#$TKQEND  ;;GO OFF THE END?
024346  001003                          BNE     5$               ;;BRANCH IF NO
024350  012737  024056  024052          MOV     #$TKQSRT,$TKQIN  ;;RESET THE POINTER
024356  000002                  5$:     RTI                      ;;RETURN

                                ;;*****************************************************************
                                ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                                ;*ROUTINE IS ENTERED  FROM THE TRAP HANDLER, AND WILL
                                ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP
                                ;*CALL WHEN OPERATING IN TTY INTERRUPT MODE.
024360  022737  000176  001154  $CKSWR: CMP     #SWREG,SWR       ;;IS THE SOFT-SWR SELECTED
024366  001124                          BNE     15$              ;;EXIT IF NOT
024370  105777  154564                  TSTB    @$TKS            ;;IS A CHAR WAITING?
024374  100121                          BPL     15$              ;;IF NOT, EXIT
024376  117746  154560                  MOVB    @$TKB,-(SP)      ;;YES
024402  042716  177600                  BIC     #^C177,(SP)      ;;MAKE IT  7-BIT ASCII
024406  021627  000007                  CMP     (SP),#7          ;;IS IT A CONTROL-G?
024412  001300                          BNE     2$               ;;IF NOT, PUT IT IN THE TTY QUEUE
                                                                 ;;AND EXIT

                                ;;*****************************************************************
                                ;*CONTROL IS PASSED TO THIS POINT FROM EITHER THE TTY INTERRUPT SERvICE
                                ;*ROUTINE OR FROM THE SOFTWARE SWITCH REGISTER TRAP CALL, AS A RESULT OF A
                                ;*CONTROL-G BEING TYPED, AND THE SOFTWARE SWITCH REGISTER BEING SELECTED.
024414  123727  001150  000001  6$:     CMPB    $AUTOB,#1        ;;ARE WE RUNNING IN AUTO-MODE?
024422  001674                          BEQ     2$               ;;BRANCH IF YES
024424  005726                          TST     (SP)+            ;;CLEAR CONTROL-G OFF STACK
024426  004737  024060                  JSR     PC,$TKINT        ;;FLUSH THE TTY INPUT QUEUE
024432  005077  154522                  CLR     @$TKS            ;;DISABLE TTY KEYBOARD INTERRUPTS
024436  112737  000001  001151          MOVB    #1,$INTAG        ;;SET INTERRUPT MODE INDICATOR

024444  104401  025304                  TYPE    ,$CNTLG          ;;ECHO THE CONTROL-G (^G)
024450  104401  025311          $GTSWR: TYPE    ,$MSWR           ;;TYPE CURRENT CONTENTS
024454  013746  000176                  MOV     SWREG,-(SP)      ;;SAVE SWREG FOR TYPEOUT
024460  104402                          TYPOC                    ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
```

```
024462  104401  025322                  TYPE    ,$MNEW              ;;PROMPT FOR NEW SWR
024466  005046                  19$:    CLR     -(SP)               ;;CLEAR COUNTER
024470  005046                          CLR     -(SP)               ;;THE NEW SWR
024472  105777  154462          7$:     TSTB    @$TKS               ;;CHAR THERE?
024476  100375                          BPL     7$                  ;;IF NOT TRY AGAIN

024500  117746  154456                  MOVB    @$TKB,-(SP)         ;;PICK UP CHAR
024504  042716  177600                  BIC     #^C177,(SP)         ;;MAKE IT 7-BIT ASCII

024510  021627  000003                  CMP     (SP),#3             ;;IS IT A CONTROL-C?
024514  001015                          BNE     9$                  ;;BRANCH IF NOT
024516  104401  025272                  TYPE    ,$CNTLC             ;;YES, ECHO CONTROL-C (^C)
024522  062706  000006                  ADD     #6,SP               ;;CLEAN UP STACK
024526  123727  001151  000001          CMPB    $INTAG,#1           ;;REENABLE TTY KEYBOARD INTERRUPTS?
024534  001003                          BNE     8$                  ;;BRANCH IF NO
024536  012777  000100  154414          MOV     #100,@$TKS          ;;ALLOW TTY KEYBOARD INTERRUPTS
024544  000137  025334          8$:     JMP     SHUT                ;;CONTROL-C RESTART

024550  021627  000025          9$:     CMP     (SP),#25            ;;IS IT A CONTROL-U?
024554  001005                          BNE     10$                 ;;BRANCH IF NOT
024556  104401  025277                  TYPE    ,$CNTLU             ;;YES, ECHO CONTROL-U (^U)
024562  062706  000006          20$:    ADD     #6,SP               ;;IGNORE PREVIOUS INPUT
024566  000737                          BR      19$                 ;;LET'S TRY IT AGAIN

024570  021627  000015          10$:    CMP     (SP),#15            ;;IS IT A <CR>?
024574  001022                          BNE     16$                 ;;BRANCH IF NO
024576  005766  000004                  TST     4(SP)               ;;YES, IS IT THE FIRST CHAR?
024602  001403                          BEQ     11$                 ;;BRANCH IF YES
024604  016677  000002  154342          MOV     2(SP),@SWR          ;;SAVE NEW SWR
024612  062706  000006          11$:    ADD     #6,SP               ;;CLEAR UP STACK
024616  104401  001231          14$:    TYPE    ,$CRLF              ;;ECHO <CR> AND <LF>
024622  123727  001151  000001          CMPB    $INTAG,#1           ;;RE-ENABLE TTY KBD INTERRUPTS?
024630  001003                          BNE     15$                 ;;BRANCH IF NOT
024632  012777  000100  154320          MOV     #100,@$TKS          ;;RE-ENABLE TTY KBD INTERRUPTS
024640  000002                  15$:    RTI                         ;;RETURN
024642  004737  023254          16$:    JSR     PC,$TYPEC           ;;ECHO CHAR
024646  021627  000060                  CMP     (SP),#60            ;;CHAR < 0?
024652  002420                          BLT     18$                 ;;BRANCH IF YES
024654  021627  000067                  CMP     (SP),#67            ;;CHAR > 7?
024660  003015                          BGT     18$                 ;;BRANCH IF YES
024662  042726  000060                  BIC     #60,(SP)+           ;;STRIP-OFF ASCII
024666  005766  000002                  TST     2(SP)               ;;IS THIS THE FIRST CHAR
024672  001403                          BEQ     17$                 ;;BRANCH IF YES
024674  006316                          ASL     (SP)                ;;NO, SHIFT PRESENT
024676  006316                          ASL     (SP)                ;;   CHAR OVER TO MAKE
024700  006316                          ASL     (SP)                ;;   ROOM FOR NEW ONE.
024702  005266  000002          17$:    INC     2(SP)               ;;KEEP COUNT OF CHAR
024706  056616  177776                  BIS     -2(SP),(SP)         ;;SET IN NEW CHAR
024712  000667                          BR      7$                  ;;GET THE NEXT ONE
024714  104401  001230          18$:    TYPE    ,$QUES              ;;TYPE ?<CR><LF>
024720  000720                          BR      20$                 ;;SIMULATE CONTROL-U
                                .DSABL  LSB

                                ;;*************************************************************************
```

```
                                        ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                        ;*CALL:
                                        ;*      RDCHR                   ;;GET A CHARACTER FROM THE QUEUE
                                        ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
                                        ;*                              ;;WITH PARITY BIT STRIPPED OFF
                                        ;

024722  011646                          $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC AND
024724  016666  000004  000002                  MOV     4(SP),2(SP)     ;;THE PS
024732  005066  000004                          CLR     4(SP)           ;;GET READY FOR A CHARACTER
024736  005046                                  CLR     -(SP)           ;;PUT NEW PS ON STACK
024740  012746  024746                          MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
024744  000002                                  RTI                     ;;POP NEW PC AND PS
024746                                  64$:
024746  005737  024050                  1$:     TST     $TKCNT          ;;WAIT ON A CHARACTER
024752  001775                                  BEQ     1$
024754  005337  024050                          DEC     $TKCNT          ;;DECREMENT THE COUNTER
024760  117766  177070  000004                  MOVB    @$TKQOUT,4(SP)  ;;GET ONE CHARACTER
024766  005237  024054                          INC     $TKQOUT         ;;UPDATE THE POINTER
024772  023727  024054  024057                  CMP     $TKQOUT,#$TKQEND ;;DID IT GO OFF OF THE END?
025000  001003                                  BNE     2$              ;;BRANCH IF NO
025002  012737  024056  024054                  MOV     #$TKQSRT,$TKQOUT ;;RESET THE POINTER
025010  000002                          2$:     RTI                     ;;RETURN
                                        ;;*************************************************************
                                        ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                                        ;*CALL:
                                        ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
                                        ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                                        ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S

025012  010346                          $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
025014  005046                                  CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
025016  012703  025246                  1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
025022  022703  025272                  2$:     CMP     #$TTYIN+20.,R3  ;;BUFFER FULL?
025026  101456                                  BLOS    4$              ;;BR IF YES
025030  104410                                  RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
025032  112613                                  MOVB    (SP)+,(R3)      ;;GET CHARACTER
025034  122713  000177                  10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
025040  001022                                  BNE     5$              ;;BR IF NO
025042  005716                                  TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
025044  001007                                  BNE     6$              ;;BR IF NO
025046  112737  000134  025244                  MOVB    #'\,9$          ;;TYPE A BACK SLASH
025054  104401  025244                          TYPE    ,9$
025060  012716  177777                          MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
025064  005303                          6$:     DEC     R3              ;;BACKUP BY ONE
025066  020327  025246                          CMP     R3,#$TTYIN      ;;STACK EMPTY?
025072  103434                                  BLO     4$              ;;BR IF YES
025074  111337  025244                          MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
025100  104401  025244                          TYPE    ,9$             ;;GO TYPE
025104  000746                                  BR      2$              ;;GO READ ANOTHER CHAR.
025106  005716                          5$:     TST     (SP)            ;;RUBOUT KEY SET?
025110  001406                                  BEQ     7$              ;;BR IF NO
025112  112737  000134  025244                  MOVB    #'\,9$          ;;TYPE A BACK SLASH
025120  104401  025244                          TYPE    ,9$
025124  005016                                  CLR     (SP)            ;;CLEAR THE RUBOUT KEY
025126  122713  000025                  7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
025132  001003                                  BNE     8$              ;;BR IF NO
```

```
025134  104401  025277                  TYPE    ,$CNTLU          ;;TYPE A CONTROL 'U''
025140  000726                          BR      1$               ;;GO START OVER
025142  122713  000022          8$:     CMPB    #22,(R3)         ;;IS CHARACTER A ''^R' ?
025146  001011                          BNE     3$               ;;BRANCH IF NO
025150  105013                          CLRB    (R3)             ;;CLEAR THE CHARACTER
025152  104401  001231                  TYPE    ,$CRLF           ;;TYPE A ''CR'' & 'LF''
025156  104401  025246                  TYPE    ,$TTYIN          ;;TYPE THE INPUT STRING
025162  000717                          BR      2$               ;;GO PICKUP ANOTHER CHACTER
025164  104401  001230          4$:     TYPE    ,$QUES           ;;TYPE A '?'
025170  000712                          BR      1$               ;;CLEAR THE BUFFER AND LOOP
025172  111337  025244          3$:     MOVB    (R3),9$          ;;ECHO THE CHARACTER
025176  104401  025244                  TYPE    ,9$
025202  122723  000015                  CMPB    #15,(R3)+        ;;CHECK FOR RETURN
025206  001305                          BNE     2$               ;;LOOP IF NOT RETURN
025210  105063  177777                  CLRB    -1(R3)           ;;CLEAR RETURN (THE 15)
025214  104401  001232                  TYPE    ,$LF             ;;TYPE A LINE FEED
025220  005726                          TST     (SP)+,           ;;CLEAN RUBOUT KEY FROM THE STACK
025222  012603                          MOV     (SP)+,R3         ;;RESTORE R3
025224  011646                          MOV     (SP),-(SP)       ;;ADJUST THE STACK AND PUT ADDRESS OF THE
025226  016666  000004  000002          MOV     4(SP),2(SP)      ;;       FIRST ASCII CHARACTER ON IT
025234  012766  025246  000004          MOV     #$TTYIN,4(SP)
025242  000002                          RTI                      ;;RETURN
025244     000                  9$:     .BYTE   0                ;;STORAGE FOR ASCII CHAR. TO TYPE
025245     000                          .BYTE   0                ;;TERMINATOR
025246                          $TTYIN: .BLKB   20.              ;;RESERVE 20. BYTES FOR TTY INPUT
025272     136     103     015  $CNTLC: .ASCIZ  /^C/<15><12>     ;;CONTROL 'C''
025277     136     125     015  $CNTLU: .ASCIZ  /^U/<15><12>     ;;CONTROL 'U''
025304     136     107     015  $CNTLG: .ASCIZ  /^G/<15><12>     ;;CONTROL 'G''
025311     015     012     123  $MSWR:  .ASCIZ  <15><12>/SWR = /
025322     040     040     116  $MNEW:  .ASCIZ  /  NEW = /
                                .EVEN

025334  005737  000042          SHUT:   TST     @#42             ;ANY MONITOR PRESENT ?
025340  001002                          BNE     1$               ;BR IF YES
025342  000137  004712                  JMP     START2           ;GO TO 'START2'
025346  005037  001330          1$:     CLR     DRVSEL           ;FUDGE NO DRIVES SELECTED
025352  000137  021334                  JMP     $EOP             ;RETURN CONTROL TO MONITOR
```

```
                                        .SBTTL  SCOPE HANDLER ROUTINE

                                        ;;*****************************************************************
                                        ;;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                                        ;;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
                                        ;;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
                                        ;;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                        ;;*SW14=1         LOOP ON TEST
                                        ;;*SW11=1         INHIBIT ITERATIONS
                                        ;;*SW09=1         LOOP ON ERROR
                                        ;;*CALL
                                        ;;*       SCOPE            ;;SCOPE=IOT

025356                                  $SCOPE:
025356  104407                                  CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
025360  032777  040000  153566          1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
025366  001402                                  BEQ     9$              ;;NO IF SW14=0.
025370  000137  025740                          JMP     $OVER           ;;JUMP OVER SCOPE ROUTINE
025374                                  9$:
                                        ;#####START OF CODE FOR THE XOR TESTER#####
025374  000416                          $XTSTR: BR      6$              ;;IF RUNNING ON THE ''XOR'' TESTER CHANGE
                                                                        ;;THIS INSTRUCTION TO A ''NOP'' (NOP=240)
025376  013746  000004                          MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
025402  012737  025422  000004                  MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
025410  005737  177060                          TST     @#177060        ;;TIME OUT ON XOR?
025414  012637  000004                          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
025420  000531                                  BR      $SVLAD          ;;GO TO THE NEXT TEST
025422  022626                          5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
025424  012637  000004                          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
025430  000474                                  BR      7$              ;;LOOP ON THE PRESENT TEST
025432                                  6$:;#####END OF CODE FOR THE XOR TESTER#####
025432  105737  001117                  2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
025436  001502                                  BEQ     3$              ;;BR IF NO
025440  022737  177777  022256                  CMP     #-1,CPSAVE      ;;SEE IF TIMEOUT WAS PREVIOUSLY RECORDED
025446  001455                                  BEQ     2003$           ;;KICK AROUND ROUTINE IF SO
025450  013746  000004                          MOV     ERRVEC,-(SP)    ;;SAVE CONTENTS OF ERROR VECTOR
025454  012737  025472  000004                  MOV     #2000$,ERRVEC   ;;SETUP 'TRAP' RETURN ADDRESS
025462  013737  177766  022256                  MOV     177766,CPSAVE   ;;MOVE CPU ERROR REGISTER TO CPSAVE FOR TEST
025470  000406                                  BR      2001$
025472  012737  177777  022256          2000$:  MOV     #-1,CPSAVE      ;;SET CPU ERROR REGISTER TIMLOUT INDICATOR
025500  012716  025506                          MOV     #2001$,(SP)     ;;SETUP RETURN ADDRESS
025504  000002                                  RTI
025506  012637  000004                  2001$:  MOV     (SP)+,ERRVEC    ;;RESTORE CONTENTS OF ERROR VECTOR

025512  022737  177777  022256          2002$:  CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
025520  001430                                  BEQ     2003$           ;;BRANCH IF SO
025522  032737  000001  022256                  BIT     #BIT00,CPSAVE   ;;SEE IF THE POWER MONITOR BIT IS ON
025530  001424                                  BEQ     2003$           ;;BRANCH TO CONTINUE ROUTINE IF CLEAR
025532  042737  000001  177766                  BIC     #BIT00,177766   ;;CLEAR THE BIT FOUND TO BE SET
025540  013746  001154                          MOV     SWR,-(SP)       ;;SAVE SWR ADDRESS
025544  017646  000000                          MOV     @(SP),-(SP)     ;;SAVE SWR VALUE
025550  012737  000176  001154                  MOV     #176,SWR        ;;GET SOFTWARE SWR ADDRESS
025556  011677  153372                          MOV     (SP),@SWR       ;;GET CURRENT SWR VALUE
025562  042777  001000  153364                  BIC     #BIT09,@SWR     ;;DON'T ALLOW LOOP ON ERROR ON THIS ERROR
025570  104177                                  EMT     177             ;;CALL SPECIAL POWER FAIL BIT ERROR CALL
025572  012676  000000                          MOV     (SP)+,@(SP)     ;;RESTORE SWR TO ORIGINAL VALUE
025576  012637  001154                          MOV     (SP)+,SWR       ;;RESTORE SWR ADDRESS
```

```
025602                          2003$:
025602  123737  001131  001117          CMPB    $ERMAX,$ERFLG    ;;MAX. ERRORS FOR THIS TEST OCCURRED?
025610  101015                          BHI     3$               ;;BR IF NO
025612  032777  001000  153334          BIT     #BIT09,@SWR      ;;LOOP ON ERROR?
025620  001404                          BEQ     4$               ;;BR IF NO
025622  013737  001124  001122  7$:     MOV     $LPERR,$LPADR    ;;SET LOOP ADDRESS TO LAST SCOPE
025630  000443                          BR      $OVER
025632  105037  001117          4$:     CLRB    $ERFLG           ;;ZERO THE ERROR FLAG
025636  005037  001220                  CLR     $TIMES           ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
025642  000412                          BR      1$               ;;ESCAPE TO THE NEXT TEST
025644  032777  004000  153302  3$:     BIT     #BIT11,@SWR      ;;INHIBIT ITERATIONS?
025652  001006                          BNE     1$               ;;BR IF YES
025654  005237  001120                  INC     $ICNT            ;;INCREMENT ITERATION COUNT
025660  023737  001220  001120          CMP     $TIMES,$ICNT     ;;CHECK THE NUMBER OF ITERATIONS MADE
025666  002024                          BGE     $OVER            ;;BR IF MORE ITERATION REQUIRED
025670  012737  000001  001120  1$:     MOV     #1,$ICNT         ;;REINITIALIZE THE ITERATION COUNTER
025676  013737  025754  001220          MOV     $MXCNT,$TIMES    ;;SET NUMBER OF ITERATIONS TO DO
025704  105237  001116          $SVLAD: INCB    $TSTNM           ;;COUNT TEST NUMBERS
025710  113737  001116  001240          MOVB    $TSTNM,$TESTN    ;;SET TEST NUMBER IN APT MAILBOX
025716  011637  001122                  MOV     (SP),$LPADR      ;;SAVE SCOPE LOOP ADDRESS
025722  011637  001124                  MOV     (SP),$LPERR      ;;SAVE ERROR LOOP ADDRESS
025726  005037  001222                  CLR     $ESCAPE          ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
025732  112737  000001  001131          MOVB    #1,$ERMAX        ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
025740  013777  001116  153210  $OVER:  MOV     $TSTNM,@DISPLAY  ;;DISPLAY TEST NUMBER
025746  013716  001122                  MOV     $LPADR,(SP)      ;;FUDGE RETURN ADDRESS
025752  000002                          RTI                      ;;FIXES PS
025754  000001                  $MXCNT: 1                        ;;MAX. NUMBER OF ITERATIONS
```

```
                                        .SBTTL  SAVE AND RESTORE R0-R5 ROUTINES

                                        ;;*************************************************************
                                        ;*SAVE R0-R5
                                        ;*CALL:
                                        ;*      SAVREG
                                        ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
                                        ;*
                                        ;*TOP---(+16)
                                        ;* +2---(+18)
                                        ;* +4---R5
                                        ;* +6---R4
                                        ;* +8---R3
                                        ;*+10---R2
                                        ;*+12---R1
                                        ;*+14---R0

025756                                  $SAVREG:
025756  010046                                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
025760  010146                                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
025762  010246                                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
025764  010346                                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
025766  010446                                  MOV     R4,-(SP)        ;;PUSH R4 ON STACK
025770  010546                                  MOV     R5,-(SP)        ;;PUSH R5 ON STACK
025772  016646  000022                          MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
025776  016646  000022                          MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
026002  016646  000022                          MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
026006  016646  000022                          MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
026012  000002                                  RTI

                                        ;*RESTORE R0-R5
                                        ;*CALL:
                                        ;*      RESREG
026014                                  $RESREG:
026014  012666  000022                          MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
026020  012666  000022                          MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
026024  012666  000022                          MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
026030  012666  000022                          MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
026034  012605                                  MOV     (SP)+,R5        ;;POP STACK INTO R5
026036  012604                                  MOV     (SP)+,R4        ;;POP STACK INTO R4
026040  012603                                  MOV     (SP)+,R3        ;;POP STACK INTO R3
026042  012602                                  MOV     (SP)+,R2        ;;POP STACK INTO R2
026044  012601                                  MOV     (SP)+,R1        ;;POP STACK INTO R1
026046  012600                                  MOV     (SP)+,R0        ;;POP STACK INTO R0
026050  000002                                  RTI
```

```
                                        .SBTTL  TRAP DECODER

                                        ;;*****************************************************************
                                        ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE ''TRAP'' INSTRUCTION
                                        ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                        ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                        ;*GO TO THAT ROUTINE.

026052  010046                          $TRAP:  MOV     R0,-(SP)            ;;SAVE R0
026054  016600  000002                          MOV     2(SP),R0            ;;GET TRAP ADDRESS
026060  005740                                  TST     -(R0)               ;;BACKUP BY 2
026062  111000                                  MOVB    (R0),R0             ;;GET RIGHT BYTE OF TRAP
026064  006300                                  ASL     R0                  ;;POSITION FOR INDEXING
026066  016000  026106                          MOV     $TRPAD(R0),R0       ;;INDEX TO TABLE
026072  000200                                  RTS     R0                  ;;GO TO ROUTINE

                                        ;;THIS IS USE TO HANDLE THE ''GETPRI'' MACRO

026074  011646                          $TRAP2: MOV     (SP),-(SP)          ;;MOVE THE PC DOWN
026076  016666  000004  000002                  MOV     4(SP),2(SP)         ;;MOVE THE PSW DOWN
026104  000002                                  RTI                         ;;RESTORE THE PSW

                                        .SBTTL  TRAP TABLE

                                        ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                        ;*BY THE ''TRAP'' INSTRUCTION.

                                        ;       ROUTINE
                                        ;       -------
026106  026074                          $TRPAD: .WORD   $TRAP2
026110  023042                                  $TYPE   ;;CALL=TYPE      TRAP+1(104401)  TTY TYPEOUT ROUTINE
026112  023422                                  $TYPOC  ;;CALL=TYPOC     TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
026114  023376                                  $TYPOS  ;;CALL=TYPOS     TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
026116  023436                                  $TYPON  ;;CALL=TYPON     TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
026120  023624                                  $TYPDS  ;;CALL=TYPDS     TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)

026122  024450                                  $GTSWR  ;;CALL=GTSWR     TRAP+6(104406)  GET SOFT-SWR SETTING

026124  024360                                  $CKSWR  ;;CALL=CKSWR     TRAP+7(104407)  TEST FOR CHANGE IN SOFT-SWR
026126  024722                                  $RDCHR  ;;CALL=RDCHR     TRAP+10(104410) TTY TYPEIN CHARACTER ROUTINE
026130  025012                                  $RDLIN  ;;CALL=RDLIN     TRAP+11(104411) TTY TYPEIN STRING ROUTINE
026132  025756                                  $SAVREG ;;CALL=SAVREG    TRAP+12(104412) SAVE R0-R5 ROUTINE
026134  026014                                  $RESREG ;;CALL=RESREG    TRAP+13(104413) RESTORE R0-R5 ROUTINE
```

```
                                        .SBTTL  SINGLE LENGTH BINARY TO DECIMAL ASCIZ ROUTINE

                                        ;;*************************************************************
                                        ;;*THIS ROUTINE WILL CONVERT A 16-BIT UNSIGNED BINARY NUMBER TO AN
                                        ;;*UNSIGNED DECIMAL ASCIZ NUMBER.
                                        ;;*CALL
                                        ;;*     MOV     NUMBER,-(SP)    ;;PUT BINARY NUMBER ON THE STACK
                                        ;;*     JSR     PC,@#$SB2D      ;;CALL
                                        ;;*     RETURN                  ;;ADDRESS OF THE 1ST ASCIZ CHAR.IS ON THE STACK


 026136  016637  000002  026166  $SB2D: MOV     2(SP),1$        ;;SAVE BINARY NUMBER
 026144  012746  026166                 MOV     #1$,-(SP)       ;;SET POINTER
 026150  004737  026172                 JSR     PC,@#$DB2D      ;;CALL DOUBLE LENGTH CONVERT
 026154  062716  000005                 ADD     #5,(SP)         ;;ONLY ALLOW FIVE CHARACTERS
 026160  012666  000002                 MOV     (SP)+,2(SP)     ;;PICKUP POINTER
 026164  000207                         RTS     PC              ;;RETURN
 026166  000000  000000         1$:     .WORD   0,0
```

```
                                          .SBTTL  DOUBLE LENGTH BINARY TO DECIMAL ASCII CONVERT ROUTINE

                                          ;;*****************************************************************
                                          ;;*THIS ROUTINE WILL CONVERT A 32-BIT BINARY NUMBER TO AN UNSIGNED
                                          ;;*DECIMAL (ASCII) NUMBER. THE SIGN OF THE BINARY NUMBER MUST BE
                                          ;;*POSITIVE.
                                          ;;*CALL
                                          ;;*       MOV     #PNTR,-(SP)        ;;POINTER TO LOW WORD OF BINARY NUMBER
                                          ;;*       JSR     PC,@#$DB2D
                                          ;;*       RETURN                     ;;THE FIRST ADDRESS OF ASCIZ
                                                                             ;;IS ON THE STACK


 026172  104412                           $DB2D:  SAVREG                     ;;SAVE REGISTERS
 026174  016602  000002                           MOV     2(SP),R2           ;;PICKUP THE DATA POINTER
 026200  012700  026352                           MOV     #$DECVL,R0         ;;GET ADDRESS OF '$DECVL'' STRING
 026204  010066  000002                           MOV     R0,2(SP)           ;;PUT ADDRESS OF ASCIZ STRING ON STACK
 026210  012201                                   MOV     (R2)+,R1           ;;PICKUP THE BINARY NUMBER
 026212  012202                                   MOV     (R2)+,R2
 026214  012737  000012  026270                   MOV     #10.,4$            ;;SET UP TO DO 10 CONVERSIONS
 026222  012704  026302                           MOV     #$TNPWR,R4         ;;ADDRESS OF TEN POWER
 026226  012705  026304                           MOV     #$TNPWR+2,R5
 026232  005003                           1$:     CLR     R3                 ;;CLEAR PARTIAL
 026234  161401                           2$:     SUB     (R4),R1            ;;SUBTRACT TEN POWER
 026236  005602                                   SBC     R2
 026240  161502                                   SUB     (R5),R2
 026242  002402                                   BLT     3$                 ;;BR IF TEN POWER TO LARGE
 026244  005203                                   INC     R3                 ;;ADD 1 TO PARTIAL
 026246  000772                                   BR      2$                 ;;LOOP
 026250  062401                           3$:     ADD     (R4)+,R1           ;;RESTORE SUBTRACTED VALUE
 026252  005502                                   ADC     R2
 026254  062402                                   ADD     (R4)+,R2
 026256  022525                                   CMP     (R5)+,(R5)+        ;;MOVE TO NEXT TEN POWER
 026260  052703  000060                           BIS     #'0,R3             ;;CHANGE PARTIAL TO ASCII
 026264  110320                                   MOVB    R3,(R0)+           ;;SAVE IT
 026266  005327                                   DEC     (PC)+              ;;DONE?
 026270  000000                           4$:     .WORD   0
 026272  001357                                   BNE     1$                 ;;BR IF NO
 026274  105020                                   CLRB    (R0)+              ;;TERMINATOR
 026276  104413                                   RESREG                     ;;RESTORE REGISTERS
 026300  000207                                   RTS     PC                 ;;RETURN
 026302  145000                           $TNPWR: 145000                     ;;1.0E09
 026304  035632                                   35632
 026306  160400                                   160400                     ;;1.0E08
 026310  002765                                   2765
 026312  113200                                   113200                     ;;1.0E07
 026314  000230                                   230
 026316  041100                                   041100                     ;;1.0E06
 026320  000017                                   17
 026322  103240                                   103240                     ;;1.0E05
 026324  000001                                   1
 026326  023420                                   23420                      ;;1.0E04
 026330  000000                                   0
 026332  001750                                   1750                       ;;1.0E03
 026334  000000                                   0
 026336  000144                                   144                        ;;1.0E02
 026340  000000                                   0
```

```
  026342  000012                    12                    ;;1.0E01
  026344  000000                    0
  026346  000001                    1                     ;;1.0E00
  026350  000000                    0
  026352                   $DECVL: .BLKB   12.            ;;RESERVE STORAGE FOR ASCIZ STRING
```

```
                                        .SBTTL  TYPE NUMERICAL ASCIZ STRING SUPPRESS LEADING ZEROS

                                        ;;*******************************************************************
                                        ;*THIS ROUTINE IS USED TO TYPE AN ASCIZ NUMBER SUPPRESSING THE
                                        ;*LEADING NUMBERS.
                                        ;*CALL
                                        ;*      MOV     #NUMADR,-(SP)     ;;FIRST ADDRESS OF ASCIZ STRING
                                        ;*      JSR     PC,@#$SUPRS

026366  010046                          $SUPRS: MOV     R0,-(SP)          ;;SAVE R0
026370  016600  000004                          MOV     4(SP),R0          ;;PICKUP THE POINTER
026374  105710                          1$:     TSTB    (R0)              ;;TERMINATEOR?
026376  001403                                  BEQ     2$                ;;BR IF YES
026400  122720  000060                          CMPB    #'0,(R0)+         ;;IS THIS AN ASCII ''0'' ?
026404  001773                                  BEQ     1$                ;;BR IF YES
026406  005300                          2$.     DEC     R0                ;;BACKUP BY ''1''
026410  010037  026416                          MOV     R0,3$             ;;SAVE FOR TYPING
026414  104401                                  TYPE                      ;;GO TYPE
026416  000000                          3$:     .WORD   0                 ;;ASCIZ POINTER GOES HERE
026420  012600                                  MOV     (SP)+,R0          ;;RESTORE R0
026422  012616                                  MOV     (SP)+,(SP)        ;;RESTORE THE STACK
026424  000207                                  RTS     PC                ;;RETURN
```

```
                                        .SBTTL  RANDOM NUMBER GENERATOR ROUTINE

                                        ;;*****************************************************************
                                        ;;*THIS ROUTINE IS A DOUBLE PRECISION PSEUDO RANDOM NUMBER GENERATOR
                                        ;;*WITH A RANGE OF 0 TO 2(+33)-1.
                                        ;;*CALL:
                                        ;;*       JSR     PC,$RAND                ;;CALL THE ROUTINE
                                        ;;*       RETURN                          ;;RETURN HERE THE RANDOM
                                        ;;*                                       ;;NUMBER WILL BE IN
                                        ;;*                                       ;;$HINUM,$LONUM

      026426                            $RAND:
      026426  010046                            MOV     R0,-(SP)                ;;PUSH R0 ON STACK
      026430  010146                            MOV     R1,-(SP)                ;;PUSH R1 ON STACK
      026432  010246                            MOV     R2,-(SP)                ;;PUSH R2 ON STACK
      026434  013700  026526                    MOV     $LONUM,R0               ;;SET R0 WITH LOW
      026440  013701  026524                    MOV     $HINUM,R1               ;;SET R1 WITH HIGH
      026444  012702  177771                    MOV     #-7,R2                  ;;SET SHIFT COUNT
      026450  006300                    1$:     ASL     R0                      ;;SHIFT R0 LEFT AND
      026452  006101                            ROL     R1                      ;;ROTATE CARRY INTO R1 AND
      026454  005202                            INC     R2                      ;;CHECK FOR DONE
      026456  001374                            BNE     1$                      ;;CONTINUE SHIFT LOOP
      026460  063700  026526                    ADD     $LONUM,R0               ;;ADD NUMBER TO MAKE X 129
      026464  005501                            ADC     R1                      ;;PROPOGATE CARRY
      026466  063701  026524                    ADD     $HINUM,R1               ;;ADD NUMBER TO MAKE X 129
      026472  062700  001057                    ADD     #1057,R0                ;;ADD LOW CONSTANT
      026476  005501                            ADC     R1                      ;;PROPOGATE CARRY
      026500  062701  047401                    ADD     #47401,R1               ;;ADD HIGH CONSTANT
      026504  010037  026526                    MOV     R0,$LONUM               ;;SAVE R0
      026510  010137  026524                    MOV     R1,$HINUM               ;;SAVE R1
      026514  012602                            MOV     (SP)+,R2                ;;POP STACK INTO R2
      026516  012601                            MOV     (SP)+,R1                ;;POP STACK INTO R1
      026520  012600                            MOV     (SP)+,R0                ;;POP STACK INTO R0
      026522  000207                            RTS     PC                      ;;RETURN
      026524  176543                    $HINUM: .WORD   176543
      026526  123456                    $LONUM: .WORD   123456
```

```
                                        .SBTTL  INTEGER DIVIDE ROUTINE

                                        ;;*********************************************************************
                                        ;;*THIS ROUTINE WILL DIVIDE A 32-BIT TWO'S COMPLEMENT INTEGER
                                        ;;*DIVIDEND BY A 16-BIT TWO'S COMPLEMENT INTEGER DIVISOR GIVING
                                        ;;*A 16-BIT TWO'S COMPLEMENT INTEGER QUOTIENT AND A 16-BIT REMAINDER.
                                        ;;*DIVISION WILL BE PERFORMED SO THAT THE REMAINDER IS OF THE
                                        ;;*SAME SIGN AS THE DIVIDEND.
                                        ;;*CALL:
                                        ;;*       MOV     LOW DIVIDEND,-(SP)      ;;THE HIGH DIVIDEND MUST BE < 1/2
                                        ;;*       MOV     HIGH DIVIDEND,-(SP)     ;;AS LARGE AS THE DIVISOR
                                        ;;*       MOV     DIVISOR,-(SP)
                                        ;;*       JSR     PC,$DIV
                                        ;;*       RETURN                          ;;QUOTIENT & REMAINDER ARE ON THE STACK
                                        ;;*       ''V''=0 IMPLIES NO ERROR
                                        ;;*       ''V''=1 IMPLIES ERROR OCCURRED
                                        ;;*               ''C''=0  DIVIDE OVERFLOW OCCURRED
                                        ;;*               ''C''=1  ATTEMPTED TO DIVIDE BY ZERO
                                        ;;*
                                        ;;*
                                        ;;*       STACK   NO ERROR        OVERFLOW        DIVIDE BY ZERO
                                        ;;*       -----   --------        --------        --------------
                                        ;;*       TOP     REMAINDER       ALL ZEROS       ALL ONES
                                        ;;*       +2      QUOTIENT        ALL ZEROS       ALL ONES

026530                                  $DIV:
026530  104400                                  TRAP                    ;;PUSH OLD PSW AND PC ON STACK
026532  042716  000017                          BIC     #17,(SP)        ;;STRIP AWAY CONDITION CODES
026536  010046                                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
026540  010146                                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
026542  010246                                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
026544  010346                                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
026546  005046                                  CLR     -(SP)           ;;SAVE A PLACE FOR SIGNS
026550  012746  000021                          MOV     #17.,-(SP)      ;;SETUP THE ITERATION COUNTER
026554  016601  000024                          MOV     24(SP),R1       ;;PICKUP THE DIVIDEND
026560  016600  000022                          MOV     22(SP),R0
026564  100005                                  BPL     1$              ;;CHECK THE SIGN
026566  105366  000003                          DECB    3(SP)           ;;KEEP TRACK OF THE SIGN
026572  005400                                  NEG     R0              ;;AND NEGATE THE ORIGINAL
026574  005401                                  NEG     R1              ;;NUMBER
026576  005600                                  SBC     R0
026600  016602  000020                  1$:     MOV     20(SP),R2       ;;PICKUP THE DIVISOR
026604  002407                                  BLT     2$              ;;CHECK THE SIGN
026606  003011                                  BGT     3$              ;;DIVISOR OF 0 IS A NO-NO
026610  052766  000003  000014                  BIS     #3,14(SP)       ;;SET 'V'' & ''C''
026616  012700  177777                          MOV     #-1,R0          ;;SET REMAINDER TO ALL ONES
026622  000424                                  BR      7$              ;;EXIT
026624  005266  000002                  2$:     INC     2(SP)           ;;KEEP TRACK OF DIVISORS SIGN
026630  000401                                  BR      4$
026632  005402                          3$:     NEG     R2              ;;NEGATE THE ORIGINAL NUMBER
026634  000241                          4$:     CLC                     ;;CLEAR ''C''
026636  000405                                  BR      6$              ;;START FORMING QUOTIENT
026640  006100                          5$:     ROL     R0              ;;POSITION MSB'S
026642  010003                                  MOV     R0,R3           ;;COPY
026644  060203                                  ADD     R2,R3           ;;COMPARE DIVIDEND & DIVISOR
026646  103001                                  BCC     6$              ;;BR IF DIVIDEND > DIVISOR
026650  010300                                  MOV     R3,R0           ;;REMAINDER AFTER THIS LOOP
```

```
026652  006101                   6$:     ROL     R1                      ;;QUOTIENT BIT ENTERS HERE
026654  005316                           DEC     (SP)                    ;;DONE?
026656  001370                           BNE     5$                      ;;BR IF NO
026660  005701                           TST     R1                      ;;OVERFLOW?
026662  100005                           BPL     8$                      ;;BR IF NO
026664  052766  000002  000014           BIS     #2,14(SP)               ;;SET 'V' IN RETURN STATUS WORD
026672  005000                           CLR     R0                      ;;SET REMAINDER TO ALL ZEROS
026674  010001                   7$:     MOV     R0,R1                   ;;COPY REMAINDER INTO QUOTIENT
026676  005726                   8$:     TST     (SP)+                   ;;CLEAR COUNTER FROM STACK
026700  005716                           TST     (SP)                    ;;REMAINDER SIGN CORRECTION NEEDED?
026702  002004                           BGE     9$                      ;;BR IF NO
026704  005400                           NEG     R0                      ;;NEGATE REMAINDER
026706  105066  000001                   CLRB    1(SP)                   ;;CLEAR SIGN
026712  005316                           DEC     (SP)                    ;;BUT DON'T FORGET QUOTIENT
026714  005726                   9$:     TST     (SP)+                   ;;QUOTIENT SIGN CORRECTION NEEDED?
026716  001401                           BEQ     10$                     ;;BR IF NO
026720  005401                           NEG     R1                      ;;NEGATE QUOTIENT
026722  010166  000020           10$:    MOV     R1,20(SP)               ;;RETURN QUOTIENT AND
026726  010066  000016                   MOV     R0,16(SP)               ;;REMAINDER TO USER
026732  012603                           MOV     (SP)+,R3                ;;POP STACK INTO R3
026734  012602                           MOV     (SP)+,R2                ;;POP STACK INTO R2
026736  012601                           MOV     (SP)+,R1                ;;POP STACK INTO R1
026740  012600                           MOV     (SP)+,R0                ;;POP STACK INTO R0
026742  012666  000002                   MOV     (SP)+,2(SP)             ;;SETUP TO RETURN CONDITION CODES
026746  000002                           RTI                             ;;RETURN
```

```
                                        .SBTTL  APT COMMUNICATIONS ROUTINE

                                        ;;*************************************************************
 026750  112737  000001  027214  $ATY1:  MOVB    #1,$FFLG                ;;TO REPORT FATAL ERROR
 026756  112737  000001  027212  $ATY3:  MOVB    #1,$MFLG                ;;TO TYPE A MESSAGE
 026764  000403                          BR      $ATYC
 026766  112737  000001  027214  $ATY4:  MOVB    #1,$FFLG                ;;TO ONLY REPORT FATAL ERROR
 026774                          $ATYC:
 026774  010046                          MOV     R0,-(SP)                ;;PUSH R0 ON STACK
 026776  010146                          MOV     R1,-(SP)                ;;PUSH R1 ON STACK
 027000  105737  027212                  TSTB    $MFLG                   ;;SHOULD TYPE A MESSAGE?
 027004  001450                          BEQ     5$                      ;;IF NOT:  BR
 027006  122737  000001  001254          CMPB    #APTENV,$ENV            ;;OPERATING UNDER APT?
 027014  001031                          BNE     3$                      ;;IF NOT:  BR
 027016  132737  000100  001255          BITB    #APTSPOOL,$ENVM         ;;SHOULD SPOOL MESSAGES?
 027024  001425                          BEQ     3$                      ;;IF NOT:  BR
 027026  017600  000004                  MOV     @4(SP),R0               ;;GET MESSAGE ADDR.
 027032  062766  000002  000004          ADD     #2,4(SP)                        ;;BUMP RETURN ADDR.
 027040  005737  001234          1$:     TST     $MSGTYPE                ;;SEE IF DONE W/ LAST XMISSION?
 027044  001375                          BNE     1$                      ;;IF NOT:  WAIT
 027046  010037  001250                  MOV     R0,$MSGAD               ;;PUT ADDR IN MAILBOX
 027052  105720                  2$:     TSTB    (R0)+                   ;;FIND END OF MESSAGE
 027054  001376                          BNE     2$
 027056  163700  001250                  SUB     $MSGAD,R0               ;;SUB START OF MESSAGE
 027062  006200                          ASR     R0                      ;;GET MESSAGE LNGTH IN WORDS
 027064  010037  001252                  MOV     R0,$MSGLGT              ;;PUT LENGTH IN MAILBOX
 027070  012737  000004  001234          MOV     #4,$MSGTYPE             ;;TELL APT TO TAKE MSG.
 027076  000413                          BR      5$
 027100  017637  000004  027124  3$:     MOV     @4(SP),4$               ;;PUT MSG ADDR IN JSR LINKAGE
 027106  062766  000002  000004          ADD     #2,4(SP)                        ;;BUMP RETURN ADDRESS
 027114  013746  177776                  MOV     177776,-(SP)            ;;PUSH 177776 ON STACK
 027120  004737  023042                  JSR     PC,$TYPE                ;;CALL TYPE MACRO
 027124  000000                  4$:     .WORD   0
 027126                          5$:
 027126  105737  027214          10$:    TSTB    $FFLG                   ;;SHOULD REPORT FATAL ERROR?
 027132  001416                          BEQ     12$                     ;;IF NOT:  BR
 027134  005737  001254                  TST     $ENV                    ;;RUNNING UNDER APT?
 027140  001413                          BEQ     12$                     ;;IF NOT:  BR
 027142  005737  001234          11$:    TST     $MSGTYPE                ;;FINISHED LAST MESSAGE?
 027146  001375                          BNE     11$                     ;;IF NOT:  WAIT
 027150  017637  000004  001236          MOV     @4(SP),$FATAL           ;;GET ERROR #
 027156  062766  000002  000004          ADD     #2,4(SP)                        ;;BUMP RETURN ADDR.
 027164  005237  001234                  INC     $MSGTYPE                ;;TELL APT TO TAKE ERROR
 027170  105037  027214          12$:    CLRB    $FFLG                   ;;CLEAR FATAL FLAG
 027174  105037  027213                  CLRB    $LFLG                   ;;CLEAR LOG FLAG
 027200  105037  027212                  CLRB    $MFLG                   ;;CLEAR MESSAGE FLAG
 027204  012601                          MOV     (SP)+,R1                ;;POP STACK INTO R1
 027206  012600                          MOV     (SP)+,R0                ;;POP STACK INTO R0
 027210  000207                          RTS     PC                      ;;RETURN
 027212     000                  $MFLG:  .BYTE   0                       ;;MESSG. FLAG
 027213     000                  $LFLG:  .BYTE   0                       ;;LOG FLAG
 027214     000                  $FFLG:  .BYTE   0                       ;;FATAL FLAG
                                         .EVEN
         000200                  APTSIZE = 200
         000001                  APTENV  = 001
         000100                  APTSPOOL= 100
         000040                  APTCSUP = 040
```

```
                                        ;THIS ROUTINE IS USED TO 'NCREMENT THE ERROR COUNT FOR EACH DRIVE BEING
                                        ;TESTED. IF THE TOTAL ERRORS ON ANY DRIVE EXCEEDS THE MAXIMUM ALLOWABLF
                                        ;ERRORS DESIGNATED IN LOCATION 'ERMAX', A MESSAGE WILL BE TYPED AND THE
                                        ;DRIVE IN ERROR WILL BE DROPPED FROM THE TEST.

027216  010046                          INCEC:  MOV     R0,-(SP)        ;SAVE R0
027220  013700  040650                          MOV     RMADR,R0        ;GET RM BASE ADDRESS
027224  016000  000010                          MOV     RMCS2(R0),R0    ;GET CONTENTS OF RMCS2
027230  042700  177770                          BIC     #^C7,R0         ;SAVE UNIT SELECT BITS
027234  136037  040636  001330                  BITB    ATABIT(R0),DRVSEL       ;WAS THIS DRIVE SELECTED FOR TEST
027242  001432                                  BEQ     1$              ;BR IF NO
027244  105260  001472                          INCB    ERRCN(R0)       ;INCREMENT ERROR COUNT
027250  126037  001472  001316                  CMPB    ERRCN(R0),ERMAX ;EXCEEDED ERROR LIMIT ?
027256  103424                                  BLO     1$              ;BR IF NO
027260  104401  001231                          TYPE    ,$CRLF          ;CR-LF
027264  104401  047625                          TYPE    ,MSDRIV         ;TYPE 'DRIVE'
027270  010046                                  MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
027272  104403                                  TYPOS                   ;;GO TYPE--OCTAL ASCII
027274     002                                  .BYTE   2               ;;TYPE 2 DIGIT(S)
027275     000                                  .BYTE   0               ;;SUPPRESS LEADING ZEROS
027276  104401  047634                          TYPE    ,DROP           ;TYPE ' DROPPED'
027302  104401  047515                          TYPE    ,COMMA          ;TYPE ', '
027306  104401  047645                          TYPE    ,EXCEED         ;TYPE 'EXCEEDED MAXIMUM ERROR LIMIT'
027312  146037  040636  001330                  BICB    ATABIT(R0),DRVSEL       ;DESELECT DRIVE FROM TEST
027320  005337  021506                          DEC     $EOPCT          ;ADJUST 'EOP' COUNT
027324  000137  021334                          JMP     $EOP            ;RETURN TO $EOP
027330  012600                          1$:     MOV     (SP)+,R0        ;RESTORE R0
027332  000207                                  RTS     PC

                                        ;THIS SUBROUTINE CLEARS THE MASSBUS CONTROLLER, MASSBUS ADAPTER,
                                        ;AND DRIVERS, THEN SELECTS THE DRIVE.
                                        ;CALL:
                                        ;       JSR     PC,CNTCLR       ;CALL TO ROUTINE
                                        ;

027334  013704  040650                  CNTCLR: MOV     RMADR,R4        ;GET RMCS1 BASE ADDRESS
027340  012764  000040  000010                  MOV     #CLR,RMCS2(R4)  ;ISSUE MASSBUS CLEAR AND
027346  042737  177770  001352                  BIC     #^C7,CHKDRV     ;SAVE UNIT SELECT BITS
027354  013764  001352  000010                  MOV     CHKDRV,RMCS2(R4)        ;SELECT THE DRIVE
027362  000207                                  RTS     PC              ;RETURN

                                        ;SET 'LPTAVL'' TO THE PROPER STATE.
                                        ; LPTAVL = 0 IF NO LINE PRINTER AVAILABLE
                                        ; LPTAVL = 1 IF LINE PRINTER IS AVAILABLE
                                        ;CALL
                                        ;       JSR     PC,LP.AVL
                                        ;       RETURN

027364  005037  001326                  LP.AVL: CLR     LPTAVL          ;START WITH NO PRINTER AVAIABLE
027370  012737  027414  000004                  MOV     #1$,ERRVEC      ;SETUP THE TIMEOUT VECTOR
027376  005037  000006                          CLR     ERRVEC+2
027402  005777  152126                          TST     @LPS            ;IS THERE A LINE PRINTER?
027406  005237  001326                          INC     LPTAVL          ;YES--SET AVAILABLE SWITCH
027412  000401                                  BR      2$
027414  022626                          1$:     CMP     (SP)+,(SP)+     ;NO--POP STACK
027416  012737  000006  000004          2$:     MOV     #ERRVEC+2,ERRVEC        ;RESTORE TIMEOUT VECTOR
027424  000207                                  RTS     PC              ;RETURN
```

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                                        ;THIS ROUTINE WILL DETERMINE IF THERE IS A CLOCK ON THE SYSTEM
                                        ;AND IF THERE IS IT WILL SETUP THE VECTOR AND START THE CLOCK
                                        ;"CLKSTA" WILL INDICATE THE CLOCK TYPE
                                        ; 0= NO CLOCK
                                        ;+1= KW11-P
                                        ;-1= KW11-L
                                        ;THIS ROUTINE WILL ALSO SETUP "TICKMS" (TIME
                                        ;PER CLOCK TICK IN MILLISECONDS) AND "TICKUS"
                                        ;(TIME PER CLOCK TICK IN MICROSECONDS) AS
                                        ;PER SW00.
                                        ;SW00=0 -- 60HZ
                                        ;SW00=1 -- 50HZ
                                        ;CALL
                                        ;       JSR     PC,ST.CLK
                                        ;       RETURN

 027426  010146                         ST.CLK: MOV     R1,-(SP)        ;SAVE R1
 027430  012701  000006                         MOV     #ERRVEC+2,R1    ;SAVE AND SETUP TIMEOUT VECTOR
 027434  011146                                 MOV     (R1),-(SP)
 027436  005011                                 CLR     (R1)            ;LEVEL 0
 027440  014146                                 MOV     -(R1),-(SP)
 027442  012711  027472                         MOV     #1$,(R1)        ;GO TO 1$ ON TIMEOUT
 027446  005037  001342                         CLR     CLKSTA          ;SET CLOCK STATUS TO NO CLOCK
 027452  005777  152036                         TST     @PKCS           ;IS THERE A KW11-P?
 027456  012737  000001  001342                 MOV     #1,CLKSTA       ;YES--SET STATUS TO KW11-P
 027464  004737  027574                         JSR     PC,ST.PCLK      ;START THE KW11-P
 027470  000414                                 BR      3$              ;GO TO EXIT
 027472  022626                         1$:     CMP     (SP)+,(SP)+     ;CLEAN UP THE STACK
 027474  012711  027520                         MOV     #2$,(R1)        ;IF TIMEOUT GO TO 2$
 027500  005777  152022                         TST     @LKS            ;IS THERE A KW11-L?
 027504  012737  177777  001342                 MOV     #-1,CLKSTA      ;YES-- SET STATUS TO KW11-L
 027512  004737  027636                         JSR     PC,ST.LCLK      ;START THE KW11-L
 027516  000401                                 BR      3$              ;EXIT
 027520  022626                         2$:     CMP     (SP)+,(SP)+     ;CLEAN UP THE STACK
 027522  012621                         3$:     MOV     (SP)+,(R1)+     ;RESTORE THE TIMEOUT VECTOR
 027524  012621                                 MOV     (SP)+,(R1)+
 027526  012601                                 MOV     (SP)+,R1        ;RESTORE R1
 027530  032737  000100  001314                 BIT     #SW06,C.SWR     ;50HZ OR 60HZ?
 027536  001407                                 BEQ     4$              ;BRANCH IF 60
 027540  012737  000020  001344                 MOV     #20,TICKMS      ;SETUP TIME PER
 027546  012737  047040  001346                 MOV     #20000.,TICKUS  ;TICK FOR 50HZ
 027554  000406                                 BR      5$
 027556  012737  000016  001344         4$:     MOV     #16,TICKMS      ;SETUP TIME PER
 027564  012737  040432  001346                 MOV     #16666.,TICKUS  ;TICK FOR 60HZ
 027572  000207                         5$:     RTS     PC              ;RETURN

 027574                                 ST.PCLK:
 027574  032737  000040  001314                 BIT     #SW05,C.SWR     ;ALLOW SOFTWARE TIMEOUTS?
 027602  001014                                 BNE     1$              ;NO--BRANCH
 027604  012777  027672  151676                 MOV     #SRVCLK,@PKV    ;SETUP THE KW11-P VECTOR
 027612  012777  000300  151672                 MOV     #300,@PKV+2
 027620  012777  000001  151670                 MOV     #1,@PKB         ;COUNT ONE TICK
 027626  012777  000115  151660                 MOV     #115,@PKCS      ;"INT.EN.",COUNT DOWN", "MODE 1 (REPEAT)",
                                                                        ;"LINE FREQ", AND "RUN"
 027634  000207                         1$:     RTS     PC              ;RETURN

```

```
112 027636                              ST.LCLK:
113 027636  032737  000040  001314              BIT     #SW05,C.SWR     ;ALLOW SOFTWARE TIMEOUTS?
114 027644  001011                              BNE     1$              ;NO--BRANCH
115 027646  012777  027672  151646              MOV     #SRVCLK,@LKV    ;SETUP THE KW11-L VECTOR
116 027654  012777  000300  151642              MOV     #300,@LKV+2
117 027662  012777  000100  151636              MOV     #100,@LKS       ;START THE KW11-L
118 027670  000207                      1$:     RTS     PC              ;RETURN
119
120 027672  013746  001344              SRVCLK. MOV     TICKMS,-(SP)    ;TIME PER TICK IN MILLISECONDS
121 027676  004737  044670                      JSR     PC,RMTMR        ;COUNT THE ELASPED TIME
122 027702  000002                              RTI                     ;RETURN AFTER INTERRUPT
123
124                                     ;THIS ROUTINE SETS UP DEFAULT PARAMETER VALUES WHEN THE PROGRAM IS
125                                     ;STARTED OR WHEN THE VALUE OF BITCO IN 'C.SWR' IS CHANGED.
126                                     ;CALL
127                                     :       JSR     PC,LODFLT
128                                     :       RETURN
129
130 027704                              LODFLT:
    027704  010046                              MOV     R0,-(SP)        ;;PUSH R0 ON STACK
    027706  010146                              MOV     R1,-(SP)        ;;PUSH R1 ON STACK
    027710  010246                              MOV     R2,-(SP)        ;;PUSH R2 ON STACK
    027712  010346                              MOV     R3,-(SP)        ;;PUSH R3 ON STACK
131 027714  012737  166777  001332              MOV     #166777,TSTNMS  ;SELECT TESTS 0-10,12,13 & 15-17
132 027722  012737  000003  001334              MOV     #3,TSTNMS+2     ;SELECT TESTS 20 & 21
133 027730  012700  002526                      MOV     #DFLT,R0        ;DEFAULT PARAMETERS POINTER
134 027734  012701  003132                      MOV     #PRM0,R1        ;TABLE POINTER
135 027740  010102                              MOV     R1,R2           ;STOP ADDRESS
136 027742  012021                      1$:     MOV     (R0)+,(R1)+     ;MOVE DEFAULT PARAMETERS INTO
137 027744  020002                              CMP     R0,R2           ;RUN TIME TABLES ** DONE?
138 027746  103775                              BLO     1$              ;NO--BRANCH
139 027750  012700  004176                      MOV     #PAT8,R0        ;PATO DEFAULTS TO PATTERN 8
140 027754  012701  003576                      MOV     #PAT0,R1
141 027760  012021                      2$:     MOV     (R0)+,(R1)+
142 027762  020027  004236                      CMP     R0,#PAT9
143 027766  103774                              BLO     2$
144 027770  032737  000001  001314              BIT     #BIT00,C.SWR    ;16 BIT MODE ?
145 027776  001012                              BNE     3$              ;BR IF 18 BIT MODE
146 030000  012737  000037  002470              MOV     #31.,PRMLMT+24  ;SET 'FS' LIMIT TO 31.
147 030006  012737  000037  002472              MOV     #31.,PRMLMT+26  ;SET 'LS' LIMIT TO 31.
148 030014  012737  160000  001452              MOV     #-<256.*32.>,TRCKWC     ;WORD COUNT FOR A 16 BIT TRACK
149 030022  000411                              BR      4$              ;CONTINUE
150 030024  012737  000035  002470      3$:     MOV     #29.,PRMLMT+24  ;SET 'FS' LIMIT TO 29.
151 030032  012737  000035  002472              MOV     #29.,PRMLMT+26  ;SET 'LS' LIMIT TO 29.
152 030040  012737  161000  001452              MOV     #-<256.*30.>,TRCKWC     ;WORD COUNT FOR AN 18 BIT TRACK
153 030046  012701  002374              4$:     MOV     #PRMPT,R1       ;ADDRESS OF PARAMETER POINTER TABLE
154 030052  005711                      5$:     TST     (R1)            ;END OF PARAMETER POINTER TABLE ?
155 030054  001425                              BEQ     8$              ;BR IF YES
156 030056  032731  004000                      BIT     #BIT11,@(R1)+   ;IS 'LS' SELECTED AS A VARIABLE IN THIS TEST ?
157 030062  001773                              BEQ     5$              ;BR IF NO
158 030064  016102  177776                      MOV     -2(R1),R2       ;GET FIRST POSITION IN PARAMETER TABLE
159 030070  011246                              MOV     (R2),-(SP)      ;AND SAVE VARIABLES BITS THAT ARE USED.
160 030072  012703  000014                      MOV     #12.,R3         ;POSITION OF 'LS' IN TEST PARAMATER TABLE
161 030076  006216                      6$:     ASR     (SP)            ;IS THIS PARAMETER A VARIABLE ?
162 030100  103002                              BCC     7$              ;BR IF NO
163 030102  062702  000002                      ADD     #2,R2           ;YES, POINT TO NEXT PARAMETER IN TABLE
164 030106  005303                      7$:     DEC     R3              ;AT 'LS' PARAMETER YET ?
```

```
030110  001372                                  BNE     6$              ;BR IF NO
030112  005726                                  TST     (SP)+           ;ADJUST THE STACK
030114  021237  002470                          CMP     (R2),PRMLMT+24  ;IS 'LS' TOO LARGE FOR THE MODE SELECTED ?
030120  101754                                  BLOS    5$              ;BR IF NO
030122  013712  002470                          MOV     PRMLMT+24,(R2)  ;RESET VALUE FOR MODE USED
030126  000751                                  BR      5$              ;CONTINUE
030130                                  8$:
030130  012603                                  MOV     (SP)+,R3        ;;POP STACK INTO R3
030132  012602                                  MOV     (SP)+,R2        ;;POP STACK INTO R2
030134  012601                                  MOV     (SP)+,R1        ;;POP STACK INTO R1
030136  012600                                  MOV     (SP)+,R0        ;;POP STACK INTO R0
030140  000207                                  RTS     PC              ;RETURN

                                        ;THIS ROUTINE FILLS THE PARAMETER TABLE THE CURRENT TEST.
                                        ;CALL
                                        ;       MOV     #TESTNUM,$TSTNM ;LOAD THE TEST NUMBER
                                        ;       JSR     PC,LODPRM
                                        ;       RETURN

030142                                  LODPRM:
030142  010146                                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
030144  010246                                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
030146  010346                                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
030150  010446                                  MOV     R4,-(SP)        ;;PUSH R4 ON STACK
030152  005004                                  CLR     R4              ;CLEAR R4
030154  113704  001116                          MOVB    $TSTNM,R4       ;GET THE TEST NUMBER
030160  006304                                  ASL     R4              ;SETUP TO ADDRESS WORDS
030162  016401  002374                          MOV     PRMPT(R4),R1    ;GET THE TEST'S PARAMETER TABLE ADDRESS
030166  012702  002334                          MOV     #PRM,R2         ;PARAMETER EXECUTION TABLE
030172  005003                                  CLR     R3              ;R3 IS USED AS A COUNTER
030174  013704  001352                          MOV     CHKDRV,R4       ;GET DRIVE ADDRESS
030200  012122                                  MOV     (R1)+,(R2)+     ;LOAD PARAMETER SPECIFIER
030202  006237  002334                  1$:     ASR     PRM             ;IS THIS PARAMETER USED IN THE TEST ?
030206  103002                                  BCC     2$              ;BR IF NOT
030210  012122                                  MOV     (R1)+,(R2)+     ;LOAD THE VALUE
030212  000401                                  BR      3$              ;CONTINUE
030214  005022                          2$:     CLR     (R2)+           ;CLEAR THE UNUSED PARAMETER LOCATION
030216  005203                          3$:     INC     R3              ;COUNT THE POSITION IN THE OUTPUT TABLE
030220  022702  002362                          CMP     #PAT+2,R2       ;FINISHED ?
030224  001437                                  BEQ     7$              ;BR IF YES
030226  022703  000007                          CMP     #7,R3           ;DOING TRACK PARAMETERS ?
030232  001363                                  BNE     1$              ;BR IF NO
030234  122764  000007  040542                  CMPB    #7,DRVTYP(R4)   ;IS DEVICE AN RM05 ?
030242  001422                                  BEQ     6$              ;IF SO, OVERLAY FT, LT & IT WITH FT', LT' & IT'
030244  013737  002456  001374                  MOV     PRMLMT+12,LSTRK ;GET LAST TRACK FOR AN RM03/2
030252  062703  000003                          ADD     #3,R3           ;ADJUST COUNTER
030256  006237  002334                          ASR     PRM             ;COUNT THE PARAMETER
030262  103001                                  BCC     4$              ;BR IF FT' IS NOT USED
030264  005721                                  TST     (R1)+           ;MOVE THE INPUT POINTER
030266  006237  002334                  4$:     ASR     PRM             ;COUNT THE PARAMETER
030272  103001                                  BCC     5$              ;BR IF LT' NOT USED
030274  005721                                  TST     (R1)+           ;MOVE THE INPUT POINTER
030276  006237  002334                  5$:     ASR     PRM             ;COUNT THE PARAMETER
030302  103337                                  BCC     1$              ;BR IF IT' NOT USED
030304  005721                                  TST     (R1)+           ;MOVE THE INPUT POINTER
030306  000735                                  BR      1$              ;KEEP GOING
030310  013737  002464  001374          6$:     MOV     PRMLMT+20,LSTRK ;GET LAST TRACK FOR AN RM05
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030316  162702  000006                  SUB     #6,R2           ;BACKUP THE OUTPUT POINTER
030322  000727                          BR      1$              ;KEEP GOING
030324                          7$:
030324  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
030326  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
030330  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
030332  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
030334  000207                          RTS     PC              ;RETURN

                                ;THIS ROUTINE LOADS A READ HEADER AND DATA COMMAND OR A SEEK COMMAND
                                ;INTO DPB.B+2 AND DPB.C+2, DEPENDING ON THE STATE OF ''CONTROL SWITCH''
                                ;BIT07.
                                ;CALL
                                ;       JSR     PC,LDCMD
                                ;       RETURN

030336  032737  000200  001314  LDCMD:  BIT     #SW07,C.SWR     ;DO EXPLICIT SEEKS?
030344  001007                          BNE     1$              ;YES--BRANCH
030346  012737  000173  047040          MOV     #READHD,DPB.B+2 ;NO--SET UP FOR READ HEADER AND
030354  012737  000173  047060          MOV     #RFADHD,DPB.C+2 ;DATA COMMAND
030362  000406                          BR      2$
030364  012737  000105  047040  1$:     MOV     #SEEK,DPB.B+2   ;SETUP FOR SEEK COMMAND
030372  012737  000105  047060          MOV     #SEEK,DPB.C+2
030400  000207                  2$:     RTS     PC

                                ;THIS ROUTINE WILL CALL THE RM05 DRIVER AND THEN WAIT ON THE FUNCTION
                                ;TO COMPLETE. IF AN ERROR OCCURS IT IS REPORTED.
                                ;CALL
                                ;       FILL 'DPB'' WITH COMMAND INFORMATION
                                ;       JSR     R0,CALL.A
                                ;       RETURN

030402  005037  001222          CALL.A: CLR     $ESCAPE         ;NO ESCAPE ADDRESS
030406  004037  041406                  JSR     R0,RM05         ;CALL RM05 DRIVER
030412  047016                          DPB.A
030414  000772                          BR      CALL.A
030416  005737  047034          1$:     TST     DPB.A+16        ;DONE?
030422  001775                          BEQ     1$              ;NO--LOOP
030424  100050                          BPL     5$              ;BRANCH IF NO ERROR
030426  012737  030522  001222          MOV     #3$,$ESCAPE     ;;ESCAPE TO 3$ ON ERROR
030434  013737  047030  001366          MOV     DPB.A+12,CYL.DS ;CYLINDER
030442  113737  047027  001372          MOVB    DPB.A+11,TRK.DS ;TRACK
030450  113737  047026  001370          MOVB    DPB.A+10,SEC.DS ;SECTOR
030456  012746  047034                  MOV     #DPB.A+16,-(SP) ;STATUS/ERROR INDICATOR ADDRESS
030462  004737  032170                  JSR     PC,ERINDX       ;FORM DISPATCH INDEX
030466  062607                          ADD     (SP)+,PC        ;REPORT PROPER ERROR
030470  104041                          EMT     41              ;NON-EXIST DRIVE
030472  104042                          EMT     42              ;PARITY ERROR
030474  104043                          EMT     43              ;UNSAFE ERROR
030476  104044                          EMT     44              ;NON-I/O ERROR
030500  000240                          NOP                     ;TO SYNC THE CALLING SEQ OF ERINDX
030502  005737  047154                  TST     RM.REG+RMER1    ;ANY DRIVE ERROR ?
030506  001004                          BNE     2$              ;BRANCH IF SO
030510  032737  100000  047202          BIT     #BSE,RM.REG+RMER2       ;BAD SPOT ERROR
030516  001013                          BNE     5$              ;BRANCH IF SO
030520                          2$:
030520  104045                          EMT     45              ;I/O ERROR
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030522  032737  040000  047202  3$:     BIT     #SKI,RM.REG+RMER2       ;SKI ERROR ?
030530  001402                          BEQ     4$                      ;BR IF NO
030532  004037  032016                  JSR     R0,CALL.R               ;DO RECALIBRATE COMMAND
030536  013746  047034          4$:     MOV     DPB.A+16,-(SP)          ;STATUS WORD
030542  004737  032130                  JSR     PC,LOP.CK               ;SEE IF LOOP, ABORT, OR CONTINUE
030546  000200                  5$:     RTS     R0                      ;RETURN

                                ;THIS ROUTINE IS THE SAME AS ''CALL.A'' EXCEPT FOR THE DPB USED AND IF
                                ;THE COMMAND IS A READ HEADER AND DATA THE HEADER (CYLINDER, TRACK,
                                ;AND SECTOR) READ IS CHECKED FOR VALIDITY.
                                ;CALL
                                ;       FILL DPB
                                ;       JSR     R0,CALL.B
                                ;       RETURN

030550  005037  001222          CALL.B: CLR     $ESCAPE                 ;NO ESCAPE ADDRESS
030554  004037  041406                  JSR     R0,RM05                 ;CALL RM05 DRIVER
030560  047036                          DPB.B
030562  000772                          BR      CALL.B
030564  005737  047054          1$:     TST     DPB.B+16                ;DONE?
030570  001775                          BEQ     1$                      ;NO--BRANCH
030572  100055                          BPL     5$                      ;BRANCH IF NO ERROR
030574  012737  030700  001222          MOV     #3$,$ESCAPE             ;;ESCAPE TO 3$ ON ERROR
030602  013737  047050  001366          MOV     DPB.B+12,CYL.DS         ;CYLINDER
030610  113737  047047  001372          MOVB    DPB.B+11,TRK.DS         ;TRACK
030616  113737  047046  001370          MOVB    DPB.B+10,SEC.DS         ;SECTOR
030624  012746  047054                  MOV     #DPB.B+16,-(SP)         ;STATUS/ERROR INDICATOR ADDRESS
030630  004737  032170                  JSR     PC,ERINDX               ;FORM DISPATCH INDEX
030634  062607                          ADD     (SP)+,PC                ;REPORT PROPER ERROR
030636  104041                          EMT     41                      ;NON-EXIST DRIVE
030640  104042                          EMT     42                      ;PARITY ERROR
030642  104043                          EMT     43                      ;UNSAFE ERROR
030644  104044                          EMT     44                      ;NON-I/O ERROR
030646  000240                          NOP                             ;TO SYNC THE CALLING SEQ OF ERINDX: RT.
030650  005737  047154                  TST     RM.REG+RMER1            ;DRIVE ERROR ?
030654  001404                          BEQ     2$                      ;BR IF NOT
030656  022737  000200  047154          CMP     #HCE,RM.REG+RMER1       ;SEE IF ONLY 'HCE' SET
030664  001420                          BEQ     5$                      ;BR IF IT IS
030666  032737  100000  047202  2$:     BIT     #BSE,RM.REG+RMER2       ;BSE ERROR
030674  001033                          BNE     7$                      ;BRANCH IF SO
030676  104045                          EMT     45                      ;I/O ERROR
030700  032737  040000  047202  3$:     BIT     #SKI,RM.REG+RMER2       ;SKI ERROR ?
030706  001402                          BEQ     4$                      ;BR IF NO
030710  004037  032016                  JSR     R0,CALL.R               ;DO RECALIBRATE COMMAND
030714  013746  047054          4$:     MOV     DPB.B+16,-(SP)          ;STATUS WORD
030720  004737  032130                  JSR     PC,LOP.CK               ;SEE IF LOOP, ABORT, OR CONTINUE
030724  000410                          BR      6$                      ;CHECK FOR STALL
030726  123727  047040  000173  5$:     CMPB    DPB.B+2,#READHD         ;DOING IMPLIED SEEKS?
030734  001004                          BNE     6$                      ;NO--BRANCH
030736  004037  032410                  JSR     R0,VERIFY               ;YES--GO CHECK THE DATA
030742  047046                          DPB.B+10
030744  000407                          BR      7$                      ;ERROR DURING VERIFY
030746  032737  040000  001314  6$:     BIT     #SW14,C.SWR             ;STALL?
030754  001403                          BEQ     7$                      ;NO--BRANCH
030756  004037  032326                  JSR     R0,STALL                ;YES--CALL STALL ROUTINE
030762  001454                          .WORD   STALL1                  ;STALL TIME POINTER
030764  000200                  7$:     RTS     R0                      ;RETURN
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                                        ;THIS ROUTINE IS THE SAME AS ''CALL.B'' EXCEPT FOR THE DPB USED.
                                        ;CALL
                                        ;       FILL DPB
                                        ;       JSR     R0,CALL.C
                                        ;       RETURN

030766  005037  001222          CALL.C: CLR     $ESCAPE         ;NO ESCAPE ADDRESS
030772  004037  041406                  JSR     R0,RM05         ;CALL RM05 DRIVER
030776  047056                          DPB.C
031000  000772                          BR      CALL.C
031002  005737  047074          1$:     TST     DPB.C+16        ;DONE?
031006  001775                          BEQ     1$              ;NO--LOOP
031010  100055                          BPL     5$              ;YES--BRANCH IF NO ERROR
031012  012737  031116  001222          MOV     #3$,$ESCAPE     ;;ESCAPE TO 3$ ON ERROR
031020  013737  047070  001366          MOV     DPB.C+12,CYL.DS ;CYLINDER
031026  113737  047067  001372          MOVB    DPB.C+11,TRK.DS ;TRACK
031034  113737  047066  001370          MOVB    DPB.C+10,SEC.DS ;SECTOR
031042  012746  047074                  MOV     #DPB.C+16,-(SP) ;STATUS/ERROR INDICATOR ADDRESS
031046  004737  032170                  JSR     PC,ERINDX       ;FORM DISPATCH INDEX
031052  062607                          ADD     (SP)+,PC        ;REPORT PROPER ERROR
031054  104041                          EMT     41              ;NON-EXIST DRIVE
031056  104042                          EMT     42              ;PARITY ERROR
031060  104043                          EMT     43              ;UNSAFE ERROR
031062  104044                          EMT     44              ;NON-I/O ERROR
031064  000240                          NOP                     ;TO SYNC THE CALLING SEQ OF ERINDX: RT.
031066  005737  047154                  TST     RM.REG+RMER1    ;DRIVE ERROR ?
031072  001404                          BEQ     2$              ;BR IF NOT
031074  022737  000200  047154          CMP     #HCE,RM.REG+RMER1       ;SEE IF ONLY 'HCE' SET
031102  001420                          BEQ     5$              ;BR IF YES
031104  032737  100000  047202  2$:     BIT     #BSE,RM.REG+RMER2       ;BSE ERROR ONLY ?
031112  001033                          BNE     7$              ;BRANCH IF SO
031114  104045                          EMT     45              ;I/O ERROR
031116  032737  040000  047202  3$:     BIT     #SKI,RM.REG+RMER2       ;SKI ERROR ?
031124  001402                          BEQ     4$              ;BR IF NO
031126  004037  032016                  JSR     R0,CALL.R       ;DO RECALIBRATE COMMAND
031132  013746  047074          4$:     MOV     DPB.C+16,-(SP)  ;STATUS WORD
031136  004737  032130                  JSR     PC,LOP.CK       ;SEE IF LOOP, ABORT, OR CONTINUE
031142  000410                          BR      6$
031144  123727  047060  000173  5$:     CMPB    DPB.C+2,#READHD ;DOING IMPLIED SEEK?
031152  001004                          BNE     6$              ;NO--EXIT
031154  004037  032410                  JSR     R0,VERIFY       ;YES--CHECK THE DATA
031160  047066                          DPB.C+10
031162  000407                          BR      7$              ;ERROR DURING VERIFY
031164  032737  040000  001314  6$:     BIT     #SW14,C.SWR     ;STALL?
031172  001403                          BEQ     7$              ;NO--BRANCH
031174  004037  032326                  JSR     R0,STALL        ;YES--CALL STALL ROUTINE
031200  001454                          .WORD   STALL1          ;STALL TIME POINTER
031202  000200                  7$:     RTS     R0


                                        ;THIS ROUTINE IS THE SAME AS ''CALL.A'' EXCEPT FOR THE DPB USED AND
                                        ;ON AN ERROR LOCATION ''ERR.CT'' IS EXAMINED. IF ERR.CT IS EQUAL TO
                                        ;$ERFLG EXIT IS TO THE NEXT TEST.
                                        ;CALL
                                        ;       FILL DPB
                                        ;       JSR     R0,DRVCAL
                                        ;       RETURN

031204  005037  001222                  DRVCAL: CLR     $ESCAPE         ;NO ESCAPE ADDRESS
031210  005037  001434                          CLR     WCEFLG          ;CLEAR WRITE CHECK ERROR FLAG
031214  004037  041406                          JSR     R0,RM05         ;CALL RM05 DRIVER
031220  047076                                  DTADPB
031222  000770                                  BR      DRVCAL

031224  005737  047114                  DRVCL1: TST     DTADPB+16       ;DONE
031230  001775                                  BEQ     DRVCL1          ;NO--LOOP
031232  100402                                  BMI     1$              ;BR IF ERRORS
031234  000137  031776                          JMP     15$             ;NO ERRORS
031240                                  1$:
031240  012737  031346  001222                  MOV     #3$,$ESCAPE     ;;ESCAPE TO 3$ ON ERROR
031246  013737  047110  001366                  MOV     DTADPB+12,CYL.DS        ;CYLINDER
031254  113737  047107  001372                  MOVB    DTADPB+11,TRK.DS        ;TRACK
031262  113737  047106  001370                  MOVB    DTADPB+10,SEC.DS        ;SECTOR
031270  012746  047114                          MOV     #DTADPB+16,-(SP)        ;STATUS/ERROR INDICATOR ADDRESS
031274  004737  032170                          JSR     PC,ERINDX       ;FORM DISPATCH INDEX
031300  062607                                  ADD     (SP)+,PC        ;REPORT PROPER ERROR
031302  104041                                  EMT     41              ;NON-EXIST DRIVE
031304  104042                                  EMT     42              ;PARITY ERROR
031306  104043                                  EMT     43              ;UNSAFE ERROR
031310  104044                                  EMT     44              ;NON-I/O ERROR
031312  000240                                  NOP                     ;TO SYN THE CALLING SEQ OF THE ERINDX:
031314  005737  047154                          TST     RM.REG+RMER1    ;ANY DRIVE ERROR ?
031320  001011                                  BNE     2$              ;REPORT THE I/O ERROR IF SO
031322  032737  100000  047202                  BIT     #BSE,RM.REG+RMER2       ;BAD SPOT ERROR ?
031330  001405                                  BEQ     2$              ;BRANCH IF NOT
031332  012737  177777  001466                  MOV     #-1,BASFLG      ;SET BAD SECTOR ENCOUNTER FLAG
031340  000137  031776                          JMP     15$             ;OTHERWISE ,DON'T REPORT THE BSE
031344                                  2$:
031344  104045                                  EMT     45              ;I/O ERROR
031346  122737  000020  001116          3$:     CMPB    #20,$TSTNM      ;TEST 20?
031354  001170                                  BNE     11$             ;NO--BRANCH
031356  013746  047114                          MOV     DTADPB+16,-(SP) ;STATUS WORD
031362  004737  032130                          JSR     PC,LOP.CK       ;SEE IF LOOP, ABORT, OR CONTINUE
031366  122737  000151  047100                  CMPB    #WRCKD,DTADPB+2 ;DOING A WRITE CHECK?
031374  001172                                  BNE     13$             ;NO--BRANCH
031376  032737  040000  047150                  BIT     #BIT14,RM.REG+10        ;IS 'WCE'=1?
031404  001566                                  BEQ     13$             ;NO--BRANCH
031406  032777  000020  147540                  BIT     #SW04,@SWR      ;INHIBIT WRITES?
031414  001162                                  BNE     13$             ;YES--BRANCH
031416  112737  000161  047100                  MOVB    #WRITE,DTADPB+2 ;SETUP FOR A WRITE
031424  005037  001222                          CLR     $ESCAPE ;NO ESCAPE ADDRESS
031430  004037  041406                          JSR     R0,RM05         ;DO THE WRITE
031434  047076                                  DTADPB
031436  000240                                  NOP
031440  005737  047114                  4$:     TST     DTADPB+16       ;DONE?
031444  001775                                  BEQ     4$              ;NO--LOOP
031446  100043                                  BPL     6$              ;YES--BRANCH IF NO ERROR
031450  012737  031736  001222                  MOV     #11$,$ESCAPE    ;;ESCAPE TO 11$ ON ERROR
031456  013737  047110  001366                  MOV     DTADPB+12,CYL.DS        ;CYLINDER
031464  113737  047107  001372                  MOVB    DTADPB+11,TRK.DS        ;TRACK
031472  113737  047106  001370                  MOVB    DTADPB+10,SEC.DS        ;SECTOR
031500  012746  047114                          MOV     #DTADPB+16,-(SP)        ;STATUS/ERROR INDICATOR ADDRESS
031504  004737  032170                          JSR     PC,ERINDX       ;FORM DISPATCH INDEX
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031510  062607                                ADD     (SP)+,PC          ;REPORT PROPER ERROR
031512  104041                                EMT     41                ;NON-EXIST DRIVE
031514  104042                                EMT     42                ;PARITY ERROR
031516  104043                                EMT     43                ;UNSAFE ERROR
031520  104044                                EMT     44                ;NON-I/O ERROR
031522  000240                                NOP                       ;TO SYN THE CALLING SEQ OF ERINDX
031524  005737  047154                        TST     RM.REG+RMER1      ;ANY DRIVE ERROR ?
031530  001011                                BNE     5$                ;BRANCH IF SO
031532  032737  100000  047202                BIT     #BSE,RM.REG+RMER2         ;BAD SOPT ERROR
031540  001405                                BEQ     5$                ;BRANCH IF NOT
031542  012737  177777  001466                MOV     #-1,BASFLG        ;SET BAD SECTOR ENCOUNTER FLAG
031550  000137  031776                        JMP     15$               ;EXIT
031554                                5$:
031554  104045                                EMT     45                ;I/O ERROR
031556  112737  000151  047100        6$:     MOVB    #WRCKD,DTADPB+2 ;COMMAND=WRITE CHECK DATA
031564  004037  041406                        JSR     R0,RM05           ;DO THE WRITE CHECK
031570  047076                                DTADPB
031572  000240                                NOP
031574  005737  047114                7$:     TST     DTADPB+16         ;DONE?
031600  001775                                BEQ     7$                ;NO--LOOP
031602  100410                                BMI     9$                ;YES--BRANCH IF ERROR
031604  004037  041406                        JSR     R0,RM05           ;DO A 2ND WRITE CHECK
031610  047076                                DTADPB
031612  000240                                NOP
031614  005737  047114                8$:     TST     DTADPB+16         ;DONE?
031620  001775                                BEQ     8$                ;NO--LOOP
031622  100065                                BPL     15$               ;YES--BRANCH IF NO ERROR
031624  012737  000001  001434        9$:     MOV     #1,WCEFLG         ;SET THE WRITE CHECK ERROR FLAG
031632  012737  031736  001222                MOV     #11$,$ESCAPE      ;;ESCAPE TO 11$ ON ERROR
031640  013737  047110  001366                MOV     DTADPB+12,CYL.DS          ;CYLINDER
031646  113737  047107  001372                MOVB    DTADPB+11,TRK.DS          ;TRACK
031654  113737  047106  001370                MOVB    DTADPB+10,SEC.DS          ;SECTOR
031662  012746  047114                        MOV     #DTADPB+16,-(SP)          ;STATUS/ERROR INDICATOR ADDRESS
031666  004737  032170                        JSR     PC,ERINDX         ;FORM DISPATCH INDEX
031672  062607                                ADD     (SP)+,PC          ;REPORT PROPER ERROR
031674  104041                                EMT     41                ;NON-EXIST DRIVE
031676  104042                                EMT     42                ;PARITY ERROR
031700  104043                                EMT     43                ;UNSAFE FRROR
031702  104044                                EMT     44                ;NON-I/O ERROR
031704  000240                                NOP                       ;SO SYN THE CALLING SEQ OF ERINDX:
031706  005737  047154                        TST     RM.REG+RMER1      ;ANY DRIVE ERROR
031712  001010                                BNE     10$               ;BRANCH IF SO
031714  032737  100000  047202                BIT     #BSE,RM.REG+RMER2         ;BAD SOPT ERROR ?
031722  001404                                BEQ     10$               ;BRANCH IF NOT
031724  012737  177777  001466                MOV     #-1,BASFLG        ;SET BAD SECTOR ENCOUNTER FLAG
031732  000421                                BR      15$               ;OTHERWISE EXIT
031734                                10$:
031734  104046                                EMT     46                ;REPORT THE FATAL WRITE CHECK ERROR
031736  032737  040000  047202        11$:    BIT     #SKI,RM.REG+RMER2         ;SKI ERROR ?
031744  001402                                BEQ     12$               ;BR IF NO
031746  004037  032016                        JSR     R0,CALL.R         ;DO RECALIBRATE COMMAND
031752  013746  047114                12$:    MOV     DTADPB+16,-(SP) ;STATUS WORD
031756  004737  032130                        JSR     PC,LOP.CK         ;SEE IF LOOP, ABORT, OR CONTINUE
031762  123737  001464  001117        13$:    CMPB    ERR.CT,$ERFLG     ;GO TO NEXT TEST?
031770  101002                                BHI     15$               ;NO--BRANCH
031772  013700  001350                14$:    MOV     BYPASS,R0         ;YES--GET EXIT ADDRESS
031776  032737  040000  001314        15$:    BIT     #SW14,C.SWR       ;STALL?
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032004  001403                          BEQ     16$             ;NO--BRANCH
032006  004037  032326                  JSR     R0,STALL        ;YES--CALL STALL ROUTINE
032012  001456                          .WORD   STALL2          ;STALL TIME POINTER
032014  000200                  16$:    RTS     R0

                                ;THIS ROUTINE WILL ISSUE A RECALIBRATE COMMAND TO THE RM05 DRIVER
                                ;AND WAIT FOR THE FUNCTION TO COMPLETE.
                                ;CALL
                                ;       JSR     R0,CALL.R
                                ;       RETURN

032016  005037  001222          CALL.R: CLR     $ESCAPE         ;NO ESCAPE ADDRESS
032022  004037  041406                  JSR     R0,RM05         ;CALL RM05 DRIVER
032026  047116                          DPB.R
032030  000772                          BR      CALL.R
032032  005737  047134          1$:     TST     DPB.R+16        ;DONE?
032036  001775                          BEQ     1$              ;NO--LOOP
032040  100032                          BPL     3$              ;BRANCH IF NO ERROR
032042  012737  032116  001222          MOV     #2$,$ESCAPE     ;;ESCAPE TO 2$ ON ERROR
032050  013737  047130  001366          MOV     DPB.R+12,CYL.DS ;CYLINDER
032056  113737  047127  001372          MOVB    DPB.R+11,TRK.DS ;TRACK
032064  113737  047126  001370          MOVB    DPB.R+10,SEC.DS ;SECTOR
032072  012746  047134                  MOV     #DPB.R+16,-(SP) ;STATUS/ERROR INDICATOR ADDRESS
032076  004737  032170                  JSR     PC,ERINDX       ;FORM DISPATCH INDEX
032102  062607                          ADD     (SP)+,PC        ;REPORT PROPER ERROR
032104  104041                          EMT     41              ;NON-EXIST DRIVE
032106  104042                          EMT     42              ;PARITY ERROR
032110  104043                          EMT     43              ;UNSAFE ERROR
032112  104044                          EMT     44              ;NON-I/O ERROR
032114  000240                          NOP                     ;TO SYNC THE CALLING SEQ OF ERINDX
032116  013746  047034          2$:     MOV     DPB.A+16,-(SP)  ;STATUS WORD
032122  004737  032130                  JSR     PC,LOP.CK       ;SEE IF LOOP, ABORT, OR CONTINUE
032126  000200                  3$:     RTS     R0              ;RETURN

                                ;THIS SUBROUTINE CHECK FOR LOOP, ABORT, OR CONTINUE SWITCHES AFTER
                                ;ERRORS 41, 42, 43, 44, 45, AND 46.
                                ;CALL
                                ;       MOV     DTA+16,-(SP)     ;STATUS WORD FROM DPB IN USE
                                ;       JSR     PC,LOP.CK
                                ;       RETURN

032130  032777  001000  147016  LOP.CK: BIT     #SW9,@SWR       ;LOOP ON ERROR
032136  001402                          BEQ     1$              ;BR IF NOT
032140  000177  146760                  JMP     @$LPERR         ;START AT THE LOOP ADDRESS
032144  005037  001222          1$:     CLR     $ESCAPE         ;CLEAR ERROR ESCAPE FLAG
032150  032766  072006  000002          BIT     #BIT14!BIT13!BIT12!BIT10!BIT02!BIT01,2(SP)      ;CHECK ERROR TYPE
032156  001402                          BEQ     2$              ;BR IF DRIVE NOT OFFLINE, UNLOADED, OR
                                                                ;PERSISTENT UNSAFE OR FATAL MASSBUS PARITY
032160  000137  021334                  JMP     $EOP            ;TERMINATE DRIVE
032164  012616                  2$:     MOV     (SP)+,(SP)      ;ADJUST RETURN ADDRESS
032166  000207                          RTS     PC

                                ;THIS ROUTINE FORMS AN INDEX THAT WILL BE USED TO DISPATCH
                                ;TO THE PROPER ERROR CALL.  THE INDEX IS FORMED BY EXAMINING
                                ;THE STATUS/ERROR INDICATOR OF THE APPLICABLE DPB.
                                ;INDEX          STATUS/ERROR
                                ;-----          ------------
                                ;       0 BIT14!BIT13!BIT08.BIT01
                                ;       2 BIT11.BIT10!BIT02
                                ;       4 BIT12.BIT04
                                ;       6 BIT05!BIT03.<BIT09 & COMMAND=NON-I/O>
                                ;      10 BIT06.<BIT09 & COMMAND=I/O>
                                ;CALL
                                ;       JSR     #DPB+16,-(SP)   ;ADDRESS OF STATUS/ERROR INDICATOR
                                ;       JSR     PC,ERINDX       ;FORM INDEX
                                ;       RETURN                  ;INDEX IS ON THE STACK

032170  010046                  ERINDX: MOV     R0,-(SP)        ;SAVE R0
032172  010146                          MOV     R1,-(SP)        ;SAVE R1
032174  016600  000006                  MOV     6(SP),R0        ;GET STATUS/ERROR INDICATOR POINTER
032200  011037  001356                  MOV     (R0),SVSTAT     ;SAVE THE STATUS/ERROR INDICATOR
032204  005001                          CLR     R1              ;START INDEX AT ZERO
032206  032710                          BIT     (PC)+,(R0)      ;FORM INDEX OF 0?
032210  020402                          .WORD   BIT13!BIT08!BIT01
032212  001037                          BNE     5$              ;YES--BRANCH
032214  032710                          BIT     (PC)+,(R0)      ;FORM PARITY ERROR OR PORT REQUEST INDEX (2)?
032216  006004                          .WORD   BIT11!BIT10!BIT02
032220  001033                          BNE     4$              ;YES--BRANCH
032222  032710                          BIT     (PC)+,(R0)      ;FORM UNSAFE INDEX (4)?
032224  050020                          .WORD   BIT14!BIT12!BIT04
032226  001027                          BNE     3$              ;YES--BRANCH
032230  032710                          BIT     (PC)+,(R0)      ;FORM NON-I/O ERROR INDEX (6)?
032232  000050                          .WORD   BIT05!BIT03
032234  001023                          BNE     2$              ;YES--BRANCH
032236  032710                          BIT     (PC)+,(R0)      ;FORM I/O ERROR INDEX (10)?
032240  000100                          .WORD   BIT06
032242  001017                          BNE     1$              ;YES--BRANCH
032244  032710                          BIT     (PC)+,(R0)      ;SOFTWARE TIMEOUT?
032246  001000                          .WORD   BIT09
032250  001420                          BEQ     5$              ;NO--FORM INDEX OF 0
032252  122760  000150  177762          CMPB    #150,-16(R0)    ;YES--I/O?
032260  003011                          BGT     2$              ;NO--BRANCH
032262  005737  047154                  TST     RM.REG+RMER1    ;ANY DRIVE ERROR ?
032266  001005                          BNE     1$              ;BRANCH IF SO
032270  032737  100000  047202          BIT     #BSE,RM.REG+RMER2       ;BSE ERROR
032276  001401                          BEQ     1$              ;BRANCH IF NOT
032300  005201                          INC     R1              ;SKIP , NOT REPORT BSE ERROR
032302  005201                  1$:     INC     R1              ;INDEX=10---ERROR=45 OR 46
032304  005201                  2$:     INC     R1              ;INDEX=6---ERROR=44
032306  005201                  3$:     INC     R1              ;INDEX=4---ERROR=43
032310  005201                  4$:     INC     R1              ;INDEX=2---ERROR=42
032312  006301                  5$:     ASL     R1              ;INDEX=0---ERROR=41
032314  010166  000006                  MOV     R1,6(SP)        ;RETURN INDEX TO USER
032320  012601                          MOV     (SP)+,R1        ;RESTORE R1
032322  012600                          MOV     (SP)+,R0        ;RESTORE R0
032324  000207                          RTS     PC              ;RETURN FROM CALL

                                ;THIS ROUTINE WILL PROVIDE A STALL IN MILLISECONDS FOR A SPECIFIC
                                ;AMOUNT OF TIME IF BIT13 OF C.SWR = 0 OR A RANDOM AMOUNT OF TIME
                                ;IF BIT 13 OF C.SWR = 1.
                                ;STALL1 CONTAINS SPECIFIED TIME FOR TESTS 0 - 7. AND STALL2
                                ;CONTAINS THE TIME FOR TESTS 16-21.
                                ;CALL
                                ;       JSR     R0,STALL
```

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                                    ;       TIME POINTER            ;WHERE TO FIND THE STALL TIME

032326  013046                      STALL:  MOV     @(R0)+,-(SP)    ;PICKUP STALL TIME
032330  032737  020000  001314              BIT     #SW13,C.SWR     ;USE A RANDOM TIME?
032336  001406                              BEQ     1$              ;NO--BRANCH
032340  004737  026426                      JSR     PC,$RAND        ;YES--FORM RANDOM NUMBER
032344  013716  026526                      MOV     $LONJM,(SP)     ;AND USE IT FOR THE STALL TIME
032350  042716  177700                      BIC     #^C77,(SP)      ;BUT NEVER > 64 MILLISECONDS
032354  005046                      1$:     CLR     -(SP)           ;CLEAR TEMP. LOCATION
032356  162766  000001  000002      2$:     SUB     #1,2(SP)        ;MORE STALL REQUIRED?
032364  103407                              BLO     4$              ;NO--BRANCH
032366  012716  000144                      MOV     #100.,(SP)      ;STALL FOR ABOUT 1 MILLISECOND
032372  005700                      3$:     TST     R0              ;NOP TO KILL TIME
032374  005366  000000                      DEC     0(SP)           ;COUNT
032400  001374                              BNE     3$              ;LOOP IF MORE COUNTS NEEDED
032402  000765                              BR      2$
032404  022626                      4$:     CMP     (SP)+,(SP)+     ;CLEAN OFF THE STACK
032406  000200                              RTS     R0              ;EXIT

                                    ;ROUTINE TO SOFTWARE COMPARE HEADER ON IMPLIED SEEKS
                                    ;CALL
                                    ;       JSR     R0,VERIFY
                                    ;       ADR POINTER             ;ADDRESS OF DPB+10 (SECTOR NUMBER)
                                    ;       RETURN

032410  010146                      VERIFY: MOV     R1,-(SP)        ;SAVE R1
032412  012001                              MOV     (R0)+,R1        ;GET ADDRESS OF DPB+10
032414  042737  150000  054522              BIC     #150000,BUFFER  ;STRIP FORMAT AND BAD SECTOR BITS FROM CYLINDER NUMBER
032422  023761  054522  000002              CMP     BUFFER,2(R1)    ;CYLINDER NUMBER OK?
032430  001003                              BNE     1$              ;NO--BRANCH
032432  023711  054524                      CMP     BUFFER+2,(R1)   ;YES--HOW ABOUT TRACK/SECTOR?
032436  001441                              BEQ     3$              ;BRANCH IF GOOD
032440  013737  054522  001360      1$:     MOV     BUFFER,CYL.RD   ;SAVE THE EXPECTED AND THE
032446  113737  054525  001362              MOVB    BUFFER+3,TRK.RD ;RECIEVED CYLINDER, TRACK,
032454  113737  054524  001364              MOVB    BUFFER+2,SEC.RD ;AND SECTOR
032462  112137  001370                      MOVB    (R1)+,SEC.DS
032466  112137  001372                      MOVB    (R1)+,TRK.DS
032472  011137  001366                      MOV     (R1),CYL.DS
032476  012737  032510  001222              MOV     #2$,$ESCAPE     ;;ESCAPE TO 2$ ON ERROR
032504  005740                              TST     -(R0)           ;MAKE IT TEST PC+4
032506  104012                              EMT     12              ;IMPROPER HEADER DATA
032510  012737  000107  047020      2$:     MOV     #RECAL,DPB.A+2  ;LOAD RECALIBRATE ORDER CODE
032516  004037  030402                      JSR     R0,CALL.A       ;GO EXECUTE THE COMMAND
032522  005037  001222                      CLR     $ESCAPE         ;CLEAR ERROR ESCAPE FLAG
032526  032777  001000  146420              BIT     #SW9,@SWR       ;LOOP ON ERROR ?
032534  001404                              BEQ     4$              ;BR IF NOT
032536  000177  146362                      JMP     @$LPERR         ;RETURN TO ERROR LOOP ADDRESS
032542  062700  000002              3$:     ADD     #2,R0           ;INCREMENT RETURN ADDRESS
032546  012601                      4$:     MOV     (SP)+,R1        ;RESTORE R1
032550  000200                              RTS     R0              ;EXIT

                                    ;THIS ROUTINE WILL PERFORM A 'MASSBUS'' INIT. FOLLOWED BY
                                    ;A 'RECALIBRATE'' ON THE DRIVE UNDER TEST.
                                    ;NOTE: THIS ROUTINE DESTROYS R1 AND R4
                                    ;CALL
                                    ;       JSR     R0,SRCH00       ;DO A MASSBUS INIT. AND RECAL
                                    ;       RETURN1                 ;RETURN HERE IF NO ERROR
```

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                                        ;       RETURN2                         ;RETURN HERE ON ERROR

032552  005001                          SRCH00: CLR     R1                      ;INCASE OF ERROR (TYPTIM)
032554  005037  177776                          CLR     PS
032560  012777  043306  006064                  MOV     #ISR,@RMVEC             ;SETUP INTERRUPT VECTOR
032566  013704  040650                          MOV     RMADR,R4                ;PICKUP ADDRESS OF RMCS1
032572  012764  000040  000010                  MOV     #CLR,RMCS2(R4)          ;MASSBUS INIT.
032600  005037  047106                          CLR     DTADPB+10               ;TRACK=0; SECTOR=0
032604  005037  047110                          CLR     DTADPB+12               ;CYLINDER =0
032610  012737  000107  047100                  MOV     #RECAL,DTADPB+2         ;COMMAND = RECALIBRATE
032616  005037  001222                          CLR     $ESCAPE                 ;NO ESCAPE ADDRESS
032622  004037  041406                          JSR     R0,RM05                 ;CALL THE DRIVER
032626  047076                                  DTADPB                          ;DPB POINTER
032630  000440                                  BR      4$                      ;QUEUE IS FULL
032632  005737  047114                  1$:     TST     DTADPB+16               ;WAIT ON DONE
032636  001775                                  BEQ     1$
032640  100030                                  BPL     3$                      ;TAKE NORMAL EXIT IF NO ERROR
032642  012737  032716  001222                  MOV     #2$,$ESCAPE             ;;ESCAPE TO 2$ ON ERROR
032650  013737  047110  001366                  MOV     DTADPB+12,CYL.DS                ;CYLINDER
032656  113737  047107  001372                  MOVB    DTADPB+11,TRK.DS                ;TRACK
032664  113737  047106  001370                  MOVB    DTADPB+10,SEC.DS                ;SECTOR
032672  012746  047114                          MOV     #DTADPB+16,-(SP)                ;STATUS/ERROR INDICATOR ADDRESS
032676  004737  032170                          JSR     PC,ERINDX               ;FORM DISPATCH INDEX
032702  062607                                  ADD     (SP)+,PC                ;REPORT PROPER ERROR
032704  104041                                  EMT     41                      ;NON-EXIST DRIVE
032706  104042                                  EMT     42                      ;PARITY ERROR
032710  104043                                  EMT     43                      ;UNSAFE ERROR
032712  104044                                  EMT     44                      ;NON-I/O ERROR
032714  104045                                  EMT     45                      ;I/O ERROR
032716  005720                          2$:     TST     (R0)+                   ;ADJUST FOR ERROR EXIT
032720  000404                                  BR      4$                      ;GO TO THE EXIT
032722  005064  000006                  3$:     CLR     RMDA(R4)                ;TRACK AND SECTOR   0
032726  005064  000034                          CLR     RMDC(R4)                ;CYLINDER = 0
032732  000200                          4$:     RTS     R0                      ;RETURN


                                        ;THIS IS AN RTI WHICH IS USED BY THE TIMING TESTS & THE SERVO SETTLE DOWN TEST

032734  000002                          DORTI:  RTI                             ;RETURN FROM INTERRUPT

                                        ;THIS ROUTINE WILL INITIALIZE THE TIMERS USED BY THE ''TIMING ROUTINES
                                        ;CALL
                                        ;       JSR     PC,STRTMR
                                        ;       RETURN

032736  104412                          STRTMR: SAVREG                          ;SAVE R0-R5
032740  012700  001376                          MOV     #TIM.UP,R0              ;START AT TIM.UP
032744  005020                          1$:     CLR     (R0)+                   ;CLEAR THE TIME TABLES
032746  020027  001432                          CMP     R0,#TIM.PT              ;DONE?
032752  103774                                  BLO     1$                      ;NO--BRANCH
032754  012710  054522                          MOV     #BUFFER,(R0)            ;SETUP POINTER
032760  012737  077777  001376                  MOV     #^CBIT15,TIM.UP         ;SET MINIMUM TIME TO MAXIMUM
032766  012737  077777  001414                  MOV     #^CBIT15,TIM.DN         ;POSITIVE NUMBER
032774  104413                                  RESREG                          ;RESTORE R0-R5
032776  000207                                  RTS     PC                      ;RETURN

                                        ;THIS ROUTINE WILL ADD THE ELAPSED TIME TO THE AVERAGE COUNTER AND
                                        ;MAINTAIN THE MINIMUM AND MAXIMUM TIMES.
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                                  ;NOTE: THIS ROUTINE DESTROYS R2
                                  ;CALL
                                  ;       MOV     #TP,R3          ;PARAMETER POINTER
                                  ;       MOV     FLAG,R5         ;FLAG=0=COUNT UP
                                  ;                               ;FLAG=-1=COUNT DOWN
                                  ;       JSR     PC,COUNT
                                  ;       RETURN

033000  012702  001376            COUNT:  MOV     #TIM.UP,R2      ;PICKUP THE 'UP'' POINTER
033004  005705                            TST     R5              ;USE IT?
033006  001402                            BEQ     1$              ;YES--BRANCH
033010  012702  001414                    MOV     #TIM.DN,R2      ;NO--PICKUP 'DOWN'' POINTER
033014  027722  146500            1$:     CMP     @PKC,(R2)+      ;LESS THAN PREVIOUS LOW?
033020  002003                            BGE     2$              ;NO--BRANCH
033022  017762  146472  177776            MOV     @PKC,-2(R2)     ;YES--SAVE IT
033030  027763  146464  000004    2$:     CMP     @PKC,4(R3)      ;LESS THAN THE LOW LIMIT?
033036  002001                            BGE     3$              ;NO--BRANCH
033040  005212                            INC     (R2)            ;YES--COUNT IT
033042  005722                    3$:     TST     (R2)+           ;ADVANCE THE POINTER
033044  027722  146450                    CMP     @PKC,(R2)+      ;GREATER THAN PREVIOUS HIGH?
033050  003403                            BLE     4$              ;NO--BRANCH
033052  017762  146442  177776            MOV     @PKC,-2(R2)     ;YES--SAVE IT
033060  027763  146434  000006    4$:     CMP     @PKC,6(R3)      ;GREATER THAN THE HIGH LIMIT?
033066  003401                            BLE     5$              ;NO--BRANCH
033070  005212                            INC     (R2)            ;YES--COUNT IT
033072  005722                    5$:     TST     (R2)+           ;ADVANCE THE POINTER
033074  067722  146420                    ADD     @PKC,(R2)+      ;ADD THIS COUNT TO THE TOTAL
033100  005522                            ADC     (R2)+
033102  005212                            INC     (R2)            ;COUNT THIS READING
033104  022737  063052  001432            CMP     #BUFFER+<4*822.>,TIM.PT ;SAVE THIS COUNT?
033112  101406                            BLOS    6$              ;NO--BRANCH
033114  017777  146400  146310            MOV     @PKC,@TIM.PT    ;YES--WELL SAVE IT THEN
033122  062737  000002  001432            ADD     #2,TIM.PT       ;ADVANCE THE POINTER
033130  000207                    6$:     RTS     PC              ;RETURN

                                  ;THIS ROUTINE PRINTS THE SPEC OF ALL TIMING TESTS
                                  ;CALL
                                  ;       JSR     R0,SPTYP
                                  ;       TABLE ADDRESS
                                  ;
                                  ;TABLE: .WORD   ASCIZ MESSAGE POINTER
                                  ;       .WORD   MIN VALUE
                                  ;       .WORD   MAX VALUE

033132  012002                    SPTYP:  MOV     (R0)+,R2        ;THE TABLE ADDRESS
033134  032777  000100  146012            BIT     #SW06,@SWR      ;ALLOW PRINT
033142  001035                            BNE     3$              ;EXIT IF NOT
033144  104401  001231                    TYPE    ,$CRLF
033150  104401  001231                    TYPE    ,$CRLF
033154  012237  033162                    MOV     (R2)+,1$        ;
033160  104401                            TYPE
033162  000000                    1$:     .WORD   0
033164  012246                            MOV     (R2)+,-(SP)     ;LOAD MIN VALUE
033166  001410                            BEQ     2$              ;SKIP IF MIN VALUE IS 0
033170  104401  050166                    TYPE    ,MSGMIN
033174  004737  026136                    JSR     PC,$SB2D        ;CONVERT TO DECIMAL
033200  004737  026366                    JSR     PC,$SUPRS       ;TYPE IT
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033204  104401  050210                          TYPE    ,MSGOUS                 ;0 US
033210  104401  050174                  2$:     TYPE    ,MSGMAX                 ;
033214  011246                                  MOV     (R2),-(SP)              ;MAXMUM VALUE
033216  004737  026136                          JSR     PC,$SB2D                ;
033222  004737  026366                          JSR     PC,$SUPRS               ;
033226  104401  050210                          TYPE    ,MSGOUS                 ;
033232  104401  001231                          TYPE    ,$CRLF                  ;CR-LF
033236  000200                          3$:     RTS     R0                      ;



                                        ;;THIS ROUTINE IS USED TO TYPE THE MINIMUM,
                                        ;MAXIMUM, AND AVERAGE TIMES FOR THE TIMING TESTS
                                        ;IT WILL ALSO CHECK THE TIMES TO ENSURE
                                        ;THEY ARE WITHIN TOLERANCE AND IF NOT FLAG THE BAD TIMES.
                                        ;NOTE: THIS ROUTINE DESTROYS R2-R5
                                        ;CALL
                                        ;       JSR     R0,TYPTIM               ;GO REPORT THE TIMES
                                        ;       TABLE                           ;POINT TO THE PROPER TABLE
                                        ;       RETURN
                                        ;
                                        ;TABLE: MSGADR1                         ;ADDRESS OF ASCIZ MESSAGE NUMBER 1
                                        ;       MSGADR2                         ;ADDRESS OF ASCIZ MESSAGE NUMBER 2
                                        ;       MIN.ALLOWED                     ;MINIMUM TIME ALLOWED
                                        ;       MAX.ALLOWED                     ;MAXIMUM TIME ALLOWED

033240                                  TYPTIM:
033240  010246                                  MOV     R2,-(SP)                ;;PUSH R2 ON STACK
033242  010346                                  MOV     R3,-(SP)                ;;PUSH R3 ON STACK
033244  010446                                  MOV     R4,-(SP)                ;;PUSH R4 ON STACK
033246  010546                                  MOV     R5,-(SP)                ;;PUSH R5 ON STACK
033250  012002                                  MOV     (R0)+,R2                ;PICKUP THE TABLE POINTER
033252  032777  000100  145674                  BIT     #SW06,@SWR              ;INHIBIT TIME REPORTS?
033260  001154                                  BNE     9$                      ;YES--BRANCH
033262  012237  033302                          MOV     (R2)+,2$                ;ADDRESS OF MESSAGE NUMBER 1
033266  012205                                  MOV     (R2)+,R5                ;ADDRESS OF MESSAGE NUMBER 2
033270  012203                                  MOV     (R2)+,R3                ;PICKUP THE LOW LIMIT
033272  011202                                  MOV     (R2),R2                 ;AND THE HIGH LIMIT
033274  012704  001376                          MOV     #TIM.UP,R4              ;PARAMETER POINTER
033300  104401                          1$:     TYPE                            ;TYPE THE MESSAGE
033302  000000                          2$:     .WORD   0                       ;ASCIZ MESSAGE POINTER GOES HERE
033304  005764  000014                          TST     14(R4)                  ;DID ANY COUNTS OCCUR?
033310  001536                                  BEQ     8$                      ;NO--BRANCH
033312  104401  050166                          TYPE    ,MSGMIN                 ;"MIN="
033316  012446                                  MOV     (R4)+,-(SP)             ;PUT (R4)+ ON THE STACK
033320  004737  026136                          JSR     PC,$SB2D                ;CHANGE TO DECIMAL ASCIZ
033324  004737  026366                          JSR     PC,$SUPRS               ;TYPE WITHOUT LEADING ZEROS
033330  104401  050210                          TYPE    ,MSGOUS                 ;"0 US"
033334  005724                                  TST     (R4)+                   ;ANY SEEKS BELOW THE LOW LIMIT
033336  001421                                  BEQ     3$                      ;NO--BRANCH
033340  104401  050345                          TYPE    ,BLNKS2                 ;TYPE 2 SPACES
033344  016446  177776                          MOV     -2(R4),-(SP)            ;PUT -2(R4) ON THE STACK
033350  004737  026136                          JSR     PC,$SB2D                ;CHANGE TO DECIMAL ASCIZ
033354  004737  026366                          JSR     PC,$SUPRS               ;TYPE WITHOUT LEADING ZEROS
033360  104401  050215                          TYPE    ,MBELOW                 ;"BELOW THE MINIMUM OF"
033364  010346                                  MOV     R3,-(SP)                ;PUT R3 ON THE STACK
033366  004737  026136                          JSR     PC,$SB2D                ;CHANGE TO DECIMAL ASCIZ
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    033372  004737  026366                JSR     PC,$SUPRS          ;TYPE WITHOUT LEADING ZEROS
    033376  104401  050210                TYPE    ,MSGOUS
    033402  104401  050174        3$:     TYPE    ,MSGMAX            ;'MAX='
    033406  012446                        MOV     (R4)+,-(SP)        ;PUT (R4)+ ON THE STACK
    033410  004737  026136                JSR     PC,$SB2D           ;CHANGE TO DECIMAL ASCIZ
    033414  004737  026366                JSR     PC,$SUPRS          ;TYPE WITHOUT LEADING ZEROS
    033420  104401  050210                TYPE    ,MSGOUS
    033424  005724                        TST     (R4)+              ;ANY SEEKS ABOVE THE HIGH LIMIT
    033426  001421                        BEQ     4$                 ;NO--BRANCH
    033430  104401  050345                TYPE    ,BLNKS2            ;TYPE 2 SPACES
    033434  016446  177776                MOV     -2(R4),-(SP)       ;PUT -2(R4) ON THE STACK
    033440  004737  026136                JSR     PC,$SB2D           ;CHANGE TO DECIMAL ASCIZ
    033444  004737  026366                JSR     PC,$SUPRS          ;TYPE WITHOUT LEADING ZEROS
    033450  104401  050244                TYPE    ,MABOVE            ;'ABOVE THE MAXIMUM OF'
    033454  010246                        MOV     R2,-(SP)           ;PUT R2 ON THE STACK
    033456  004737  026136                JSR     PC,$SB2D           ;CHANGE TO DECIMAL ASCIZ
    033462  004737  026366                JSR     PC,$SUPRS          ;TYPE WITHOUT LEADING ZEROS
    033466  104401  050210                TYPE    ,MSGOUS
    033472  104401  050202        4$:     TYPE    ,MSGAVG            ;'AVG='
    033476  012446                        MOV     (R4)+,-(SP)        ;FORM THE AVERAGE
    033500  012446                        MOV     (R4)+,-(SP)
    033502  012446                        MOV     (R4)+,-(SP)
    033504  004737  026530                JSR     PC,$DIV
    033510  006126                        ROL     (SP)+              ;IS THE REMAINDER OVER HALF?
    033512  100001                        BPL     5$                 ;NO--BRANCH
    033514  005216                        INC     (SP)               ;YES--ROUND UP
    033516                        5$:
    033516  004737  026136                JSR     PC,$SB2D           ;CHANGE TO DECIMAL ASCIZ
    033522  004737  026366                JSR     PC,$SUPRS          ;TYPE WITHOUT LEADING ZEROS
    033526  104401  050210                TYPE    ,MSGOUS
    033532  104401  050345                TYPE    ,BLNKS2            ;TYPE 2 SPACES
    033536  016446  177776                MOV     -2(R4),-(SP)       ;PUT -2(R4) ON THE STACK
    033542  004737  026136                JSR     PC,$SB2D           ;CHANGE TO DECIMAL ASCIZ
    033546  004737  026366                JSR     PC,$SUPRS          ;TYPE WITHOUT LEADING ZEROS
    033552  022737  000012  001116        CMP     #12,$TSTNM         ;TEST 12 ?
    033560  001403                        BEQ     6$                 ;BRANCH IF SO
    033562  104401  050313                TYPE    ,MSGNUM            ;TYPE "SEEKS TIMED"
    033566  000402                        BR      7$                 ;TYPE IT
    033570  104401  050273        6$:     TYPE    ,MSGSEA            ;TYPE "SEARCHES TIMED"

    033574  010537  033302        7$:     MOV     R5,2$              ;NEXT MESSAGE POINTER
    033600  001404                        BEQ     9$                 ;IF NONE EXIT
    033602  005005                        CLR     R5                 ;NO MORE THAN 2
    033604  000635                        BR      1$
    033606  104401  050330        8$:     TYPE    ,MSGNON
    033612                        9$:
    033612  012605                        MOV     (SP)+,R5           ;;POP STACK INTO R5
    033614  012604                        MOV     (SP)+,R4           ;;POP STACK INTO R4
    033616  012603                        MOV     (SP)+,R3           ;;POP STACK INTO R3
    033620  012602                        MOV     (SP)+,R2           ;;POP STACK INTO R2
    033622  000200                        RTS     R0                 ;EXIT

                                  ;THIS SUBROUTINE WILL INCREMENT THE TRACK
                                  ;NUMBER (R2) BY THE AMOUNT SPECIFIED BY 'IT'.
                                  ;CALL
                                  ;       JSR     R0,INCTRK
                                  ;       RETURN1                    ;TRACK NUMBER GREATER THAN LT15
```

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                                       ;       RETURN2                         ;TRACK NUMBER INCREMENTED

033624  020237  002350                 INCTRK: CMP     R2,LT                   ;LAST TRACK COMPLETED?
033630  001410                                 BEQ     2$                      ;YES--EXIT
033632  063702  002352                         ADD     IT,R2                   ;NO--UPDATE TRACK
033636  020237  002350                         CMP     R2,LT                   ;TRACK TO BIG?
033642  003402                                 BLE     1$                      ;NO--EXIT
033644  013702  002350                         MOV     LT,R2                   ;YES--SET TRACK TO LAST TRACK
033650  005720                         1$:     TST     (R0)+                   ;ADJUST FOR RETURN 2
033652  000200                         2$:     RTS     R0                      ;RETURN


                                       ;THIS SUBROUTINE WILL INCREMENT THE CYLINDER
                                       ;NUMBER (R1) BY THE AMOUNT SPECIFIED BY 'IC'.
                                       ;CALL
                                       ;       JSR     R0,INCCYL
                                       ;       RETURN1                         ;CYLINDER NUMBER GREATER THAN LC15
                                       ;       RETURN2                         ;CYLINDER NUMBER INCREMENTED

033654  020137  002342                 INCCYL: CMP     R1,LC                   ;LAST CYLINDER COMPLETED?
033660  001410                                 BEQ     2$                      ;YES--EXIT
033662  063701  002344                         ADD     IC,R1                   ;NO--UPDATE CYLINDER
033666  020137  002342                         CMP     R1,LC                   ;CYLINDER TO BIG?
033672  003402                                 BLE     1$                      ;NO--EXIT
033674  013701  002342                         MOV     LC,R1                   ;YES--SET CYLINDER TO LAST CYLINDER
033700  005720                         1$:     TST     (R0)+                   ;ADJUST FOR RETURN 2
033702  000200                         2$:     RTS     R0                      ;RETURN

                                       ;THIS ROUTINE DECREMENTS THE SECTOR ADDRESS.
                                       ;CALL
                                       ;       CLR     -(SP)                   ;CLEAR THE STACK
                                       ;       JSR     PC,DECSEC               ;SUBROUTINE ENTRY
                                       ;       RETURN

033704  113766  047146  000002         DECSEC: MOVB    RM.REG+RMDA,2(SP)               ;PUT THE SECTOR ADDRESS ON THE STACK
033712  005366  000002                         DEC     2(SP)                   ;DECREMENT THE ADDRESS
033716  100003                                 BPL     1$                      ;BR IF NOT CORRECTION NEEDED
033720  013766  002470  000002                 MOV     PRMLMT+24,2(SP) ;OVERFLOW OCCURED, FORCE TO MAXIMUM ADDRESS
033726  000207                         1$:     RTS     PC                      ;RETURN

                                       ;THIS SUBROUTINE IS USED TO FILL THE DATA BUFFER
                                       ;WITH ADDRESSES FROM 0 TO 31 WITH EACH ADDRESS
                                       ;BEING STORED IN 256 CONSECUTIVE LOCATIONS
                                       ;CALL
                                       ;       JSR     PC,FILBUF
                                       ;       RETURN

033730  104412                         FILBUF: SAVREG                          ;SAVE R0 - R5
033732  005000                                 CLR     R0                      ;FIRST DISK ADDRESS
033734  012701  054522                         MOV     #BUFFER,R1              ;START FILLING HERE
033740  012702  000400                 1$:     MOV     #256.,R2                ;DO 256 WORDS
033744  010021                         2$:     MOV     R0,(R1)+                ;STORE
033746  005302                                 DEC     R2                      ;MORE?
033750  003375                                 BGT     2$                      ;YES--BRANCH
033752  005200                                 INC     R0                      ;NO--UPDATE DISK ADDRESS
033754  023700  002470                         CMP     PRMLMT+24,R0            ;DONE?
033760  103367                                 BHIS    1$                      ;NO--BRANCH
```

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849 033762  104413                         RESREG                      ;RESTORE R0 - R5
850 033764  000207                         RTS     PC                  ;RETURN
851
852                                ;THIS ROUTINE WILL CLEAR THE BUFFER BY
853                                ;SETTING EACH WORD TO "177400".
854                                ;CALL
855                                ;       JSR     R0,CLRBUF
856                                ;       RETURN
857
858 033766  104412                 CLRBUF: SAVREG                      ;SAVE R0 - R5
859 033770  012701  177400                 MOV     #177400,R1          ;WORD TO FILL BUFFER WITH
860 033774  012702  054522                 MOV     #BUFFER,R2          ;FIRST ADDRESS OF BUFFER
861 034000  012703  114522                 MOV     #BUFFER+<512.*32.>,R3   ;LAST ADDRESS+2 OF BUFFER
862 034004  010122                 1$:     MOV     R1,(R2)+            ;FILL WORDS 1, 9,...249,...5625
863 034006  010122                         MOV     R1,(R2)+            ;FILL WORDS 2,10,...250,...5626
864 034010  010122                         MOV     R1,(R2)+            ;FILL WORDS 3,11,...251,...5627
865 034012  010122                         MOV     R1,(R2)+            ;FILL WORDS 4,12,...252,...5628
866 034014  010122                         MOV     R1,(R2)+            ,FILL WORDS 5,13,...253,...5629
867 034016  010122                         MOV     R1,(R2)+            ;FILL WORDS 6,14,...254,...5630
868 034020  010122                         MOV     R1,(R2)+            ;FILL WORDS 7,15,...255,...5631
869 034022  010122                         MOV     R1,(R2)+            ;FILL WORDS 8,16,...256,...5632
870 034024  020203                         CMP     R2,R3               ;DONE?
871 034026  103766                         BLO     1$                  ;NO--BRANCH
872 034030  104413                         RESREG                      ;RESTORE R0 - R5
873 034032  000200                         RTS     R0                  ;RETURN FROM CALL
874
875                                ;THIS ROUTINE IS USED TO CHECK THE DATA BUFFER
876                                ;FOR ADDRESSES 0 THROUGH 31 WITH EACH ADDRESS
877                                ;BEING STORED IN 256 CONSECUTIVE LOCATIONS
878                                ;CALL
879                                ;       JSR     R0,CKSCTR
880                                ;       RETURN
881
882 034034  104412                 CKSCTR: SAVREG                      ;SAVE R0 - R5
883 034036  162706  000004                 SUB     #4,SP               ;RESERVE TEMP. STORAGE AREA
884 034042  005001                         CLR     R1                  ;FIRST SECTOR
885 034044  012716  054522                 MOV     #BUFFER,(SP)        ;FIRST ADDRESS OF DATA BUFFER
886 034050  005066  000002                 CLR     2(SP)               ;NO ERRORS
887 034054  012702  000020         1$:     MOV     #16.,R2             ;LOOP COUNT (16*16=256)
888 034060  011603                         MOV     (SP),R3             ;GET 1ST ADDRESS OF THIS SECTORS DATA
889 034062                         2$:
893 034062  020123                         CMP     R1,(R3)+            ;WORD 1
    034064  001063                         BNE     7$                  ;BRANCH IF BAD
    034066  020123                         CMP     R1,(R3)+            ;WORD 2
    034070  001061                         BNE     7$                  ;BRANCH IF BAD
    034072  020123                         CMP     R1,(R3)+            ;WORD 3
    034074  001057                         BNE     7$                  ;BRANCH IF BAD
    034076  020123                         CMP     R1,(R3)+            ;WORD 4
    034100  001055                         BNE     7$                  ;BRANCH IF BAD
    034102  020123                         CMP     R1,(R3)+            ;WORD 5
    034104  001053                         BNE     7$                  ;BRANCH IF BAD
    034106  020123                         CMP     R1,(R3)+            ;WORD 6
    034110  001051                         BNE     7$                  ;BRANCH IF BAD
    034112  020123                         CMP     R1,(R3)+            ;WORD 7
    034114  001047                         BNE     7$                  ;BRANCH IF BAD
    034116  020123                         CMP     R1,(R3)+            ;WORD 8
    034120  001045                         BNE     7$                  ;BRANCH IF BAD
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     034122  020123                           CMP     R1,(R3)+           ;WORD 9
     034124  001043                           BNE     7$                 ;BRANCH IF BAD
     034126  020123                           CMP     R1,(R3)+           ;WORD 10
     034130  001041                           BNE     7$                 ;BRANCH IF BAD
     034132  020123                           CMP     R1,(R3)+           ;WORD 11
     034134  001037                           BNE     7$                 ;BRANCH IF BAD
     034136  020123                           CMP     R1,(R3)+           ;WORD 12
     034140  001035                           BNE     7$                 ;BRANCH IF BAD
     034142  020123                           CMP     R1,(R3)+           ;WORD 13
     034144  001033                           BNE     7$                 ;BRANCH IF BAD
     034146  020123                           CMP     R1,(R3)+           ;WORD 14
     034150  001031                           BNE     7$                 ;BRANCH IF BAD
     034152  020123                           CMP     R1,(R3)+           ;WORD 15
     034154  001027                           BNE     7$                 ;BRANCH IF BAD
     034156  020123                           CMP     R1,(R3)+           ;WORD 16
     034160  001025                           BNE     7$                 ;BRANCH IF BAD
 894 034162  005302                           DEC     R2                 ;FINISHED WITH THIS SECTORS DATA?
 895 034164  001336                           BNE     2$                 ;NO--BRANCH
 896 034166  062716  001000           3$:     ADD     #512.,(SP)         ;YES--FIRST ADDRESS OF NEXT SECTOR
 897 034172  005201                           INC     R1                 ;MOVE TO NEXT SECTOR
 898 034174  023701  002470                   CMP     PRMLMT+24,R1       ;DONE?
 899 034200  103325                           BHIS    1$                 ;NO--BRANCH
 900 034202  005766  000002           4$:     TST     2(SP)              ;ERROR OCCUR?
 901 034206  001406                           BEQ     6$                 ;NO--BRANCH
 902 034210  123737  001464  001117           CMPB    ERR.CT,$ERFLG      ;MAX. ERROR OCCURRED?
 903 034216  101002                           BHI     6$                 ;NO--BRANCH
 904 034220  013700  001350           5$:     MOV     BYPASS,R0          ;TAKE ERROR EXIT
 905 034224  062706  000004           6$:     ADD     #4,SP              ;FREE TEMP. AREA
 906 034230  104413                           RESREG                     ;RESTORE R0 - R5
 907 034232  000200                           RTS     R0                 ;RETURN FROM CALL
 908 034234  010304                   7$:     MOV     R3,R4              ;FORM WORD NUMBER AND
 909 034236  161604                           SUB     (SP),R4            ;ADDRESS TO CONTINUE FROM
 910 034240  010405                           MOV     R4,R5
 911 034242  006204                           ASR     R4                 ;WORD NUMBER
 912 034244  042705  177740                   BIC     #^C37,R5
 913 034250  001002                           BNE     8$                 ;BRANCH IF NOT A MULTIPLE OF 16
 914 034252  012705  000040                   MOV     #40,R5             ;SET TO WORD 16
 915 034256  006305                   8$:     ASL     R5
 916 034260  062705  034062                   ADD     #2$,R5             ;ADDRESS
 917 034264  016337  177776  001142           MOV     -2(R3),$BDDAT      ;SAVE BAD DATA
 918 034272  005766  000002                   TST     2(SP)              ;FIRST ERROR?
 919 034276  001015                           BNE     10$                ;NO--BRANCH
 920 034300  013737  047110  001366           MOV     DTADPB+12,CYL.DS          ;CYLINDER NUMBER
 921 034306  113737  047107  001372           MOVB    DTADPB+11,TRK.DS          ;TRACK NUMBER
 922 034314  012737  034324  001222           MOV     #9$,$ESCAPE        ;;ESCAPE TO 9$ ON ERROR
 923 034322  104021                           EMT     21                 ;DATA COMPARE FAILURE
 924 034324  105166  000002           9$:     COMB    2(SP)              ;SET ERROR SWITCH
 925 034330  000404                           BR      11$
 926
 927 034332                          10$:
     034332  012737  034342  001222           MOV     #11$,$ESCAPE       ;;ESCAPE TO 11$ ON ERROR
 928 034340  104022                           EMT     22                 ;FOLLOWS EMT 21
 929 034342  032777  001000  144604  11$:     BIT     #SW09,@SWR         ;LOOP ON ERROR?
 930 034350  001323                           BNE     5$                 ;YES
 931 034352  032777  000002  144574           BIT     #SW01,@SWR         ;STOP DATA COMPARE?
 932 034360  001310                           BNE     4$                 ;YES--BRANCH
 933 034362  123737  001464  001117           CMPB    ERR.CT,$ERFLG      ;MAX. ERRORS?
 934 034370  101713                          BLOS    5$              ;YES--BRANCH
 935 034372  032777  000040  144554          BIT     #SW05,@SWR      ;REPORT ONLY 1ST ERROR PER SECTOR?
 936 034400  001272                          BNE     3$              ;YES--BRANCH
 937 034402  000115                          JMP     (R5)
 938
 939                                 ;THIS ROUTINE WILL MOVE THE 16 WORDS OF THE
 940                                 ;DESIRED PATTERN INTO THE DATA BUFFER.
 941                                 ;CALL
 942                                 ;       MOV     #NX,R0          ;PATTERN NUMBER INDEX TO R0
 943                                 ;       JSR     PC,SETBUF
 944
 945 034404  104412                  SETBUF: SAVREG                  ;SAVE R0 - R5
 946 034406  012701  054522                  MOV     #BUFFER,R1      ;FIRST ADDRESS
 947 034412  013702  047102                  MOV     DTADPB+4,R2     ;WORD COUNT
 948 034416  016003  003536          1$:     MOV     PAT.PT(R0),R3   ;PICKUP PATTERN POINTER
 951 034422  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 1 INTO DATA BUFFER
     034424  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 2 INTO DATA BUFFER
     034426  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 3 INTO DATA BUFFER
     034430  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 4 INTO DATA BUFFER
     034432  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 5 INTO DATA BUFFER
     034434  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 6 INTO DATA BUFFER
     034436  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 7 INTO DATA BUFFER
     034440  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 8 INTO DATA BUFFER
     034442  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 9 INTO DATA BUFFER
     034444  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 10 INTO DATA BUFFER
     034446  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 11 INTO DATA BUFFER
     034450  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 12 INTO DATA BUFFER
     034452  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 13 INTO DATA BUFFER
     034454  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 14 INTO DATA BUFFER
     034456  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 15 INTO DATA BUFFER
     034460  012321                          MOV     (R3)+,(R1)+     ;MOVE WORD 16 INTO DATA BUFFER
 952 034462  062702  000020                  ADD     #16.,R2 ;DONE?
 953 034466  001353                          BNE     1$              ;NO--BRANCH
 954 034470  104413                          RESREG                  ;RESTORE R0 - R5
 955 034472  000207                          RTS     PC              ;RETURN
 956
 957                                 ;THIS ROUTINE COMPARES A 16 WORD DATA PATTERN
 958                                 ;AGAINST THE DATA BUFFER
 959                                 ;CALL
 960                                 ;       MOV     #NX,R0          ;PATTERN NUMBER INDEX TO R0
 961                                 ;       JSR     PC,DATCMP
 962                                 ;       RETURN
 963
 964 034474  104412                  DATCMP: SAVREG                  ;SAVE R0 - R5
 965 034476  012701  054522                  MOV     #BUFFER,R1      ;FIRST ADDRESS OF BUFFER
 966 034502  013702  047102                  MOV     DTADPB+4,R2     ;WORD COUNT
 967 034506  005046                          CLR     -(SP)           ;NO ERROR
 968 034510  016003  003536          1$:     MOV     PAT.PT(R0),R3   ;PATTERN POINTER
 969 034514                          2$:
 972 034514  162321                          SUB     (R3)+,(R1)+     ;CHECK WORD 1
     034516  001044                          BNE     4$              ;BRANCH IF DIFFERENT
     034520  162321                          SUB     (R3)+,(R1)+     ;CHECK WORD 2
     034522  001042                          BNE     4$              ;BRANCH IF DIFFERENT
     034524  162321                          SUB     (R3)+,(R1)+     ;CHECK WORD 3
     034526  001040                          BNE     4$              ;BRANCH IF DIFFERENT
     034530  162321                          SUB     (R3)+,(R1)+     ;CHECK WORD 4
     034532  001036                          BNE     4$              ;BRANCH IF DIFFERENT
     034534  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 5
     034536  001034                          BNE     4$                  ;BRANCH IF DIFFERENT
     034540  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 6
     034542  001032                          BNE     4$                  ;BRANCH IF DIFFERENT
     034544  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 7
     034546  001030                          BNE     4$                  ;BRANCH IF DIFFERENT
     034550  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 8
     034552  001026                          BNE     4$                  ;BRANCH IF DIFFERENT
     034554  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 9
     034556  001024                          BNE     4$                  ;BRANCH IF DIFFERENT
     034560  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 10
     034562  001022                          BNE     4$                  ;BRANCH IF DIFFERENT
     034564  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 11
     034566  001020                          BNE     4$                  ;BRANCH IF DIFFERENT
     034570  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 12
     034572  001016                          BNE     4$                  ;BRANCH IF DIFFERENT
     034574  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 13
     034576  001014                          BNE     4$                  ;BRANCH IF DIFFERENT
     034600  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 14
     034602  001012                          BNE     4$                  ;BRANCH IF DIFFERENT
     034604  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 15
     034606  001010                          BNE     4$                  ;BRANCH IF DIFFERENT
     034610  162321                          SUB     (R3)+,(R1)+         ;CHECK WORD 16
     034612  001006                          BNE     4$                  ;BRANCH IF DIFFERENT
     034614  062702  000020                  ADD     #16.,R2             ;DONE ?
     034620  001333                          BNE     1$                  ;NO--BRANCH
     034622  005726                  3$:     TST     (SP)+               ;YES -- CLEAN UP STACK
     034624  104413                          RESREG                      ;RESTORE R0 - R5
     034626  000207                          RTS     PC

     034630  010104                  4$:     MOV     R1,R4               ;FORM THE WORD NUMBER
     034632  162704  054522                  SUB     #BUFFER,R4
     034636  006204                          ASR     R4                  ;WORD NUMBER
     034640  010305                          MOV     R3,R5               ;FORM ADDRESS TO CONTINUE FROM
     034642  166005  003536                  SUB     PAT.PT(R0),R5
     034646  006305                          ASL     R5
     034650  062705  034514                  ADD     #2$,R5              ;ADDRESS
     034654  064341                          ADD     -(R3),-(R1)         ;RECONSTRUCT THE BAD WORD
     034656  010137  001136                  MOV     R1,$BDADR           ;SAVE THE ERROR INFORMATION
     034662  010337  001134                  MOV     R3,$GDADR           ;
     034666  012137  001142                  MOV     (R1)+,$BDDAT        ;
     034672  012337  001140                  MOV     (R3)+,$GDDAT        ;
     034676  005716                          TST     (SP)                ;1ST DATA COMPARE ERROR?
     034700  001023                          BNE     6$                  ;NO--BRANCH
     034702  013737  047110  001366          MOV     DTADPB+12,CYL.DS            ;CYLINDER
     034710  113737  047107  001372          MOVB    DTADPB+11,TRK.DS            ;TRACK
     034716  113737  047106  001370          MOVB    DTADPB+10,SEC.DS            ;SECTOR
     034724  016600  000026                  MOV     26(SP),R0           ;GET TEST PC+4
     034730  012737  034740  001222          MOV     #5$,$ESCAPE         ;;ESCAPE TO 5$ ON ERROR
     034736  104013                          EMT     13                  ;DATA COMPARE FAILURE
     034740  016600  000020          5$:     MOV     20(SP),R0           ;PATTERN NUMBER INDEX
     034744  105116                          COMB    (SP)                ;SET THE ERROR SWITCH
     034746  000404                          BR      7$

     034750                          6$:
     034750  012737  034760  001222          MOV     #7$,$ESCAPE         ;;ESCAPE TO 7$ ON ERROR
     034756  104014                          EMT     14                  ;FOLLOWS EMT 13
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034760  032777  000002  144166  7$:     BIT     #SW01,@SWR          ;STOP DATA COMPARE?
034766  001315                          BNE     3$                  ;YES--EXIT
034770  123737  001464  001117          CMPB    ERR.CT,$ERFLG       ;MAX. ERRORS?
034776  101004                          BHI     8$                  ;NO--BRANCH
035000  013766  001350  000002          MOV     BYPASS,2(SP)        ;YES--ERROR EXIT
035006  000705                          BR      3$
035010  000115                  8$:     JMP     (R5)                ;NO--CONTINUE AT NEXT WORD

                                ;THIS ROUTINE WILL FILL THE DATA BUFFER (256*32 WORDS) WITH
                                ;A RANDOM PATTERN.  THE FIRST TWO WORDS OF EVERY 256 WILL
                                ;BE THE BASE OF THE RANDOM NUMBER GENERATOR FOR THE
                                ;NEXT 254 WORDS.
                                ;NOTE: THIS ROUTINE DESTROYS R1 AND R2
                                ;CALL
                                ;       JSR     R0,FILRAN
                                ;       RETURN

035012  012701  054522          FILRAN: MOV     #BUFFER,R1
035016  013702  002470                  MOV     PRMLMT+24,R2        ;MAXIMUM NUMBER OF SECTORS
035022  004037  035232          1$:     JSR     R0,RANPAT
035026  005302                          DEC     R2
035030  100374                          BPL     1$
035032  000200                          RTS     R0

                                ;THIS ROUTINE USES THE FIRST TWO WORDS OF THE
                                ;READ BUFFER TO GENERATED A RANDOM PATTERN.  THEN
                                ;THE READ BUFFER IS COMPARED TO THE PATTERN GENERATED.
                                ;NOTE: THIS ROUTINE DESTROYS R1-R4
                                ;CALL
                                ;       JSR     R0,RANCK
                                ;       RETURN

035034  013746  026524          RANCK:  MOV     $HINUM,-(SP)        ;SAVE THE PRESENT RANDOM NUMBER
035040  013746  026526                  MOV     $LONUM,-(SP)
035044  012702  055522                  MOV     #BUFFER+512.,R2 ;READ BUFFER ADDRESS
035050  012701  056522                  MOV     #BUFFER+1024.,R1            ;RANDOM PATTERN ADDRESS
035054  010103                          MOV     R1,R3               ;COPY IT INTO R3 FOR LATER USE
035056  011237  026526                  MOV     (R2),$LONUM         ;PRIME THE RANDOM NUMBER GENERATOR
035062  016237  000002  026524          MOV     2(R2),$HINUM
035070  004037  035232                  JSR     R0,RANPAT           ;GENERATE A RANDOM PATTERN
035074  012637  026526                  MOV     (SP)+,$LONUM        ;RESTORE PRESENT RANDOM NUMBER
035100  012637  026524                  MOV     (SP)+,$HINUM
035104  005046                          CLR     -(SP)               ;NO ERRORS
035106  162322                  1$:     SUB     (R3)+,(R2)+         ;ARE THESE TWO WORDS DIFFERENT?
035110  001441                          BEQ     4$                  ;NO--BRANCH
035112  012737  035164  001222          MOV     #3$,$ESCAPE         ;;ESCAPE TO 3$ ON ERROR
035120  064342                          ADD     -(R3),-(R2)         ;RECREATE THE BAD WORD
035122  010237  001136                  MOV     R2,$BDADR           ;ADDRESS OF BAD DATA
035126  010337  001134                  MOV     R3,$GDADR           ;ADDRESS OF GOOD DATA
035132  012237  001142                  MOV     (R2)+,$BDDAT        ;BAD DATA
035136  012337  001140                  MOV     (R3)+,$GDDAT        ;GOOD DATA
035142  010204                          MOV     R2,R4               ;FORM WORD NUMBER (1 TO 256)
035144  162704  055522                  SUB     #BUFFER+512.,R4
035150  006204                          ASR     R4
035152  005716                          TST     (SP)                ;FIRST ERROR
035154  001002                          BNE     2$                  ;NO--BRANCH
035156  105116                          COMB    (SP)                ;YES--SET ERROR SWITCH
```

```
035160  104015                              EMT     15              ;DATA COMPARE FAILURE
035162                              2$:
035162  104016                              EMT     16              ;FOLLOWS EMT 15
035164  032777  001000  143762      3$:     BIT     #SW09,@SWR      ;LOOP ON ERROR?
035172  001012                              BNE     5$              ;YES--BRANCH
035174  123737  001464  001117              CMPB    ERR.CT,$ERFLG   ;MAX. ERRORS OCCURRED?
035202  101406                              BLOS    5$              ;YES--BRANCH
035204  032777  000002  143742              BIT     #SW01,@SWR      ;STOP COMPARING?
035212  001002                              BNE     5$              ;YES--BRANCH
035214  020103                      4$:     CMP     R1,R3           ;ALL DATA BEEN COMPARED?
035216  101333                              BHI     1$              ;NO--BRANCH
035220  005726                      5$:     TST     (SP)+           ;ERROR OCCUR?
035222  001402                              BEQ     6$              ;NO--BRANCH
035224  013700  001350                      MOV     BYPASS,R0       ;TAKE ERROR EXIT
035230  000200                      6$:     RTS     R0              ;EXIT

                                    ;THIS ROUTINE FILLS A 256 WORD BUFFER WITH A RANDOM
                                    ;PATTERN OF WHICH THE FIRST TWO WORDS ARE THE BASE
                                    ;OF THE PATTERN.
                                    ;CALL
                                    ;       MOV     #ADR,R1         ;ADDRESS OF THE BUFFER
                                    ;       JSR     R0,RANPAT
                                    ;       RETURN

035232  010246                      RANPAT: MOV     R2,-(SP)        ;SAVE R2
035234  012702  000200                      MOV     #256./2.,R2     ;GENERATE 256 WORDS
035240  000402                              BR      2$
035242  004737  026426              1$:     JSR     PC,$RAND        ;GENERATE A RANDOM NUMBER
035246  013721  026526              2$:     MOV     $LONUM,(R1)+    ;PUT LOW WORD IN BUFFER
035252  013721  026524                      MOV     $HINUM,(R1)+    ;PUT HIGH WORD IN BUFFER
035256  005302                              DEC     R2              ;DONE?
035260  003370                              BGT     1$              ;NO--BRANCH
035262  012602                              MOV     (SP)+,R2        ;RESTORE R2
035264  000200                              RTS     R0              ;EXIT

                                    ;THIS ROUTINE GENERATES RANDOM CYLINDER, TRACK, AND SECTOR
                                    ;ADDRESSES AND SAVES THEN IN THE DPB (DTADPB+10, 11 & DTADPB+12).
                                    ;NOTE: THIS ROUTINE DESTROYS R1-R3
                                    ;CALL
                                    ;       JSR     R0,RANADR
                                    ;       RETURN

035266  004737  026426              RANADR: JSR     PC,$RAND        ;GENERATE A RANDOM NUMBER
035272  113701  026526                      MOVB    $LONUM,R1       ;FORM SECTOR IN R1
035276  113702  026527                      MOVB    $LONUM+1,R2     ;FORM TRACK IN R2
035302  013703  026524                      MOV     $HINUM,R3       ;FORM CYLINDER IN R3
035306  105701                              TSTB    R1              ;ENSURE THE SECTOR IS BETWEEN 0 AND 31
035310  002403                              BLT     2$
035312  123701  002470              1$:     CMPB    PRMLMT+24,R1    ;CHECK MAXIMUM SECTOR ADDRESS
035316  103003                              BHIS    3$
035320  000241                      2$:     CLC
035322  106001                              RORB    R1
035324  000772                              BR      1$
035326  105702                      3$:     TSTB    R2              ;ENSURE THE TRACK IS BETWEEN 0 AND LAST TRACK
035330  002403                              BLT     5$
035332  123702  001374              4$:     CMPB    LSTRK,R2
035336  002003                              BGE     6$
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035340  000241                    5$:     CLC
035342  106002                            RORB    R2
035344  000772                            BR      4$
035346  023703  002340            6$:     CMP     FC,R3            ;ENSURE THE CYLINDER IS BETWEEN FC AND LC
035352  003413                            BLE     7$
035354  000241                            CLC
035356  006003                            ROR     R3
035360  005503                            ADC     R3
035362  001371                            BNE     6$
035364  010103                            MOV     R1,R3
035366  000303                            SWAB    R3
035370  060203                            ADD     R2,R3
035372  005203                            INC     R3
035374  003364                            BGT     6$
035376  005403                            NEG     R3
035400  000762                            BR      6$
035402  023703  002342            7$:     CMP     LC,R3
035406  002003                            BGE     8$
035410  000241                            CLC
035412  006003                            ROR     R3
035414  000772                            BR      7$
035416  023703  002340            8$:     CMP     FC,R3
035422  003403                            BLE     9$
035424  005203                            INC     R3
035426  000303                            SWAB    R3
035430  000764                            BR      7$
035432  110137  047106            9$:     MOVB    R1,DTADPB+10     ;SAVE SECTOR ADDRESS
035436  110237  047107                    MOVB    R2,DTADPB+11     ;SAVE TRACK ADDRESS
035442  010337  047110                    MOV     R3,DTADPB+12     ;SAVE CYLINDER ADDRESS
035446  000200                            RTS     R0               ;RETURN

                                  ;THIS ROUTINE IS USED TO INPUT THE ''CONTROL SWITCHES''.
                                  ;IF SWR<07>=1 THE PRESENT SETTING WILL BE TYPED AND THE NEW
                                  ;SETTING IS READ AND STORED.
                                  ;NOTE: THIS ROUTINE DESTROYS R3 AND R4
                                  ;CALL
                                  ;       JSR     PC,GETSWR
                                  ;       RETURN                   ;(C.SWR)=DESIRED CONTROL SWITCHES

035450  032777  000200  143476    GETSWR: BIT     #SW07,@SWR       ;READ CONTROL SWITCHES?
035456  001430                            BEQ     2$               ;NO--BRANCH
035460  104401  035466                    TYPE    ,65$             ;;TYPE ASCIZ STRING
035464  000410                            BR      64$              ;;GET OVER THE ASCIZ
                                  ;;65$:   .ASCIZ  <CRLF>/SET SWR<07>=0/
035506                            64$:
035506  012703  047264            1$:     MOV     #MSG.CS,R3       ;''CONTROL SWITCHES=''
035512  013704  001314                    MOV     C.SWR,R4         ;PRESENT CONTROL SWITCH SETTINGS
035516  004037  035542                    JSR     R0,GETNUM        ;GET THE NEW SWITCH SETTINGS
035522  000771                            BR      1$               ; COMMA
035524  000240                            NOP                      ;PERIOD
035526  013737  001314  001320            MOV     C.SWR,SAVCSW     ;SAVE PREVIOUS VALUE
035534  010437  001314                    MOV     R4,C.SWR         ; DOUBLE PERIOD-SAVE NEW SWITCH SETTING
035540  000207                    2$:     RTS     PC               ;RETURN FROM CALL

                                  ;THIS ROUTINE WILL TYPE AN ASCIZ MESSAGE AND THEN
                                  ;INPUT AN ASCIZ STRING AND CHANGE THE STRING TO OCTAL
                                  ;IF REQUIRED.
                                  ;NOTE: THIS ROUTINE DESTROYS R1
                                  ;CALL
                                  ;       MOV     #ADR,R3         ;ADDRESS OF ASCIZ MESSAGE
                                  ;       MOV     #NUM,R4         ;OCTAL NUMBER
                                  ;       JSR     RO,GETNUM
                                  ;       RETURN1                 ;INPUT TERMINATED WITH A COMMA
                                  ;       RETURN2                 ;WITH A PERIOD
                                  ;       RETURN3                 ;WITH A DOUBLE PERIOD
                                  ;                               ;R4=INPUT NUMBER AND
                                  ;                               ;R2=R4*32 FOR ALL
                                  ;                               ;THREE RETURNS

035542  010337  035550            GETNUM: MOV     R3,2$           ;SAVE MESSAGE POINTER
035546  104401                    1$:     TYPE                    ;TYPE THE MESSAGE
035550  000000                    2$:     .WORD   0               ;MESSAGE POINTER GOES HERE
035552  010446                            MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
035554  104402                            TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
035556  104401  047307                    TYPE    ,SLASH          ;' / '
035562  104411                            RDLIN                   ;READ AN ASCIZ STRING
035564  012601                            MOV     (SP)+,R1        ;ADDRESS OF FIRST CHARACTER
035566  004037  040132                    JSR     RO,CK.CHR       ;CHECK ONE CHARACTER
035572  035546                            1$                      ;ILLEGAL CHARACTER
035574  035546                            '$                      ;CARRIAGE RETURN
035576  035610                            4$                      ;"/"
035600  035634                            8$                      ;","
035602  035642                            9$                      ;"."
035604  035606                            3$                      ;DIGIT 0-9
035606  005301                    3$:     DEC     R1              ;DECREMENT THE INPUT POINTEP
035610                            4$:
035610  004037  040372                    JSR     RO,CK.NUM       ;CHECK THE NUMBEP
035614  035546                            1$                      ;ILLEGAL INPUT
035616  035630                            7$                      ;TERMINATED WITH A "," OR "CR"
035620  035626                            6$                      ;TERMINATED WITH A "."
035622  035624                            5$                      ;TERMINATED WITH A ".."
035624  005720                    5$:     TST     (RO)+           ;DOUBLE PERIOD
035626  005720                    6$:     TST     (RO)+           ;SINGLE PERIOD
035630  010204                    7$:     MOV     R2,R4           ;COMMA--SAVE !NPUT NUMBER
035632  000414                            BR      11$             ;GO TO EXIT
035634  105711                    8$:     TSTB    (R1)            ;TERMINATOR AFTER A COMMA?
035636  001343                            BNE     1$              ;NO--LOOP
035640  000411                            BR      11$             ;YES--EXIT
035642  105711                    9$:     TSTB    (R1)            ;TERMINATOR AFTER A PERIOD?
035644  001406                            BEQ     10$             ;YES--EXIT
035646  122721  000056                    CMPB    #'.,(R1)+       ;NO--DOUBLE PERIOD?
035652  001335                            BNE     1$              ;NO--LOOP
035654  105711                            TSTB    (R1)            ;YES--TERMINATOR?
035656  001333                            BNE     1$              ;NO--LOOP
035660  005720                            TST     (RO)+           ;DOUBLE PERIOD
035662  005720                    10$:    TST     (RO)+           ;PERIOD
035664  010402                    11$:    MOV     R4,R2           ;COMMA--POSITION THE
035666  000302                            SWAB    R2              ;NUMBER IN CASE IT
035670  006202                            ASR     R2              ;IS THE PRIORITY LEVEL
035672  006202                            ASR     R2
035674  006202                            ASR     R2
035676  000200                            RTS     RO              ;EXIT

                                  ;THIS ROUTINE IS USED TO CHANGE OR MODIFY
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                                          ;THE TEST PARAMETERS.  IT GIVES THE OPERATOR
                                          ;THE CAPABILITY OF SPECIFYING WHICH DRIVES TO TEST, WHICH
                                          ;TESTS TO RUN AND HOW MANY TIMES TO REPEAT EACH TEST

035700  104412                            GT.PRM: SAVREG                          ;SAVE R0 - R5
035702  005037  001330                    GT.PR1: CLR     DRVSEL                  ;NO DRIVE SELECTED
035706  104401  035714                            TYPE    ,65$                    ;;TYPE ASCIZ STRING
035712  000406                                    BR      64$                     ;;GET OVER THE ASCIZ
                                          ;;65$:  .ASCIZ  <CRLF>/DRIVE(S)=/
035730                                    64$:
035730  104411                                    RDLIN                           ;READ TTY
035732  012601                                    MOV     (SP)+,R1                ;ADDRESS OF ASCIZ STRING
035734  004037  040132                            JSR     R0,CK.CHR               ;CHECK ONE CHARACTER
035740  035702                                    GT.PR1                          ;ILLEGAL CHARACTER
035742  035702                                    GT.PR1                          ,CARRIAGE RETURN
035744  035702                                    GT.PR1                          ;''/''
035746  035702                                    CT.PR1                          ;'':''
035750  035702                                    GT.PR1                          ;'',''
035752  035754                                    1$                              ;DIGIT 0-9
035754  005301                            1$:     DEC     R1
035756                                    2$:
035756  012702  000007                            MOV     #7,R2                   ;UPPER LIMIT OF INPUT
035762  004037  040206                            JSR     R0,CK.DIG               ;CHECK THE DIGIT(S)
035766  035702                                    GT.PR1                          ;ILLEGAL INPUT
035770  035702                                    GT.PR1                          ;INPUT TO LARGE
035772  036000                                    3$                              ;TERMINATED WITH A '','' OR ''CR''
035774  036024                                    4$                              ;TERMINATED WITH A '':''
035776  036024                                    4$                              ;TERMINATED WITH A ''..''
036000  156237  040636  001330            3$:     BISB    ATABIT(R2),DRVSEL       ;SET THE DRIVE SELECTED BIT
036006  105741                                    TSTB    -(R1)                   ;WAS THE LINE TERMINATED?
036010  001362                                    BNE     2$                      ;NO-GET THE NEXT DRIVE
036012  005037  001332                            CLR     TSTNMS                  ;DESELECT ALL TESTS
036016  005037  001334                            CLR     TSTNMS+2
036022  000405                                    BR      GTTST1                  ;YES--SELECT TEST
036024  156237  040636  001330            4$:     BISB    ATABIT(R2),DRVSEL       ;SET THE SELECTED DRIVE BITS
036032  104413                            GT.PR2: RESREG                          ;RESTORE R0 - R5
036034  000207                                    RTS     PC                      ;EXIT

036036                                    GTTST1:
036036  104401  036044                            TYPE    ,65$                    ;;TYPE ASCIZ STRING
036042  000403                                    BR      64$                     ;;GET OVER THE ASCIZ
                                          ;;65$:  .ASCIZ  /TEST=/
036052                                    64$:
036052  104411                                    RDLIN                           ;READ AN ASCIZ STRING
036054  012601                                    MOV     (SP)+,R1                ;POINTER TO R1
036056  122711  000056                            CMPB    #'.,(R1)                ;DOUBLE PERIOD?
036062  001007                                    BNE     1$                      ,NO--BRANCH
036064  122761  000056  000001                    CMPB    #'.,1(R1)
036072  001003                                    BNE     1$
036074  105761  000002                            TSTB    2(R1)                   ;''CR''?
036100  001754                                    BEQ     GT.PR2                  ;YES--EXIT
036102  005037  001332                    1$:     CLR     TSTNMS                  ;NO TEST SELECTED
036106  005037  001334                            CLR     TSTNMS+2
036112  005037  001336                            CLR     OPNFLG                  ;NO TESTS TO BE OPENED
036116  005037  001340                            CLR     OPNFLG+2

036122  121127  000123                    GTTST2: CMPB    (R1),#'S                ;ALL SEEK TESTS?
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  1254 036126  001004                              BNE     1$                  ;NO--BRANCH
  1255 036130  052737  000777  001332              BIS     #777,TSTNMS         ;YES--SELECT TESTS 0-10
  1256 036136  000552                              BR      GTTST3
  1257 036140  121127  000124           1$:        CMPB    (R1),#'T            ;ALL TIMING TESTS?
  1258 036144  001004                              BNE     2$                  ;NO--BRANCH
  1259 036146  052737  026000  001332              BIS     #26000,TSTNMS       ;YES--SELECT TESTS 12,13 & 15
  1260 036154  000543                              BR      GTTST3
  1261 036156  121127  000101           2$:        CMPB    (R1),#'A            ;ALL ADDRESSING TESTS?
  1262 036162  001004                              BNE     3$                  ;NO--BRANCH
  1263 036164  052737  140000  001332              BIS     #140000,TSTNMS      ;YES--SELECT TESTS 16 & 17
  1264 036172  000534                              BR      GTTST3
  1265 036174  121127  000104           3$:        CMPB    (R1),#'D            ;DATA TEST?
  1266 036200  001004                              BNE     4$                  ;NO--BRANCH
  1267 036202  052737  000001  001334              BIS     #1,TSTNMS+2         ;YES--SELECT TEST 20
  1268 036210  000525                              BR      GTTST3
  1269 036212  121127  000105           4$:        CMPB    (R1),#'E            ;EXERCISER TEST?
  1270 036216  001004                              BNE     5$                  ;NO--BRANCH
  1271 036220  052737  000002  001334              BIS     #2,TSTNMS+2         ;YES--SELECT TEST 21
  1272 036226  000516                              BR      GTTST3
  1273 036230  004037  040056           5$:        JSR     R0,CK.OCT           ;OCTAL DIGIT?
  1274 036234  000514                              BR      GTTST4              ;NO--BRANCH
  1275 036236  010205                              MOV     R2,R5               ;YES--SAVE IT
  1276 036240  005201                              INC     R1                  ;MOVE TO NEXT CHARACTER
  1277 036242  004037  040056                      JSR     R0,CK.OCT           ;OCTAL DIGIT
  1278 036246  000405                              BR      6$                  ;NO--BRANCH
  1279 036250  005201                              INC     R1                  ;MOVE TO NEXT CHARACTER
  1280 036252  006305                              ASL     R5                  ;SCALE HIGH DIGIT
  1281 036254  006305                              ASL     R5
  1282 036256  006305                              ASL     R5
  1283 036260  060502                              ADD     R5,R2               ;COMBINE HIGH & LOW DIGITS
  1284 036262                                  6$:
  1287 036262  020227  000022                      CMP     R2,#22              ;VALID TEST NUMBER?
  1288 036266  003263                              BGT     GTTST1              ;NO--BRANCH
  1289 036270  010237  036462                      MOV     R2,9$               ;SAVE THE TEST NUMBER
  1290 036274  010204                              MOV     R2,R4               ;CONVERT TEST NUMBER INTO AN INDEX
  1291 036276  042704  000017                      BIC     #17,R4              ;CLEAR UNWANTED BITS
  1292 036302  006204                              ASR     R4                  ;SHIFT THE BITS
  1293 036304  006204                              ASR     R4
  1294 036306  006204                              ASR     R4
  1295 036310  006302                              ASL     R2
  1296 036312  056264  001540  001332              BIS     BITS(R2),TSTNMS(R4)     ;SELECT TEST
  1297 036320  121127  000055                      CMPB    (R1),#'-            ;TEST STRING?
  1298 036324  001060                              BNE     GTTST4              ;NO--BRANCH
  1299 036326  005201                              INC     R1                  ;YES--MOVE TO NEXT CHARACTER
  1300 036330  004037  040056                      JSR     R0,CK.OCT           ;OCTAL DIGIT?
  1301 036334  000640                              BR      GTTST1              ;NO--BRANCH
  1302 036336  010205                              MOV     R2,R5               ;YES--SAVE IT
  1303 036340  005201                              INC     R1                  ;MOVE TO NEXT CHARACTER
  1304 036342  004037  040056                      JSR     R0,CK.OCT           ;OCTAL DIGIT?
  1305 036346  000405                              BR      7$                  ;NO--BRANCH
  1306 036350  005201                              INC     R1                  ;YES--MOVE TO NEXT CHARACTER
  1307 036352  006305                              ASL     R5                  ;SCALE HIGH DIGIT
  1308 036354  006305                              ASL     R5
  1309 036356  006305                              ASL     R5
  1310 036360  060502                              ADD     R5,R2               ;COMBINE HIGH & LOW DIGIT
  1311 036362                                  7$:
  1314 036362  020227  000022                      CMP     R2,#22              ;VALID TEST NUMBER?
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036366  003223                            BGT     GTTST1          ;NO--BRANCH
036370  023702  036462                    CMP     9$,R2           ;IS THE FIRST NUMBER OF THE
                                                                  ;STRING SMALLER THAN THE LAST?
036374  002220                            BGE     GTTST1          ;NO--BRANCH
036376  010246                            MOV     R2,-(SP)        ;SAVE ENDING TEST NUMBER
036400  013702  036462                    MOV     9$,R2           ;GET STARTING TEST NUMBER
036404  012637  036462                    MOV     (SP)+,9$        ;STORE ENDING TEST NUMBER
036410  006337  036462                    ASL     9$              ;SHIFT ENDING TEST NUMBER
036414  006302                            ASL     R2              ;SHIFT TEST NUMBER
036416  010204                  8$:       MOV     R2,R4           ;COPY TEST NUMBER INTO R4
036420  042704  000037                    BIC     #37,R4          ;CLEAR LOWER BITS
036424  006204                            ASR     R4              ;SHIFT THE TEST NUMBER
036426  006204                            ASR     R4
036430  006204                            ASR     R4
036432  006204                            ASR     R4
036434  056264  001540  001332            BIS     BITS(R2),TSTNMS(R4)      ;SELECT THE TEST
036442  062702  000002                    ADD     #2,R2           ;INECREMENT THE TEST NUMBER
036446  020237  036462                    CMP     R2,9$           ;SEE IF FINISHED
036452  101761                            BLOS    8$              ;BR IF NOT
036454  162702  000002                    SUB     #2,R2           ;CORRECT TEST NUMBER
036460  000402                            BR      GTTST4          ;CONTINUE
036462  000000                  9$:       .WORD   0               ;STORE TEST NUMBER HERE

036464  005201                  GTTST3:   INC     R1              ;MOVE TO NEXT CHARACTER
036466  121127  000056          GTTST4:   CMPB    (R1),#'.        ;'PERIOD'?
036472  001511                            BEQ     GTTST5          ;YES--BRANCH
036474  005737  001332                    TST     TSTNMS          ;ANY TEST SELECTED THIS CYCLE?
036500  001005                            BNE     1$              ;BR IF YES
036502  005737  001334                    TST     TSTNMS+2        ;ANY TEST SELECTED THIS CYCLE ?
036506  001002                            BNE     1$              ;BR IF YES
036510  000137  036036                    JMP     GTTST1          ;NO

                                ;CHECK TO OPEN TESTS FOR PARAMETER CHANGES

036514  121127  000057          1$:       CMPB    (R1),#'/        ;'OPEN'?
036520  001054                            BNE     7$              ;NO--BRANCH
036522  126127  177777  000123            CMPB    -1(R1),#'S      ;ALL SEEK TESTS?
036530  001004                            BNE     2$              ;NO--BRANCH
036532  052737  000777  001336            BIS     #777,OPNFLG     ;YES--OPEN TESTS 0-10
036540  000451                            BR      8$
036542  126127  177777  000124  2$:       CMPB    -1(R1),#'T      ;ALL TIMING TESTS?
036550  001004                            BNE     3$              ;NO--BRANCH
036552  052737  026000  001336            BIS     #26000,OPNFLG   ;YES--OPEN TESTS 12,13 & 15
036560  000441                            BR      8$
036562  126127  177777  000101  3$:       CMPB    -1(R1),#'A      ;ALL ADDRESSING TESTS?
036570  001004                            BNE     4$              ;NO--BRANCH
036572  052737  140000  001336            BIS     #140000,OPNFLG  ;YES--OPEN TESTS 16 & 17
036600  000431                            BR      8$
036602  126127  177777  000104  4$:       CMPB    -1(R1),#'D      ;DATA TEST?
036610  001004                            BNE     5$              ;NO--BRANCH
036612  052737  000001  001340            BIS     #1,OPNFLG+2     ;YES--OPEN TEST 20
036620  000421                            BR      8$
036622  126127  177777  000105  5$:       CMPB    -1(R1),#'E      ;EXERCISER TEST?
036630  001004                            BNE     6$              ;NO--BRANCH
036632  052737  000002  001340            BIS     #2,OPNFLG+2     ;YES--OPEN TEST 21
036640  000411                            BR      8$
036642  056264  001540  001336  6$:       BIS     BITS(R2),OPNFLG(R4)      ;YES--SET BITS FOR TEST TO OPEN
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036650  000405                          BR      8$

036652  121127  000054          7$:     CMPB    (R1),#',        ;''COMMA''?
036656  001402                          BEQ     8$              ;BR IF YES
036660  000137  036036                  JMP     GTTST1          ;NO
036664  005201                  8$:     INC     R1              ;MOVE TO NEXT CHARACTER
036666  105711                          TSTB    (R1)            ;''CR''?
036670  001402                          BEQ     9$              ;BR IF 'CR'
036672  000137  036122                  JMP     GTTST2          ;NO--GO GET NEXT CHARACTER
036676  005737  001336          9$:     TST     OPNFLG          ;ANY TESTS TO OPEN ?
036702  001042                          BNE     OPNTST          ;BR IF YES
036704  005737  001340                  TST     OPNFLG+2        ;ANY TESTS TO OPEN ?
036710  001037                          BNE     OPNTST          ;BR IF YES
036712  000137  036036                  JMP     GTTST1          ;NO--START AGAIN

036716  005201                  GTTST5: INC     R1              ;MOVE TO NEXT CHARACTER
036720  121127  000056                  CMPB    (R1),#'.        ;''PERIOD''?
036724  001414                          BEQ     GTTST6          ;YES--BRANCH
036726  105711                          TSTB    (R1)            ;''CR''?
036730  001402                          BEQ     1$              ;YES--BRANCH
036732  000137  036036                  JMP     GTTST1
036736  005737  001336          1$:     TST     OPNFLG          ;ANY TESTS TO OPEN ?
036742  001022                          BNE     OPNTST          ;BR IF YES
036744  005737  001340                  TST     OPNFLG+2        ;ANY TESTS TO OPEN ?
036750  001017                          BNE     OPNTST          ;BR IF YES
036752  000137  036032                  JMP     GT.PR2          ;NO--GO START TESTING

036756  005201                  GTTST6: INC     R1              ;MOVE TO NEXT CHARACTER
036760  105711                          TSTB    (R1)            ;''CR''?
036762  001402                          BEQ     1$              ;YES--BRANCH
036764  000137  036036                  JMP     GTTST1          ;NO--GO ASK FOR TEST
036770  005737  001336          1$:     TST     OPNFLG          ;ANY TESTS TO OPEN ?
036774  001005                          BNE     OPNTST          ;BR IF YES
036776  005737  001340                  TST     OPNFLG+2        ;ANY TESTS TO OPEN ?
037002  001002                          BNE     OPNTST          ;BR IF YES
037004  000137  036032                  JMP     GT.PR2          ;NO--GO START TESTING

                                ;OPEN THE SELECTED TEST FOR CHANGES

037010  104412                  OPNTST: SAVREG                  ;SAVE R0 - R5
037012  005027                          CLR     (PC)+           ;START WITH TEST 0
037014  000000                  OPN.CT: .WORD   0               ;COUNT STORED HERE
037016  000411                          BR      OPN.2           ;SKIP THE INCREMENT

037020  005237  037014          OPN.1:  INC     OPN.CT          ;MOVE TO THE NEXT TEST
037024  022737  000022  037014          CMP     #22,OPN.CT      ;TEST NUMBER TOO BIG?
037032  002003                          BGE     OPN.2           ;NO--OPEN THE NEXT TEST
037034  104413                          RESREG                  ;RESTORE R0 - R5
037036  000137  036036                  JMP     GTTST1          ;YES--GO ASK FOR MORE TESTS

037042  013705  037014          OPN.2:  MOV     OPN.CT,R5       ;SETUP TO USE THE
037046  006305                          ASL     R5              ;TEST NUMBER AS AN INDEX
037050  013703  037014                  MOV     OPN.CT,R3       ;GET INDEX
037054  042703  000017                  BIC     #17,R3          ;CLEAR LOWER TEST BITS
037060  006203                          ASR     R3              ;SHIFT TEST NUMBER
037062  006203                          ASR     R3
037064  006203                          ASR     R3
```

```
037066  036563  001540  001336                  BIT     BITS(R5),OPNFLG(R3)     ;OPEN THIS TEST?
037074  001751                                  BEQ     OPN.1                   ;NO--MOVE TO NEXT TEST
037076  104401  037104                          TYPE    ,65$                    ;;TYPE ASCIZ STRING
037102  000404                                  BR      64$                     ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  / TEST /
037114                                  64$:
037114  013746  037014                          MOV     OPN.CT,-(SP)            ;;SAVE OPN.CT FOR TYPEOUT
037120  104403                                  TYPOS                           ;;GO TYPE--OCTAL ASCII
037122     002                                  .BYTE   2                       ;;TYPE 2 DIGIT(S)
037123     000                                  .BYTE   0                       ;;SUPPRESS LEADING ZEROS
037124  104401  001231                          TYPE    ,$CRLF                  ;CR-LF
037130  016500  002374                          MOV     PRMPT(R5),R0            ;PICKUP PARAMETER POINTER
037134  011046                                  MOV     (R0),-(SP)              ;SAVE THE VARIABLE INDICATOR
037136  012702  002334                          MOV     #PRM,R2                 ;FIRST ADDRESS OF TABLE
037142  000405                                  BR      2$
037144  006216                          1$:     ASR     (SP)                    ;CHECK FOR A VARIABLE
037146  103403                                  BCS     2$                      ;GO MOVE THIS ONE
037150  001404                                  BEQ     OPNPRM                  ;DONE
037152  005722                                  TST     (R2)+                   ;BUMP THE POINTER
037154  000773                                  BR      1$
037156  012022                          2$:     MOV     (R0)+,(R2)+             ;MOVE THIS VARIABLE INTO THE
037160  000771                                  BR      1$                      ;COMMON AREA

037162  013716  002334                  OPNPRM: MOV     PRM,(SP)                ;GET THE VARIABLE INDICATOR
037166  005004                                  CLR     R4                      ;ZERO THE INDEX
037170  006216                          1$:     ASR     (SP)                    ;CHECK FOR A VARIABLE
037172  103403                                  BCS     3$                      ;GO GET IT
037174  001772                                  BEQ     OPNPRM                  ;OUT OF VARIABLES
037176  005724                          2$:     TST     (R4)+                   ;UPDATE THE INDEX
037200  000773                                  BR      1$
037202  005764  002444                  3$:     TST     PRMLMT(R4)              ;IS THE MAX. MAGNITUDE NEG?
037206  100466                                  BMI     OPNPAT                  ;YES--THEN IT IS THE PATTERN
037210  104401  050345                          TYPE    ,BLNKS2                 ;TYPE 2 SPACES
037214  016437  002476  037224                  MOV     PRMMSG(R4),4$           ;TYPE THE NAME OF THIS VARIABLE
037222  104401                                  TYPE
037224  000000                          4$:     .WORD   0
037226  104401  047262                          TYPE    ,MSG.EQ                 ;TYPE "="
037232  016446  002336                          MOV     RPT(R4),-(SP)           ;PUT RPT(R4) ON THE STACK
037236  004737  026136                          JSR     PC,$SB2D                ;CHANGE TO DECIMAL ASCIZ
037242  004737  026366                          JSR     PC,$SUPRS               ;TYPE WITHOUT LEADING ZEROS
037246  104401  047307                          TYPE    ,SLASH                  ;TYPE ' / '
037252  104411                                  RDLIN
037254  012601                                  MOV     (SP)+,R1                ;READ AN ASCIZ STRING
037256  004037  040132                          JSR     R0,CK.CHR               ;CHECK ONE CHARACTER
037262  037202                                  3$                              ;ILLEGAL CHARACTER
037264  037176                                  2$                              ;CARRIAGE RETURN
037266  037334                                  9$                              ;"/"
037270  037276                                  5$                              ;","
037272  037304                                  6$                              ;"."
037274  037332                                  8$                              ;DIGIT 0-9
037276  105711                          5$:     TSTB    (R1)                    ;"CR"?
037300  001340                                  BNE     3$                      ;NO--STAY ON THIS VARIABLE
037302  000735                                  BR      2$                      ;YES--MOVE TO NEXT VARIABLE
037304  105711                          6$:     TSTB    (R1)                    ;IS THERE A "CR" AFTER THE PERIOD?
037306  001002                                  BNE     7$                      ;NO
037310  000137  037724                          JMP     OPN.N2                  ;YES--GO CLOSE THIS TEST
037314  122721  000056                  7$:     CMPB    #'.,(R1)+               ;DOUBLE PERIOD?
```

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037320  001330                          BNE     3$              ;NO--GO ASK FOR THIS VARIABLE
037322  105711                          TSTB    (R1)            ;YES--IS A ''CR'' AFTER THE DOUBLE PERIOD?
037324  001326                          BNE     3$              ;NO--ASK FOR THIS VARIABLE AGAIN
037326  000137  037742                  JMP     OPN.X2          ;YES--CLOSE ALL TEST

037332  005301                  8$:     DEC     R1              ;BACK THE POINTER UP BY ONE
037334                          9$:
037334  016402  002444                  MOV     PRMLMT(R4),R2           ;UPPER LIMIT OF INPUT
037340  004037  040206                  JSR     R0,CK.DIG       ;CHECK THE DIGIT(S)
037344  037202                          3$                      ;ILLEGAL INPUT
037346  037202                          3$                      ;INPUT TO LARGE
037350  037356                          10$                     ;TERMINATED WITH A '','' OR ''CR''
037352  037720                          OPN.N1                  ;TERMINATED WITH A ''.''
037354  037736                          OPN.X1                  ;TERMINATED WITH A ''..''
037356  010264  002336          10$:    MOV     R2,RPT(R4)      ;SAVE THIS VARIABLE
037362  000705                          BR      2$              ;MOVE TO NEXT VARIABLE

                                ;OPEN PATTERN FOR CHANGES

037364  104401  050345          OPNPAT: TYPE    ,BLNKS2         ;TYPE 2 SPACES
037370  104401  047256                  TYPE    ,MSG.PAT        ;TYPE ''PAT''
037374  104401  047262                  TYPE    ,MSG.EQ         ;TYPE ''=''
037400  016446  002336                  MOV     RPT(R4),-(SP)   ;;SAVE RPT(R4) FOR TYPEOUT
037404  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
037406  104401  050346                  TYPE    ,BLNKS1         ;TYPE ONE SPACE
037412  104411                          RDLIN                   ;READ ASCIZ STRING
037414  012601                          MOV     (SP)+,R1        ;PICKUP POINTER
037416  004037  040132                  JSR     R0,CK.CHR       ;CHECK ONE CHARACTER
037422  037364                          OPNPAT                  ;ILLEGAL CHARACTER
037424  037162                          OPNPRM                  ;CARRIAGE RETURN
037426  037460                          3$                      ;''/''
037430  037162                          OPNPRM                  ;'',''
037432  037436                          1$                      ;''.''
037434  037456                          2$                      ;DIGIT 0-9
037436  105711                  1$:     TSTB    (R1)            ;''CR'' AFTER THE PERIOD?
037440  001531                          BEQ     OPN.N2          ;YES--GO CLOSE THIS TEST
037442  122721  000056                  CMPB    #'.,(R1)+       ;NO--PERIOD?
037446  001346                          BNE     OPNPAT          ;NO--LOOP
037450  105711                          TSTB    (R1)            ;''CR'' AFTER A DOUBLE PERIOD?
037452  001533                          BEQ     OPN.X2          ;YES--GO START TESTING
037454  000743                          BR      OPNPAT          ;NO--LOOP
037456  005301                  2$:     DEC     R1              ;BACKUP THE ASCII POINTER
037460                          3$:
037460  004037  040372                  JSR     R0,CK.NUM       ;CHECK THE NUMBER
037464  037364                          OPNPAT                  ;ILLEGAL INPUT
037466  037474                          4$                      ;TERMINATED WITH A '','' OR ''CR''
037470  037720                          OPN.N1                  ;TERMINATED WITH A ''.''
037472  037736                          OPN.X1                  ;TERMINATED WITH A ''..''
037474  010264  002336          4$:     MOV     R2,RPT(R4)      ;SAVE THE INPUT NUMBER
037500  006002                          ROR     R2              ;OPEN PATTERN 0?
037502  103227                          BCC     OPNPRM          ;NO--START AT BEGINNING OF PARAMETER TABLE
037504  104412                          SAVREG                  ;SAVE R0 - R5

                                ;OPEN WORDS IN PATTERN #0 FOR CHANGES

037506  005000                  OPNWDS: CLR     R0              ;START WITH WORD 0
037510  012704  003576                  MOV     #PAT0,R4
```

```
037514                             1$:
037514  104401  037522                     TYPE    ,65$            ;;TYPE ASCIZ STRING
037520  000403                             BR      64$             ;;GET OVER THE ASCIZ
                                   ;;65$:  .ASCIZ  /   WD/
037530                             64$:
037530  010046                             MOV     R0,-(SP)        ;PUT R0 ON THE STACK
037532  004737  026136                     JSR     PC,$SB2D        ;CHANGE TO DECIMAL ASCIZ
037536  004737  026366                     JSR     PC,$SUPRS       ;TYPE WITHOUT LEADING ZEROS
037542  104401  047262                     TYPE    ,MSG.EQ         ;TYPE "="
037546  011446                             MOV     (R4),-(SP)      ;;SAVE (R4) FOR TYPEOUT
037550  104402                             TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
037552  104411                             RDLIN                   ;READ ASCIZ STRING
037554  012601                             MOV     (SP)+,R1        ;PICKUP THE POINTER
037556  004037  040132                     JSR     R0,CK.CHR       ;CHECK ONE CHARACTER
037562  037514                             1$                      ;ILLEGAL CHARACTER
037564  037616                             5$                      ;CARRIAGE RETURN
037566  037600                             3$                      ;"/"
037570  037616                             5$                      ;","
037572  037632                             6$                      ;"."
037574  037576                             2$                      ;DIGIT 0-9
037576  005301                     2$:     DEC     R1              ;BACKUP THE ASCII POINTER
037600                             3$:
037600  004037  040372                     JSR     R0,CK.NUM       ;CHECK THE NUMBER
037604  037514                             1$                      ;ILLEGAL INPUT
037606  037614                             4$                      ;TERMINATED WITH A "," OR "CR"
037610  037652                             7$                      ;TERMINATED WITH A "."
037612  037664                             9$                      ;TERMINATED WITH A ".."
037614  010214                     4$:     MOV     R2,(R4)         ;SAVE THE INPUT
037616  005724                     5$:     TST     (R4)+           ;MOVE TO NEXT WORD
037620  005200                             INC     R0              ;INCREMENT THE COUNT
037622  022700  000020                     CMP     #16.,R0         ;COUNT TO LARGE?
037626  003332                             BGT     1$              ;NO--BRANCH
037630  000726                             BR      OPNWDS          ;YES--BRANCH
037632  105711                     6$:     TSTB    (R1)            ;"CR" AFTER THE PERIOD?
037634  001407                             BEQ     8$              ;YES--GO CLOSE THIS TEST
037636  122721  000056                     CMPB    #'.,(R1)+       ;NO--PERIOD?
037642  001324                             BNE     1$              ;NO--BRANCH ILLEGAL INPUT STRING
037644  105711                             TSTB    (R1)            ;"CR" AFTER THE 'PERIOD-PERIOD'?
037646  001407                             BEQ     10$             ;YES--GO START TESTING
037650  000721                             BR      1$              ;NO--LOOP
037652  010224                     7$:     MOV     R2,(R4)+        ;SAVE THE INPUT
037654  004737  037676             8$:     JSR     PC,CLSWDS       ;CLOSE THE DATA PATTERN
037660  104413                             RESREG                  ;RESTORE R0 - R5
037662  000420                             BR      OPN.N2          ;MOVE TO NEXT TEST
037664  010224                     9$:     MOV     R2,(R4)+        ;SAVE THE INPUT
037666  004737  037676             10$:    JSR     PC,CLSWDS       ;CLOSE THE DATA PATTERN
037672  104413                             RESREG                  ;RESTORE R0 - R5
037674  000422                             BR      OPN.X2          ;START TESTING

                                   ;CLOSE PATTERN #0 AND SAVE CHANGED WORDS

037676  012701  003576             CLSWDS: MOV     #PAT0,R1        ;FIRST ADDRESS OF DATA PATTERN
037702  005200                     1$:     INC     R0              ;COUNT THE LAST WORD THAT WAS STORED
037704  022700  000017                     CMP     #15.,R0         ;END OF TABLE
037710  002402                             BLT     2$              ;YES--EXIT
037712  012124                             MOV     (R1)+,(R4)+     ;COPY
037714  000772                             BR      1$              ;LOOP
```

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037716  000207                    2$:      RTS     PC                      ;RETURN

037720  010264  002336            OPN.N1:  MOV     R2,RPT(R4)              ;SAVE THIS VARIABLE
037724  005726                    OPN.N2:  TST     (SP)+                   ;CLEAN OFF THE STACK
037726  004737  037776                     JSR     PC,CLOSE                ;CLOSE THIS TEST
037732  000137  037020                     JMP     OPN.1                   ;GO OPEN THE NEXT TEST

037736  010264  002336            OPN.X1:  MOV     R2,RPT(R4)              ;SAVE THIS VARIABLE
037742  005726                    OPN.X2:  TST     (SP)+                   ;CLEAN OFF THE STACK
037744  004737  037776            1$:      JSR     PC,CLOSE                ;CLOSE THIS TEST
037750  005725                    2$:      TST     (R5)+                   ;UPDATE THE INDEX
037752  020527  000034                     CMP     R5,#16*2                ;INDEX TO BIG?
037756  002403                             BLT     3$                      ;NO--BRANCH
037760  104413                             RESREG                          ;RESTORE R0 - R5
037762  000137  036032                     JMP     GT.PR2                  ;GO TO EXIT
037766  036503  001540            3$:      BIT     BITS(R5),R3             ;IS THIS TEST OPEN FOR CHANGE?
037772  001364                             BNE     1$                      ;YES--GO CLOSE IT
037774  000765                             BR      2$                      ;NO--MOVE TO NEXT TEST

                                  ;CLOSE CURRENT TEST THAT WAS OPEN FOR CHANGES

037776  104412                    CLOSE:   SAVREG                          ;SAVE R0 - R5
040000  012700  002334                     MOV     #PRM,R0                 ;''FROM'' ADDRESS
040004  016501  002374                     MOV     PRMPT(R5),R1            ;''TO'' ADDRESS
040010  012002                             MOV     (R0)+,R2                ;''FROM'' INDICATOR
040012  012103                             MOV     (R1)+,R3                ;''TO'' INDICATOR
040014  012704  000001                     MOV     #1,R4                   ;TEST BIT START A 'RPT''
040020  030402                    1$:      BIT     R4,R2                   ;PARAMETER TO BE MOVED?
040022  001403                             BEQ     2$                      ;NO--BRANCH
040024  030403                             BIT     R4,R3                   ;A PLACE TO PUT IT?
040026  001404                             BEQ     3$                      ;NO--BRANCH
040030  011011                             MOV     (R0),(R1)               ;YES--MOVE ''FROM'' TO ''TO''
040032  030403                    2$:      BIT     R4,R3                   ;''TO'' PARAMETER?
040034  001401                             BEQ     3$                      ;NO--BRANCH
040036  005721                             TST     (R1)+                   ;YES--UPDATE THE POINTER
040040  005720                    3$:      TST     (R0)+                   ;UPDATE FROM POINTER
040042  006304                             ASL     R4                      ;POSITION THE TEST BIT
040044  032704  002000                     BIT     #BIT10,R4               ;DONE?
040050  001763                             BEQ     1$                      ;NO--BRANCH
040052  104413                             RESREG                          ;RESTORE R0 - R5
040054  000207                             RTS     PC                      ;RETURN

                                  ;THIS ROUTINE IS USED TO CHECK IF AN
                                  ;ASCII CHARACTER IS A DIGIT BETWEEN 0 AND 7.
                                  ;CALL
                                  ;        MOV     #ADR,R1                 ;ADDRESS OF ASCII CHARACTER
                                  ;        JSR     R0,CK.OCT               ;CHECK THE CHARACTER
                                  ;        RETURN1                         ;CHARACTER IS NOT BETWEEN 0-7
                                  ;        RETURN2                         ;CHARACTER IS IN R2 AS A
                                  ;                                        ;OCTAL DIGIT

040056  121127  000060            CK.OCT:  CMPB    (R1),#'0                ;LESS THAN ZERO?
040062  103407                             BLO     1$                      ;YES -- BRANCH
040064  121127  000067                     CMPB    (R1),#'7                ;GREATER THAN SEVEN?
040070  101004                             BHI     1$                      ;YES -- BRANCH
040072  111102                             MOVB    (R1),R2                 ;GET THE CHARACTER
040074  042702  177770                     BIC     #^C7,R2                 ;STRIP AWAY THE ASCII
```

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040100  005720                          TST     (R0)+           ;ADJUST FOR RETURN
040102  000200                  1$:     RTS     R0              ;RETURN

                                ;THIS ROUTINE IS USED TO CHECK AN ASCII CHARACTER
                                ;AND DETERMINE IF IT IS A DIGIT BETWEEN 0 AND 9.
                                ;CALL
                                ;       MOV     #ADR,R1         ;ADDRESS OF ASCII CHARACTER
                                ;       JSR     R0,CK.DEC       ;CHECK THE CHARACTER
                                ;       RETURN1                 ;NOT BETWEEN 0 AND 9
                                ;       RETURN2                 ;BETWEEN 0 AND 9
                                ;                               ;R2 = DIGIT

040104  121127  000060          CK DEC: CMPB    (R1),#'0        ;LESS THAN ZERO?
040110  103407                          BLO     1$              ;YES -- BRANCH
040112  121127  000071                  CMPB    (R1),#'9                ;GREATER THAN NINE?
040116  101004                          BHI     1$              ;YES -- BRANCH
040120  111102                          MOVB    (R1),R2         ;GET THE CHARACTER
040122  042702  000060                  BIC     #'0,R2          ;STRIP AWAY THE ASCII
040126  005720                          TST     (R0)+           ;ADJUST FOR RETURN
040130  000200                  1$:     RTS     R0              ;RETURN

                                ;THIS ROUTINE WILL CHECK AN ASCII CHARACTER TO
                                ;DETERMINE WHAT IT IS.
                                ;CALL
                                ;       MOV     #ADR,R1         ;ADDRESS OF ASCII CHARACTER
                                ;       JSR     R0,CK.CHR       ;CHECK CHARACTER
                                ;       RETURN  ADR1            ;UNKNOWN CHARACTER
                                ;       RETURN  ADR2            ;CARRIAGE RETURN * (R1)-ADR+1
                                ;       RETURN  ADR3            ;SLASH * (R1)=ADR+1
                                ;       RETURN  ADR4            ;COMMA * (R1)=ADR+1
                                ;       RETURN  ADR5            ;PERIOD * (R1)=ADR+1
                                ;       RETURN  ADR6            ;DIGIT BETWEEN 0 AND 9.
                                ;                               ;R2 = DIGIT * (R1)-ADR+1

040132  105711                  CK.CHR: TSTB    (R1)            ;''CARRIAGE RETURN''?
040134  001420                          BEQ     4$              ;YES -- BRANCH
040136  121127  000057                  CMPB    (R1),#'/        ;''SLASH''?
040142  001414                          BEQ     3$              ;YES -- BRANCH
040144  121127  000054                  CMPB    (R1),#',        ;''COMMA''?
040150  001410                          BEQ     2$              ;YES -- BRANCH
040152  121127  000056                  CMPB    (R1),#'.        ;''PERIOD''?
040156  001404                          BEQ     1$              ;YES -- BRANCH
040160  004037  040104                  JSR     R0,CK.DEC       ;''DIGIT''?
040164  000406                          BR      5$              ;NO -- BRANCH
040166  005720                          TST     (R0)+           ;DIGIT BETWEEN 0-9
040170  005720                  1$:     TST     (R0)+           ;PERIOD
040172  005720                  2$:     TST     (R0)+           ;COMMA
040174  005720                  3$:     TST     (R0)+           ;SLASH
040176  005720                  4$:     TST     (R0)+           ;CARRIAGE RETURN
040200  005201                          INC     R1              ;MOVE POINTER TO NEXT CHARACTER
040202  011000                  5$:     MOV     (R0),R0         ;UNKNOWN CHARACTER
040204  000200                          RTS     R0              ;RETURN

                                ;THIS ROUTINE CHECKS AN ASCII STRING FOR LEGAL
                                ;CHARACTERS AND FORMS A DECIMAL VALUE BINARY NUMBER IN R2.
                                ;CALL
                                ;       MOV     #ADR,R1         ;ADDRESS OF ASCIZ STRING
                                ;       MOV     #NUM,R2         ;MAX. MAGNITUDE OF INPUT NUMBER
                                ;       JSR     R0,CK.DIG       ;CHECK DIGITS
                                ;       RETURN  ADR1            ;ILLEGAL CHARACTER -- R2-?
                                ;       RETURN  ADR2            ;INPUT NUMBER TO LARGE -- R2 ?
                                ;       RETURN  ADR3            ;''COMMA'' -- R2 = NUMBER
                                ;       RETURN  ADR4            ;''PERIOD'' -- R2 = NUMBER
                                ;       RETURN  ADR5            ;''PERIOD-PERIOD'' -- R2 = NUMBER

 040206 010446                  CK.DIG: MOV     R4,-(SP)        ;SAVE R4
 040210 010346                          MOV     R3,-(SP)        ;SAVE R3
 040212 010246                          MOV     R2,-(SP)        ;SAVE THE MAX. SIZE ON THE STACK
 040214 005002                          CLR     R2              ;START WITH 0
 040216 005003                          CLR     R3
 040220 005004                          CLR     R4
 040222 004037  040132                  JSR     R0,CK.CHR       ;CHECK ONE CHARACTER
 040226 040356                          9$                      ;ILLEGAL CHARACTER
 040230 040356                          9$                      ;CARRIAGE RETURN
 040232 040356                          9$                      ;''/''
 040234 040356                          9$                      ;'',''
 040236 040356                          9$                      ;''.''
 040240 040242                          1$                      ;DIGIT 0-9
 040242 006303                  1$:     ASL     R3              ;2
 040244 010346                          MOV     R3,-(SP)        ;SAVE *2
 040246 006303                          ASL     R3              ;4
 040250 006303                          ASL     R3              ;8
 040252 062603                          ADD     (SP)+,R3        ;(*8)+(*2)=*10.
 040254 060203                          ADD     R2,R3           ;UPDATE THE INPUT NUMBER
 040256 004037  040132                  JSR     R0,CK.CHR       ;CHECK ONE CHARACTER
 040262 040356                          9$                      ;ILLEGAL CHARACTER
 040264 040276                          2$                      ;CARRIAGE RETURN
 040266 040356                          9$                      ;''/''
 040270 040304                          4$                      ;'',''
 040272 040302                          3$                      ;''.''
 040274 040242                          1$                      ;DIGIT 0-9
 040276 005301                  2$:     DEC     R1              ;BACKUP THE CHARACTER POINTER
 040300 000401                          BR      4$              ;CONTINE
 040302 005724                  3$:     TST     (R4)+           ;''PERIOD''
 040304 005724                  4$:     TST     (R4)+           ;''COMMA'' OR ''CR''
 040306 004037  040132                  JSR     R0,CK.CHR       ;CHECK ONE CHARACTER
 040312 040356                          9$                      ;ILLEGAL CHARACTER
 040314 040346                          7$                      ;CARRIAGE RETURN
 040316 040356                          9$                      ;''/''
 040320 040356                          9$                      ;'',''
 040322 040326                          5$                      ;''.''
 040324 040336                          6$                      ;DIGIT 0-9
 040326 005724                  5$:     TST     (R4)+           ;''PERIOD-PERIOD''
 040330 105711                          TSTB    (R1)            ;''CR''?
 040332 001405                          BEQ     7$              ;YES--BRANCH
 040334 000410                          BR      9$
 040336 126127  177776  000054  6$:     CMPB    -2(R1),#',      ;WAS CHARACTER BEFORE THE DIGIT A COMMA?
 040344 001004                          BNE     9$              ;NO--EXIT
 040346 020316                  7$:     CMP     R3,(SP)         ;INPUT TO LARGE?
 040350 101001                          BHI     8$              ;YES -- BRANCH
 040352 060400                          ADD     R4,R0           ;ADJUST RETURN ADDRESS
 040354 005720                  8$:     TST     (R0)+
 040356 010302                  9$:     MOV     R3,R2           ;NUMBER TO R2
 040360 005726                          TST     (SP)+           ;CLEAN MAX. SIZE OFF OF STACK
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040362  012603                  MOV     (SP)+,R3        ;RESTORE R3
040364  012604                  MOV     (SP)+,R4        ;RESTORE R4
040366  011000                  MOV     (R0),R0         ;GET RETURN ADDRESS
040370  000200                  RTS     R0              ;RETURN

                        ;THIS ROUTINE CHECKS AN ASCIZ STRING FOR LEGAL CHARACTERS
                        ;AND FORMS AN OCTAL NUMBER IN R2
                        ;CALL:
                        ;       MOV     #ADR,R1         ;ADDRESS OF ASCIZ STRING
                        ;       JSR     R0,CK.NUM       ;GO FORM THE NUMBER
                        ;       RETURN  ADR1            ;ILLEGAL CHARACTER IN THE INPUT STRING
                        ;       RETURN  ADR2            ;''COMMA'' OR ''CR''--R2=NUMBER
                        ;       RETURN  ADR3            ;''PERIOD''--R2=NUMBER
                        ;       RETURN  ADR4            ;''PERIOD-PERIOD''--R2=NUMBER

040372  010346          CK.NUM: MOV     R3,-(SP)        ;SAVE R3
040374  005003                  CLR     R3              ;START NUMBER AT ZERO
040376  004037  040056          JSR     R0,CK.OCT       ;OCTAL DIGIT?
040402  000440                  BR      6$              ;NO--BRANCH
040404  005201          1$:     INC     R1              ;MOVE TO NEXT CHARACTER
040406  006303                  ASL     R3              ;FOR THE OCTAL NUMBER IN R3
040410  103435                  BCS     6$              ;DON'T LET IT GET TO BIG
040412  006303                  ASL     R3
040414  103433                  BCS     6$
040416  006303                  ASL     R3
040420  103431                  BCS     6$
040422  060203                  ADD     R2,R3
040424  004037  040056          JSR     R0,CK.OCT       ;IS THIS AN OCTAL DIGIT?
040430  000401                  BR      2$              ;NO--FIND OUT WHAT IT IS
040432  000764                  BR      1$              ;YES--MAKE IT PART OF THE NUMBER
040434  010302          2$:     MOV     R3,R2           ;SAVE THE OCTAL NUMBER
040436  005003                  CLR     R3              ;START WITH ZERO INDEX
040440  004037  040132          JSR     R0,CK.CHR       ;CHECK ONE CHARACTER
040444  040504                  6$                      ;ILLEGAL CHARACTER
040446  040474                  5$                      ;CARRIAGE RETURN
040450  040504                  6$                      ;''/''
040452  040474                  5$                      ;'',''
040454  040460                  3$                      ;''.''
040456  040504                  6$                      ;DIGIT 0-9
040460  005723          3$:     TST     (R3)+           ;''PERIOD''
040462  121127  000056          CMPB    (R1),#'.        ;''PERIOD-PERIOD''?
040466  001002                  BNE     5$              ;NO--BRANCH
040470  005201                  INC     R1              ;YES--ADVANCE THE POINTER
040472  005723          4$:     TST     (R3)+           ;''PERIOD-PERIOD''
040474  005723          5$:     TST     (R3)+           ;''COMMA''
040476  105711                  TSTB    (R1)            ;''CR''?
040500  001001                  BNE     6$              ;NO--BRANCH
040502  060300                  ADD     R3,R0           ;YES--SAVE THE OCTAL NUMBER
040504  012603          6$:     MOV     (SP)+,R3        ;RESTORE R3
040506  011000                  MOV     (R0),R0         ;PICKUP EXIT ADDRESS
040510  000200                  RTS     R0              ;RETURN
```

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                                      .SBTTL  SINGLE/DUAL PORT RH/RM DRIVER (REV 6.5) 1981

                                      ;NEW DRIVE TYPE ID FOR RM02 **********
                                      ;10-AUG-77 ***********
                                      ;10-MAR-78 THE SC, SC5 CHANGES
                                      ;NEW DRIVE TYPE ID FOR RM05 **********
                                      ;1980 ***********

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                                      ;MAYNARD, MA 01754
                                      ;AUTHOR(S): JIM LACEY/CHUCK HESS
                                      ;REVISED BY: MIKE LEAVITT        11-APR-80, 27-MAR-81

                                      ;;*************************************************************

                                      ;STORAGE FOR RMDS, RMER1, RMER2, AND RMMR2 ON AN ERROR "2"
                                              ;RMERRS   = RMDS
                                              ;RMERRS+2 = RMER1
                                              ;RMERRS+4 = RMER2
                                              ;RMERRS+6 = RMMR2

040512  000000  000000  000000  RMERRS: .WORD   0,0,0,0

                                      ;TABLE OF DRIVE ACTIVE INDICATORS (DRVACT=8 BYTES)
                                              ;DRVACT=0 IF DRIVE IS IDLE
                                              ;DRVACT>0 IF DRIVE IS ACTIVE WITH A COMMAND
                                              ;DRVACT<0 IF DRIVE IS ACTIVE WITH AN ERROR RECOVERY OPERATION

040522      000                     DRVACT: .BYTE   0               ;DRIVE 0
040523      000                             .BYTE   0               ;DRIVE 1
040524      000                             .BYTE   0               ;DRIVE 2
040525      000                             .BYTE   0               ;DRIVE 3
040526      000                             .BYTE   0               ;DRIVE 4
040527      000                             .BYTE   0               ;DRIVE 5
040530      000                             .BYTE   0               ;DRIVE 6
040531      000                             .BYTE   0               ;DRIVE 7

                                      ;TABLE OF DRIVE STATUS INDICATORS (DRVSTA=8 BYTES)
                                              ;DRVSTA=0 IF DRIVE IS OFFLINE OR NONFXSITENT
                                              ;DRVSTA>0 IF DRIVE IS ONLINE
                                              ;DRVSTA<0 IF DRIVE IS UNSAFE

040532      000                     DRVSTA: .BYTE   0               ;DRIVE 0
040533      000                             .BYTE   0               ;DRIVE 1
040534      000                             .BYTE   0               ;DRIVE 2
040535      000                             .BYTE   0               ;DRIVE 3
040536      000                             .BYTE   0               ;DRIVE 4
040537      000                             .BYTE   0               ;DRIVE 5
040540      000                             .BYTE   0               ;DRIVE 6
040541      000                             .BYTE   0               ;DRIVE 7

                                      ;TABLE OF DRIVE TYPES (DRVTYP=8 BYTES)
                                              ;DRVTYP=0 IF DRIVE IS NONEXISTENT (DRVSTA=0, ALSO)
                                              ;DRVTYP=7 IF DRIVE IS RM05 ******
                                              ;DRVTYP-5 IF DRIVE IS RM02 ******
                                              ;DRVTYP-4 IF DRIVE IS RM03
```

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                                          ;DRVTYP=-1 IF NOT RM05/3/2

 040542      000                  DRVTYP: .BYTE    0               ;DRIVE 0
 040543      000                          .BYTE    0               ;DRIVE 1
 040544      000                          .BYTE    0               ;DRIVE 2
 040545      000                          .BYTE    0               ;DRIVE 3
 040546      000                          .BYTE    0               ;DRIVE 4
 040547      000                          .BYTE    0               ;DRIVE 5
 040550      000                          .BYTE    0               ;DRIVE 6
 040551      000                          .BYTE    0               ;DRIVE 7

                                  ;TABLE OF DUAL PORT INITIALIZATION INDICATORS
                                          ;DPINT=0 IF INITIALIZATION IS NOT ACTIVE ON THE DRIVE
                                          ;DPINT<0 IF INITIALIZATION IS IN PROGRESS

 040552      000                  DPINT:  .BYTE    0               ;DRIVE 0
 040553      000                          .BYTE    0               ;DRIVE 1
 040554      000                          .BYTE    0               ;DRIVE 2
 040555      000                          .BYTE    0               ;DRIVE 3
 040556      000                          .BYTE    0               ;DRIVE 4
 040557      000                          .BYTE    0               ;DRIVE 5
 040560      000                          .BYTE    0               ;DRIVE 6
 040561      000                          .BYTE    0               ;DRIVE 7

                                  ;TABLE OF PENDING DUAL PORT REQUESTS
                                          ;DPRQS=0 IF THAT A DUAL PORT REQUEST IS NOT PENDING FOR THAT DRIVE
                                          ;DPRQS<0 IF THAT A DUAL PORT REQUEST IS PENDING FOR THAT DRIVE

 040562      000                  DPRQS:  .BYTE    0               ;DRIVE 0
 040563      000                          .BYTE    0               ;DRIVE 1
 040564      000                          .BYTE    0               ;DRIVE 2
 040565      000                          .BYTE    0               ;DRIVE 3
 040566      000                          .BYTE    0               ;DRIVE 4
 040567      000                          .BYTE    0               ;DRIVE 5
 040570      000                          .BYTE    0               ;DRIVE 6
 040571      000                          .BYTE    0               ;DRIVE 7

                                  ;TRANSFER WAIT FLAG (TRNSWT=1 WORD)
                                          ;THIS IS A ONE WORD QUEUE. IT WILL CONTAIN THE ADDRESS OF
                                          ;"DPB" OF THE I/O OPERATION.

 040572   000000                  TRNSWT: .WORD    0

                                  ;SEARCH WAIT KEYS (SRCHWT=1 WORD)
                                          ;THIS IS A ONE WORD QUEUE THAT WILL CONTAIN A KEY FOR EACH OF
                                          ;THE DRIVES THAT ARE PERFORMING A SEARCH COMMAND FOR THE I/O
                                          ;REQUEST THAT IS AT THE TOP OF THEIR REQUEST QUEUE.
                                          ;EACH DRIVE IS ASSIGNED ONE BIT, STARTING AT BIT00 FOR DRIVE 0.

 040574   000000                  SRCHWT: .WORD    0

                                  ;RM DRIVER ACTIVE FLAG (ACTDRV=1 BYTE)
                                          ;ACTDRV=0 IF DRIVER IS INACTIVE
                                          ;ACTDRV>0 IF DRIVER IS ACTIVE

 040576      000                  ACTDRV: .BYTE    0

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                        ;SOFTWARE TIMER ROUTINE ACTIVE FLAG (ACTSTR=1 BYTE)
                                ;ACTSTR=0 IF SOFTWARE TIMER ROUTINE IS INACTIVE
                                ;ACTSTR>0 IF SOFTWARE TIMER ROUTINE IS ACTIVE

040577     000          ACTSTR: .BYTE   0

                        ;UNLOAD FLAG (ULDFLG=8 BYTES)
                                ;ULDFLG=0 IF NO UNLOAD COMMAND
                                ;ULDFLG>0 IF UNLOAD COMMAND IN PROGRESS
                                ;ULDFLG<0 IF UNLOAD COMMAND IN WAIT QUEUE

040600     000          ULDFLG: .BYTE   0               ;DRIVE 0
040601     000                  .BYTE   0               ;DRIVE 1
040602     000                  .BYTE   0               ;DRIVE 2
040603     000                  .BYTE   0               ;DRIVE 3
040604     000                  .BYTE   0               ;DRIVE 4
040605     000                  .BYTE   0               ;DRIVE 5
040606     000                  .BYTE   0               ;DRIVE 6
040607     000                  .BYTE   0               ;DRIVE 7

                        ;SAVE REGISTERS FLAG (SAVEFG =1 WORD)
                                ;SAVEFG <0 IF SAVE THE RH/RM REGISTERS WHEN THE
                                ;OPERATION IS COMPLETED AS PER (DPB+14).
                                ;SAVEFG=0 IF SAVE THE RH/RM REGISTERS, AS PER
                                ;(DPB+14), AFTER AN ERROR.

040610  000000          SAVEFG: .WORD   0

                        ;SEEK FLAG (SEEKFG=1 WORD)
                                ;SEEKFG=0 IF WHEN THE DISK ADDRESS ISN'T IN THE WINDOW
                                ;FOR A DATA TRANSFER START A SEARCH COMMAND
                                ;SEEKFG<0 IF DATA TRANSFER WILL DO IMPLIED SEEKS,
                                ;DISREGARD THE WINDOW

040612  177777          SEEKFG: .WORD   -1

                        ;TIMEOUT TABLE (TIMER=8 WORDS)
                                ;THIS TABLE CONTAINS THE TIME ALLOWED FOR AN OPERATION

040614  177777          TIMER:  .WORD   -1              ;DRIVE 0
040616  177777                  .WORD   -1              ;DRIVE 1
040620  177777                  .WORD   -1              ;DRIVE 2
040622  177777                  .WORD   -1              ;DRIVE 3
040624  177777                  .WORD   -1              ;DRIVE 4
040626  177777                  .WORD   -1              ;DRIVE 5
040630  177777                  .WORD   -1              ;DRIVE 6
040632  177777                  .WORD   -1              ;DRIVE 7

                        ;DATA TRANSFER UNDERWAY INDICATOR (DTUW=1 WORD)
                                ;DTUW<0 IF NO DATA TRANSFER UNDERWAY
                                ;DTUW-+N (WHERE N=0 TO 7) IMPLIES DATA TRANSFER UNDERWAY ON DRIVE N

040634  177777          DTUW:   .WORD   -1

                        ;ATTENTION BITS TABLE (ATABIT=8 BYTES)
                                ;THIS TABLE CONTAINS THE CORRESPONDING BIT TO EACH DRIVES
                                ;ATTENTION BIT
```

```

040636     001                      ATABIT: .BYTE    1        ;DRIVE 0
040637     002                              .BYTE    2        ;DRIVE 1
040640     004                              .BYTE    4        ;DRIVE 2
040641     010                              .BYTE    10       ;DRIVE 3
040642     020                              .BYTE    20       ;DRIVE 4
040643     040                              .BYTE    40       ;DRIVE 5
040644     100                              .BYTE    100      ;DRIVE 6
040645     200                              .BYTE    200      ;DRIVE 7

                                    ;NUMBER OF 'MASSBUS CONTROL PARITY ERRORS'' (MCPE) ALLOWED BEFORE
                                    ;CALLING IT FATAL (MCPEMX=1 WORD)

040646  000003                      MCPEMX: .WORD    3

                                    ;STORAGE FOR RMADR (THE FIRST ADDRESS (776700) OF THE RH/RM),
                                    ;RMVEC (THE VECTOR ADDRESS (254)), AND RMVEC+2 (THE BR LEVEL (5)).

040650  176700                      RMADR:  .WORD    176700
040652  000254  000240              RMVEC:  .WORD    254,5*32.

                                    ;MAXIMUM SEARCH FOR I/O WINDOW IS 5 SECTORS (MXWNDW-1 WORD)
040656  000005                      MXWNDW: .WORD    5

                                    ;DEFINITIONS OF THE RH/RM ADDRESS INDEXES

        000000                      RMCS1    = 0                   ;CONTROL AND STATUS REGISTER #1 (DRIVE REG. 0)
        000002                      RMWC     = 2                   ;WORD COUNT REGISTER (NOT A DRIVE REG)
        000004                      RMBA     = 4                   ;UNIBUS ADDRESS REGISTER (NOT A DRIVE REG)
        000006                      RMDA     = 6                   ;DESIRED SECTOR/TRACK ADDRESS REGISTER (DRIVE REG. 5)
        000010                      RMCS2    = 10                  ;CONTROL AND STATUS REGISTER #2 (NOT A DRIVE REG)
        000012                      RMDS     = 12                  ;DRIVE STATUS REGISTER (DRIVE REG 1)
        000014                      RMER1    = 14                  ;ERROR REGISTER #1 (DRIVE REG. 2)
        000016                      RMAS     = 16                  ;ATTENTION SUMMARY PSEUDO REGISTER (DRIVE REG. 4)
        000020                      RMLA     = 20                  ;LOOK AHEAD REGISTER (DRIVE REG. 7)
        000022                      RMDB     = 22                  ;DATA BUFFER REGISTER (NOT A DRIVE REG.)
        000024                      RMMR1    = 24                  ;MAINTAINABILITY REGISTER (DRIVE REG. 3)
        000026                      RMDT     = 26                  ;DRIVE TYPE REGISTER (DRIVE REG. 6)
        000030                      RMSN     = 30                  ;SERIAL NUMBER REGISTER (DRIVE REG. 10)
        000032                      RMOF     = 32                  ;OFFSET REGISTER (DRIVE REG. 11)
        000034                      RMDC     = 34                  ;DESIRED CYLINDER ADDRESS REGISTER (DRIVE REG. 12)
        000036                      RMHR     - 36                  ;DUMMY  ADDRESS REGISTER (DRIVE REG. 13)
        000040                      RMMR2    = 40                  ;MAINTENANCE REGISTER #2
        000042                      RMER2    = 42                  ;ERROR REGISTER #2 (DRIVE REG. 15)
        000044                      RMEC1    = 44                  ;ECC POSITION REGISTER (DRIVE REG. 16)
        000046                      RMEC2    = 46                  ;ECC PATTERN REGISTER (DRIVE REG.  17)

                                    .SBTTL  RH/RM DRIVER INITIALIZATION CODE

                                    ;THIS ROUTINE WILL DETERMINE WHICH RM DRIVES ARE
                                    ;AVAILABLE FOR TESTING AND SET THE DRVSTA INDICATOR
                                    ;TO THE PROPER STATE FOR EACH DRIVE.
                                    ;NOTE: THIS ROUTINE CALLS DRVINT
                                    ;
                                    ;CALL
                                    ;
                                    ;       JSR     PC,RMINIT
```

```
                                        ;       RETURN
                                        ;
                                        ;NOTE: THE 'P' OR 'L' CLOCK MUST BE STARTED
                                        ;
040660  104412                          RMINIT: SAVREG                          ;SAVE R0 - R5
040662  013746  177776                          MOV     PS,-(SP)                ;SAVE THE PRESENT PROCESSOR STATUS
040666  012737  000240  177776                  MOV     #<5*32.>,PS             ;CHANGE THE PRIORITY TO 5
040674  004737  046336                          JSR     PC,CLRQUE               ;CLEAR ALL REQUEST QUEUES
040700  012701  040512                          MOV     #RMERRS,R1              ;FIRST ADDRESS TO BE CLEARED
040704  012702  040612                          MOV     #SEEKFG,R2              ;LAST ADDRESS TO BE CLEARED
040710  005021                          1$:     CLR     (R1)+                   ;CLEAR
040712  020102                                  CMP     R1,R2                   ;ARE WE DONE?
040714  103775                                  BLO     1$                      ;BR IF NO
040716  012702  040634                          MOV     #DTUW,R2                ;LAST ADDRESS
040722  012721  177777                  2$:     MOV     #-1,(R1)+               ;INITIALIZE
040726  020102                                  CMP     R1,R2                   ;DONE?
040730  101774                                  BLOS    2$                      ;LOOP IF NO
040732  005037  040532                          CLR     DRVSTA                  ;SET ALL DRIVES TO OFFLINE
040736  005037  040534                          CLR     DRVSTA+2
C40742  005037  040536                          CLR     DRVSTA+4
040746  005037  040540                          CLR     DRVSTA+6
040752  013703  040652                          MOV     RMVEC,R3                ;SETUP THE RH/RM VECTOR
040756  012723  043306                          MOV     #ISR,(R3)+
040762  013713  040654                          MOV     RMVEC+2,(R3)
040766  013704  040650                          MOV     RMADR,R4                ;FIRST ADDRESS OF RH/RM
040772  012764  000040  000010                  MOV     #CLR,RMCS2(R4)          ;MASSBUS INIT
041000  005001                                  CLR     R1                      ;START WITH DRIVE 0
041002  004037  041072                  3$:     JSR     R0,DRVINT               ;INIT THE DRIVE
041006  000401                                  BR      4$                      ;'DVA' NOT SET OR PARITY ERROR
041010  000402                                  BR      5$                      ;NORMAL RETURN
041012  105061  040532                  4$:     CLRB    DRVSTA(R1)              ;SET DRIVE STATUS TO OFFLINE
041016  005201                          5$:     INC     R1                      ;GO TO NEXT DRIVE
041020  042701  177770                          BIC     #^C7,R1                 ;MASK OUT UNUSED BITS
041024  001366                                  BNE     3$                      ;BR IF MORE DRIVES TO GO
041026  012701  000007                          MOV     #7,R1                   ;START WITH DRIVE 7
041032  005037  177776                          CLR     PS                      ;CLEAR THE PROCESSOR STATUS
041036  105761  040552                  6$:     TSTB    DPINT(R1)               ;WAITING FOR DRIVE TO SWITCH PORTS ?
041042  001405                                  BEQ     8$                      ;BR NOT WAITING
041044  004737  045772                          JSR     PC,SET.IE               ;SET INTERRUPT
041050  105761  040552                  7$:     TSTB    DPINT(R1)               ;DRIVE SWITCHED PORTS ?
041054  001375                                  BNE     7$                      ;BR IF NOT
041056  005301                          8$:     DEC     R1                      ;GO TO THE NEXT DRIVE
041060  100366                                  BPL     6$                      ;CHECK NEXT DRIVE
041062  012637  177776                          MOV     (SP)+,PS                ;RESTORE THE PROCESSOR STATUS
041066  104413                                  RESREG                          ;RESTORE R0 - R5
041070  000207                                  RTS     PC                      ;BYE-BYE

                                        ;DRIVE INITILIZATION ROUTINE
                                        ;THIS ROUTINE DETERMINES IF A DRIVE EXIST AND IF IT IS
                                        ;AN RM05/3/2. IF IT IS, A ''READ-IN PRESET'' IS ISSUED AND FMT16
                                        ;IS SET TO A ''1''. THEN MOL, DPR, DRY, AND VV ARE CHECKED TO
                                        ;INSURE THEY ARE ALL ON A ''1''. AND DEPENDING ON THEIR STATE,
                                        ;DRVSTA IS SET TO THE PROPER CONDITION.
                                        ;CALL
                                        ;       MOV     #DRVNUM,R1              ;DRIVE NUMBER TO R1
                                        ;       MOV     RMADR,R4                ;UNIBUS ADDRESS OF RH/RM (RMCS1)
                                        ;       JSR     R0,DRVINT               ;CALLED BY A JSR
                                        ;       RETURN1                 ;ERROR OCCURRED (PARITY)
                                        ;       RETURN2                 ;NORMAL RETURN
                                        ;

041072  010546                  DRVINT: MOV     R5,-(SP)                ;SAVE R5
041074  105061  040532                  CLRB    DRVSTA(R1)              ;START DRIVE STATUS AS OFFLINE
041100  105061  040542                  CLRB    DRVTYP(R1)              ;CLEAR THE DRIVE TYPE INDICATOR
041104  105061  040600                  CLRB    ULDFLG(R1)              ;CLEAR THE UNLOAD FLAG
041110  010164  000010                  MOV     R1,RMCS2(R4)            ;SELECT A DRIVE
041114  112764  000111  000000          MOVB    #111,RMCS1(R4)          ;DO A DRIVE CLEAR COMMAND (& SEIZE DRIVE)
041122  032764  010000  000010          BIT     #BIT12,RMCS2(R4)                ;NONEXISTENT DRIVE?
041130  001403                          BEQ     1$                      ;NO
041132  004737  045772                  JSR     PC,SET.IE               ;GO SET ''IE'' WITHOUT A ''TRE''
041136  000520                          BR      4$                      ;LEAVE THIS ROUTINE

041140  105061  040532          1$:     CLRB    DRVSTA(R1)              ;SET DRIVE STATUS TO OFFLINE
041144  032764  004000  000000          BIT     #BIT11,RMCS1(R4)                ;SEE IF DRIVE AVAILABLE
041152  001512                          BEQ     4$                      ;BR IF DRIVE NOT AVAILABLE
041154  004037  045302                  JSR     R0,RD.RM                ;READ THE DRIVE TYPE REG.
041160  000026                          RMDT
041162  041402                          5$                              ;ERROR RETURN ADDRESS
041164  012605                          MOV     (SP)+,R5                ;PUT DRIVE TYPE IN R5
041166  112761  000004  040542          MOVB    #4,DRVTYP(R1)           ;SET RM03 INDICATOR
041174  022705  020024                  CMP     #20024,R5               ;SINGLE PORT RM03 ?
041200  001431                          BEQ     2$                      ;BR IF YES
041202  022705  024024                  CMP     #24024,R5               ;DUAL PORT RM03 ?
041206  001426                          BEQ     2$                      ;BR IF YES
041210  112761  000005  040542          MOVB    #5,DRVTYP(R1)           ;SET RM02 INDICATOR
041216  022705  020025                  CMP     #20025,R5               ;SINGLE PORT RM02 ?
041222  001420                          BEQ     2$                      ;BR IF SO
041224  022705  024025                  CMP     #24025,R5               ;DUAL PORT RM02 ?
041230  001415                          BEQ     2$                      ;BR IF SO
041232  112761  000007  040542          MOVB    #7,DRVTYP(R1)           ;SET RM05 INDICATOR
041240  022705  020027                  CMP     #20027,R5               ;SINGLE PORT RM05 ?
041244  001407                          BEQ     2$                      ;BR IF YES
041246  022705  024027                  CMP     #24027,R5               ;DUAL PORT RM05 ?
041252  001404                          BEQ     2$                      ;BR IF YES
041254  112761  177777  040542          MOVB    #-1,DRVTYP(R1)          ;SET INDICATOR TO 'OTHER'
041262  000446                          BR      4$                      ;EXIT

041264  012746  000121          2$:     MOV     #121,-(SP)              ;DO A ''READ-IN PRESET''
041270  004037  045462                  JSR     R0,WRT.RM
041274  000000                          RMCS1
041276  041402                          5$
041300  012746  010000                  MOV     #BIT12,-(SP)            ;SET FMT16=1
041304  004037  045462                  JSR     R0,WRT.RM
041310  000032                          RMOF
041312  041402                          5$
041314  004037  045302                  JSR     R0,RD.RM                ;READ RMDS
041320  000012                          RMDS
041322  041402                          5$
041324  012605                          MOV     (SP)+,R5                ;AND SAVE IT IN R5
041326  100015                          BPL     3$                      ;BR IF ATA=0
041330  116164  040636  000016          MOVB    ATABIT(R1),RMAS(R4)             ;CLEAR ATTENTION BIT
041336  004037  045302                  JSR     R0,RD.RM                ;FIND OUT WHY ATA-1
041342  000014                          RMER1
041344  041402                          5$
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041346  006126                           ROL     (SP)+             ;IS IT UNSAFE?
041350  100004                           BPL     3$                ;BR IF NOT
041352  112761  177777  040532           MOVB    #-1,DRVSTA(R1)    ;SET UNSAFE INDICATOR
041360  000407                           BR      4$                ;EXIT

041362  005105                   3$:     COM     R5                ;CHECK MOL, DPR, DRY, AND VV
041364  042705  167077                   BIC     #^C<BIT12!BIT08!BIT07!BIT06>,R5
041370  001003                           BNE     4$                ;BR IF MOL, DPR, DRY, OR VV IS CLEAR
041372  112761  000001  040532           MOVB    #1,DRVSTA(R1)     ;SET DRIVE STATUS TO ONLINE
041400  005720                   4$:     TST     (R0)+             ;STEP OVER THE ERROR RETURN
041402  012605                   5$:     MOV     (SP)+,R5          ;RESTORE R5
041404  000200                           RTS     R0                ;EXIT

                                 ;REQUEST PRE-PROCESSOR-HANDLES SUBSYSTEM REQUEST
                                 ;
                                 ;CALL
                                 ;
                                 ;       JSR     R0,RM05           ;CALL THE RM05 DRIVER
                                 ;       PNTADR                    ;ADDRESS OF POINTER OF DRIVES PARAMETER BLOCK
                                 ;       RETURN1                   ;RETURN HERE IF QUEUE IS FULL
                                 ;       RETURN2                   ;RETURN HERE IF REQUEST IS IN QUEUE OR THERE
                                                                   ;IS AN ERROR CONDITION

041406  013746  177776           RM05:   MOV     PS,-(SP)          ;SAVE THE CALLING STATUS
041412  013737  040654  177776           MOV     RMVEC+2,PS        ;DON'T ALLOW ANY RM INTERRUPTS
041420  112737  000001  040576           MOVB    #1,ACTDRV         ;SET ''ACTIVE DRIVER'' FLAG
041426  104412                           SAVREG                    ;SAVE R0 - R5
041430  011002                           MOV     (R0),R2           ;PICKUP THE DRIVE PARAMETER BLOCK POINTER
041432  005062  000016                   CLR     16(R2)            ;CLEAR THE STATUS/ERROR INDICATOR
041436  111201                           MOVB    (R2),R1           ;PICKUP THE DRIVE NUMBER
041440  013704  040650                   MOV     RMADR,R4          ;UNIBUS ADDRESS OF RMCS1
041444  105761  040532                   TSTB    DRVSTA(R1)        ;CHECK DRIVES STATUS
041450  003014                           BGT     1$                ;BR IF ONLINE
041452  105761  040600                   TSTB    ULDFLG(R1)        ;UNLOAD COMMAND IN QUEUE?
041456  001036                           BNE     3$                ;BR IF YES
041460  105761  040552                   TSTB    DPINT(R1)         ;TRYING TO INIT THE DRIVE
041464  001042                           BNE     5$                ;BR IF YES
041466  004037  041072                   JSR     R0,DRVINT         ;GO INIT. THE DRIVE
041472  000434                           BR      4$                ;ERROR RETURN
041474  105761  040532                   TSTB    DRVSTA(R1)        ;IS DRIVE STATUS ONLINE?
041500  003445                           BLE     6$                ;BR IF NOT
041502  105761  040562           1$:     TSTB    DPRQS(R1)         ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
041506  001031                           BNE     5$                ;BR IF YES
041510  010164  000010                   MOV     R1,RMCS2(R4)      ;SELECT THE DRIVE
041514  004037  046434                   JSR     R0,DRVQUE         ;PUT THIS REQUEST IN QUEUE
041520  000460                           BR      9$                ;QUEUE IS FULL
041522  122762  000103  000002           CMPB    #103,2(R2)        ;IS THIS REQ. FOR AN UNLOAD?
041530  001003                           BNE     2$                ;BR IF NO
041532  112761  177777  040600           MOVB    #-1,ULDFLG(R1)    ;SET THE ''UNLOAD IN QUEUE'' FLAG
041540  105761  040522           2$:     TSTB    DRVACT(R1)        ;IS THIS DRIVE ACTIVE?
041544  001043                           BNE     8$                ;BR IF YES
041546  004737  041700                   JSR     PC,OPT            ;CALL THE OPTIMIZER
041552  000440                           BR      8$
041554  012762  120000  000016   3$:     MOV     #BIT15!BIT13,16(R2)     ;SET THE ''UNLOAD IN QUEUE'' ERROR FLAG
041562  000434                           BR      8$                ;EXIT
041564  004737  042756           4$:     JSR     PC,CI7            ;GO HANDLE THE PARITY ERROR
041570  000431                           BR      8$
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041572  004037  046434          5$:     JSR     R0,DRVQUE       ;PUT REQUEST IN QUEUE
041576  000431                          BR      9$              ;QUEUE IS FUL.
041600  032714  000100                  BIT     #BIT06,(R4)     ;IE BIT SET ?
041604  001023                          BNE     8$              ;YES
041606  004737  045772                  JSR     PC,SET.IE       ;SET THE INTERRUPT
041612  000420                          BR      8$              ;RETURN
041614  105761  040532          6$:     TSTB    DRVSTA(R1)      ;SEE IF DRIVE OFFLINE OR UNSAFE
041620  002412                          BLT     7$              ;BR IF UNSAFE
041622  012762  140000  000016          MOV     #BIT15!BIT14,16(R2)     ;SET OFFLINE ERROR INDICATOR
041630  105761  040542                  TSTB    DRVTYP(R1)      ;SEE IF OFFLINE OR NONEXISTENT
041634  001007                          BNE     8$              ;BR IF OFFLINE
041636  012762  100002  000016          MOV     #BIT15!BIT01,16(R2)     ;REPORT DRIVE NONEXISTENT
041644  000403                          BR      8$              ;GO TO EXIT
041646  012762  110000  000016  7$:     MOV     #BIT15.BIT12,16(R2)     ;DRIVE IS UNSAFE
041654  104413                  8$:     RESREG                  ;RESTORE R0 - R5
041656  005720                          TST     (R0)+           ;SETUP FOR NORMAL RETURN
041660  000401                          BR      10$             ;FINISH UP, THEN EXIT
041662  104413                  9$:     RESREG                  ;RESTORE R0 - R5
041664  005720                  10$:    TST     (R0)+           ;CORRECT THE RETURN ADDRESS
041666  105037  040576                  CLRB    ACTDRV          ;CLEAR ''ACTIVE DRIVER'' FLAG
041672  012637  177776                  MOV     (SP)+,PS        ;RETURN ''PS'' TO USER LEVEL
041676  000200                          RTS     R0              ;RETURN TO CALLER

                                ;OPTIMIZER-CALLED FOR A PARTICULAR DRIVE
                                ;
                                ;CALL
                                ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
                                ;       JSR     PC,OPT          ;SETUP A COMMAND

041700  104412                  OPT:    SAVREG                  ;SAVE R0 - R5
041702  013746  177776                  MOV     PS,-(SP)        ;SAVE PROC. STATUS
041706  146137  040636  040574          BICB    ATABIT(R1),SRCHWT       ;CLEAR LA SEACH FLAG
041714  105061  040562                  CLRB    DPRQS(R1)       ;RESET THE PORT REQ FLAG ****
041720  004737  046510                  JSR     PC,GETREQ       ;GET 'DPB'' POINTER OF REQUEST
041724  005702                          TST     R2              ;IS THERE A REQUEST IN QUEUE?
041726  001466                          BEQ     7$              ;NO--BR TO EXIT
041730  010164  000010                  MOV     R1,RMCS2(R4)    ;LOAD THE DRIVE ADDRESS *******
041734  012764  000111  000000          MOV     #111,RMCS1(R4)  ;CLEAR THE DRIVE
041742  032764  004000  000000          BIT     #BIT11,RMCS1(R4)        ;DVA SET ?
041750  001442                          BEQ     5$              ;TO PORT REQUEST ,IF NOT
041752  105761  040532          1$:     TSTB    DRVSTA(R1)      ;IS DRIVE ONLINE?
041756  003014                          BGT     2$              ;YES
041760  004737  046532                  JSR     PC,POPQUE       ;NO--REMOVE REQUEST FROM QUEUE
041764  012762  140000  000016          MOV     #BIT15!BIT14,16(R2)     ;SET OFFLINE STATUS/ERROR INDICATOR
041772  105761  040532                  TSTB    DRVSTA(R1)      ;IS DRIVE UNSAFE ?
041776  100047                          BPL     8$              ;BR TO EXIT IF NOT
042000  012762  110000  000016          MOV     #BIT15.BIT12,16(R2)     ;SET UNSAFE STATUS/ERROR INDICATOR
042006  000443                          BR      8$              ;BR TO EXIT
042010                          2$:
042010  122762  000150  000002          CMPB    #150,2(R2)      ;IS THE REQUEST FOR I/O?
042016  002403                          BLT     3$              ;YES
042020  004737  042342                  JSR     PC,CI4          ;CALL THE COMMAND INITIATOR
042024  000434                          BR      8$              ;BR TO EXIT
042026  005737  040634          3$:     TST     DTUW            ;DATA TRANSFER UNDERWAY?
042032  002006                          BGE     4$              ;YES--GO START A SEARCH
042034  005737  040612                  TST     SEEKFG          ;DO IMPLIED SEEKS?
042040  100003                          BPL     4$              ;NO, DO A SEARCH
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042042  004737  042126                  JSR     PC,CI1              ;START A DATA TRANSFER
042046  000423                          BR      8$
042050  004737  042234          4$:     JSR     PC,CI3              ;START A SEARCH
042054  000420                          BR      8$                  ;GO TO THE EXIT
042056  112761  177777  040562  5$:     MOVB    #-1,DPRQS(R1)       ;SET PORT REQUEST INDICATOR
042064  010103                          MOV     R1,R3               ;SET UP TO ADDRESS WORDS
042066  006303                          ASL     R3                  ;CONVERT TO WORD INDEX
042070  012763  035230  040614          MOV     #15000.,TIMER(R3)       ;START 15. SECOND TIMER
042076  000402                          BR      7$                  ;EXIT
042100  004737  042756          6$:     JSR     PC,CI7              ;PROCESS THE PARITY ERROR
042104  032714  000100          7$:     BIT     #BIT06,(R4)         ;SEE IF 'IE' ALREADY SET
042110  001002                          BNE     8$                  ;BR IF SET
042112  004737  045772                  JSR     PC,SET.IE           ;SET ''IE'' WITHOUT A ''TRE''
042116  012637  177776          8$:     MOV     (SP)+,PS            ;RESTORE PROC. STATUS
042122  104413                          RESREG                      ;RESTORE R0 - R5
042124  000207                          RTS     PC

                                ;COMMAND INITIATOR
                                ;
                                ;CALL
                                ;       MOV     #DRVNUM,R1          ;DRIVE NUMBER
                                ;       MOV     #DPB,R2             ;ADDRESS OF DPB
                                ;       JSR     PC,CI?              ;CI?= CI1,CI3, OR CI4
                                ;                                   ;WHERE:
                                ;                                   ;CI1=DATA TRANSFER
                                ;                                   ;CI3=SEARCH REQUESTED BY DATA XFER
                                ;                                   ;CI4=NOT DATA TRANSFER

042126  004737  046532          CI1:    JSR     PC,POPQUE           ;REMOVE REQUEST FROM ''DRIVES WAIT'' QUEUE
042132  010237  040572                  MOV     R2,TRNSWT           ;PUT REQ. IN TRANSFER WAIT QUEUE
042136  010203                          MOV     R2,R3               ;DPB ADDRESS TO R3
042140  013704  040650                  MOV     RMADR,R4            ;RMCS1 ADDRESS
042144  010164  000010                  MOV     R1,RMCS2(R4)        ;SELECT DRIVE
042150  062703  000004                  ADD     #4,R3               ;DESIRED WORD COUNT
042154  062704  000002                  ADD     #2,R4               ;RMWC ADDRESS
042160  012324                          MOV     (R3)+,(R4)+         ;LOAD WORD COUNT
042162  012324                          MOV     (R3)+,(R4)+         ;LOAD BUFFER ADDRESS
042164  012346                          MOV     (R3)+,-(SP)         ;LOAD SECTOR AND TRACK
042166  004037  045462                  JSR     R0,WRT.RM           ;CALL THE LOAD(WRITE) ROUTINE
042172  000006                          RMDA                        ;INDEX OF REGISTER TO LOAD
042174  042756                          CI7                         ;ERROR RETURN ADDRESS
042176  012346                          MOV     (R3)+,-(SP)         ;LOAD CYLINDER ADDRESS
042200  004037  045462                  JSR     R0,WRT.RM
042204  000034                          RMDC
042206  042756                          CI7
042210  016246  000002                  MOV     2(R2),-(SP)         ;LOAD ''COMMAND+GO'', ''A17&A16'', AND ''PSEL''
042214  004037  045462                  JSR     R0,WRT.RM
042220  000000                          RMCS1
042222  042756                          CI7
042224  010137  040634                  MOV     R1,DTUW             ;SET ''DATA TRANSFER UNDERWAY''
042230  000137  042720                  JMP     CI5

042234  013704  040650          CI3:    MOV     RMADR,R4            ;RMCS1 ADDRESS
042240  010164  000010                  MOV     R1,RMCS2(R4)        ;SELECT DRIVE
042244  016246  000012                  MOV     12(R2),-(SP)        ;DESIRED CYLINDER ADDRESS
042250  004037  045462                  JSR     R0,WRT.RM
042254  000034                          RMDC
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042256  042756                               CI7
042260  116203  000010                       MOVB    10(R2),R3          ;PICKUP SECTOR ADDRESS
042264  163703  040656                       SUB     MXWNDW,R3          ;BACKUP BY MAX. SEARCH FOR I/O WINDOW
042270  002002                               BGE     1$
042272  062703  000040                       ADD     #32.,R3
042276  010346                       1$:     MOV     R3,-(SP)           ;COMBINE THE ADJUSTED SECTOR WITH
042300  116266  000011  000001               MOVB    11(R2),1(SP)       ;THE DESIRED TRACK
042306  004037  045462                       JSR     R0,WRT.RM          ;LOAD DESIRED TRACK & SECTOR
042312  000006                               RMDA
042314  042756                               CI7
042316  012746  000131                       MOV     #131,-(SP)         ;START A SEARCH
042322  004037  045462                       JSR     R0,WRT.RM
042326  000000                               RMCS1
042330  042756                               CI7
042332  156137  040636  040574               BISB    ATABI.(R1),SRCHWT          ;SET ''SEARCH WAIT'' KEY
042340  000567                               BR      CI5

042342  013704  040650               CI4:    MOV     RMADR,R4           ;RMCS1 ADDRESS
042346  010164  000010                       MOV     R1,RMCS2(R4)       ;SELECT DRIVE
042352  116203  000002                       MOVB    2(R2),R3           ;PICKUP THE REQUESTED COMMAND
042356  122703  000131                       CMPB    #131,R3            ;IS IT A SEARCH COMMAND?
042362  001007                               BNE     1$                 ;BR IF NO
042364  016246  000010                       MOV     10(R2),-(SP)       ;LOAD DESIRED TRACK & SECTOR
042370  004037  045462                       JSR     R0,WRT.RM
042374  000006                               RMDA
042376  042756                               CI7
042400  000403                               BR      2$                 ;GO LOAD CYLINDER
042402  122703  000105               1$:     CMPB    #105,R3            ;IS IT A SEEK COMMAND
042406  001007                               BNE     3$                 ;BR IF NO
042410  016246  000012               2$:     MOV     12(R2),-(SP)       ;LOAD DESIRED CYLINDER
042414  004037  045462                       JSR     R0,WRT.RM
042420  000034                               RMDC
042422  042756                               CI7
042424  000546                               BR      CI6
042426  122703  000115               3$:     CMPB    #115,R3            ;IS IT AN ''OFFSET'' COMMAND?
042432  001013                               BNE     4$                 ;BR IF NO
042434  004037  045302                       JSR     R0,RD.RM           ;MERGE THE OFFSET VALUE INTO RMOF
042440  000032                               RMOF                       ;BUT DON'T CHANGE THE UPPER
042442  042756                               CI7
042444  116216  000001                       MOVB    1(R2),(SP)         ;BYTE WHEN LOADING THE
042450  004037  045462                       JSR     R0,WRT.RM          ;REGISTER (RMOF)
042454  000032                               RMOF
042456  042756                               CI7
042460  000530                               BR      CI6                ;GO START THE COMMAND
042462  122703  000107               4$:     CMPB    #107,R3            ;IS IT A ''RECALIBRATE'' COMMAND?
042466  001525                               BEQ     CI6                ;BR IF YES
042470  122703  000117                       CMPB    #117,R3            ;IS IT A RETURN TO CENTER?
042474  001522                               BEQ     CI6                ;BR IF YES
042476  122703  000103                       CMPB    #103,R3            ;IS IT AN ''UNLOAD'' COMMAND?
042502  001016                               BNE     5$                 ;BR IF NO
042504  112761  000001  040522               MOVB    #1,DRVACT(R1)      ;SET THE DRIVE ACTIVE INDICATOR
042512  105061  040532                       CLRB    DRVSTA(R1)         ;PUT DRIVE STATUS TO OFFLINE
042516  112761  000001  040600               MOVB    #1,ULDFLG(R1)      ;SET ''UNLOAD IN PROGRESS'' FLAG
042524  010346                               MOV     R3,-(SP)           ;START THE ''UNLOAD'' COMMAND
042526  004037  045462                       JSR     R0,WRT.RM
042532  000000                               RMCS1
042534  042756                               CI7
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    558 042536  000207                              RTS     PC                      ;RETURN TO USER
    559 042540  122703  000143             5$:      CMPB    #143,R3                 ;IS IT A ''SET FORMAT'' COMMAND?
    560 042544  001014                              BNE     6$                      ;BR IF NO
    561 042546  004037  045302                      JSR     R0,RD.RM                ;READ THE OFFSET REGISTER
    562 042552  000032                              RMOF
    563 042554  042756                              CI7
    564 042556  116266  000001  000001              MOVB    1(R2),1(SP)             ;COMBINE ''FMT16'',''ECI'', AND ''HCI''.
    565 042564  004037  045462                      JSR     R0,WRT.RM               ;LOAD ''FMT16'', ''ECI'', AND/OR ''HCI''.
    566 042570  000032                              RMOF
    567 042572  042756                              CI7
    568 042574  000436                              BR      12$
    569 042576  122703  000141             6$:      CMPB    #141,R3                 ;IS IT A ''GET REGISTER'' COMMAND?
    570 042602  001023                              BNE     10$                     ;BR IF NO
    571 042604  016203  000006             7$:      MOV     6(R2),R3                ;POINTS TO 1ST ADDRESS OF WHERE
    572                                                                             ;TO PUT THE REGISTER(S)
    573 042610  116237  000010  042626              MOVB    10(R2),9$               ;INIT. THE INDEX FOR THE FIRST REG.
    574 042616  116205  000011                      MOVB    11(R2),R5               ;INDEX OF LAST REG. TO MOVE
    575 042622  004037  045302             8$:      JSR     R0,RD.RM                ;READ RH/RM REGISTER
    576 042626  000000                     9$:      RMCS1                           ;INDEX OF REG. TO READ
    577 042630  042756                              CI7
    578 042632  012623                              MOV     (SP)+,(R3)+             ;GET THE CONTENTS OF RH/RM REG.
    579 042634  023705  042626                      CMP     9$,R5                   ;LAST REG. BEEN READ?
    580 042640  001414                              BEQ     12$                     ;GET OUT IF YES
    581 042642  062737  000002  042626              ADD     #2,9$                   ;INCREASE THE INDEX BY 2
    582 042650  000764                              BR      8$                      ;LOOP--MORE TO READ
    583 042652  122703  000145             10$:     CMPB    #145,R3                 ;IS IT A ''SELECT DRIVE'' COMMAND?
    584 042656  001405                              BEQ     12$                     ;BR IF YES
    585 042660  010346                     11$:     MOV     R3,-(SP)                ;LOAD THE COMMAND
    586 042662  004037  045462                      JSR     R0,WRT.RM
    587 042666  000000                              RMCS1
    588 042670  042756                              CI7
    589 042672  004737  046532             12$:     JSR     PC,POPQUE               ;REMOVE REQ. FROM QUEUE
    590 042676  052762  000200  000016              BIS     #BIT07,16(R2)           ;SET THE ''DONE'' BIT
    591 042704  005737  040610                      TST     SAVEFG                  ;SAVE THE RH/RM REGISTERS?
    592 042710  100002                              BPL     13$                     ;BR IF NO
    593 042712  004737  045654                      JSR     PC,SVRH70               ;YES--GO SAVE THE REGISTERS
    594 042716  000207                     13$:     RTS     PC                      ;RETURN TO USER
    595
    596 042720  006301                     CI5:     ASL     R1
    597 042722  012761  023420  040614              MOV     #10000.,TIMER(R1)               ;START 10. SECOND TIMER
    598 042730  006201                              ASR     R1
    599 042732  112761  000001  040522              MOVB    #1,DRVACT(R1)           ;SET THE DRIVE ACTIVE
    600 042740  000207                              RTS     PC                      ;RETURN TO THE USER
    601
    602 042742  010346                     CI6:     MOV     R3,-(SP)                ;LOAD THE COMMAND
    603 042744  004037  045462                      JSR     R0,WRT.RM
    604 042750  000000                              RMCS1
    605 042752  042756                              CI7
    606 042754  000761                              BR      CI5
    607
    608 042756  032764  010000  000010     CI7:     BIT     #BIT12,RMCS2(R4)                ;DRIVE NON-EXISTENT ?
    612 042764  005702                     1$:      TST     R2                      ;ANYTHING IN QUEUE ?
    616 042766  001001                              BNE     2$                      ;BR IF QUEUE IS THERE
    617 042770  000207                              RTS     PC                      ;OTHERWISE EXIT
    618 042772  012762  104000  000016     2$:      MOV     #BIT15.BIT11,16(R2)             ;SET ''PARITY'' ERROR INDICATOR
    622
    623 043000  012746  000111             CI7B:    MOV     #111,-(SP)              ;DO A ''DRIVE CLEAR''
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043004  004037  045462                  JSR     R0,WRT.RM
043010  000000                          RMCS1
043012  043056                          CI8
043014  004737  046414          1$:     JSR     PC,EMPTYQ          ;EMPTY THE QUEUE
043020  105061  040562                  CLRB    DPRQS(R1)          ;CLEAR THE PORT REQUEST FLAG
043024  105061  040600                  CLRB    ULDFLG(R1)         ;CLEAR THE UNLOAD IN QUEUE FLAG
043030  105061  040522                  CLRB    DRVACT(R1)         ;DRIVE IS IDLE
043034  020237  040572                  CMP     R2,TRNSWT          ;IF THIS DRIVE HAD AN I/O REQUEST
043040  001005                          BNE     2$                 ;IN PROGRESS CLEAR ALL OF THE FLAGS
043042  005037  040572                  CLR     TRNSWT
043046  012737  177777  040634          MOV     #-1,DTUW
043054  000207                  2$:     RTS     PC

043056  104412                  CI8:    SAVREG                     ;SAVE R0 - R5
043060  005001                          CLR     R1
043062  005003                          CLR     R3
043064  105761  040522          1$:     TSTB    DRVACT(R1)         ;DRIVE ACTIVE?
043070  001003                          BNE     2$                 ;BR IF IN ACTIVE
043072  105761  040562                  TSTB    DPRQS(R1)          ;PORT REQUEST
043076  001443                          BEQ     6$                 ;BR IF NOT
043100  013702  040572          2$:     MOV     TRNSWT,R2          ;GET THE ''TRANSFER WAIT'' QUEUE
043104  020137  040634                  CMP     R1,DTUW            ;DID THIS DRIVE HAVE AN I/O IN PROGRESS?
043110  001402                          BEQ     3$                 ;BR IF YES
043112  004737  046510                  JSR     PC,GETREQ          ;GET THE DPB POINTER
043116  005702                  3$:     TST     R2                 ;QUEUE ENTRY FOR DRIVE ?
043120  001413                          BEQ     5$                 ;BR IF NOT
043122  032764  010000  000010          BIT     #BIT12,RMCS2(R4)         ;'NED' SET ?
043130  001404                          BEQ     4$                 ;BR IF NOT
043132  012762  100002  000016          MOV     #BIT15!BIT01,16(R2)      ;SET 'DRIVE NON-EXISTENT' INDICATOR
043140  000403                          BR      5$                 ;CONTINUE
043142  012762  102000  000016  4$:     MOV     #BIT15!BIT10,16(R2)      ;SET 'NON-CLEARABLE PARITY'' ERROR INDICATOR
043150  012763  177777  040614  5$:     MOV     #-1,TIMER(R3)      ;STOP THE TIMER
043156  105061  040522                  CLRB    DRVACT(R1)         ;SET 'DRIVE ACTIVE'' TO IDLE
043162  105061  040562                  CLRB    DPRQS(R1)          ;CLEAR PORT REQUEST FLAG
043166  020137  040634                  CMP     R1,DTUW            ;IS THIS DRIVE SETUP FOR A TRANSFER
043172  001005                          BNE     6$                 ;BR IF NOT
043174  012737  177777  040634          MOV     #-1,DTUW           ;RESET THE INDICATOR
043202  005037  040572                  CLR     TRNSWT             ;CLEAR THE TRANSFER QUEUE
043206  105061  040600          6$:     CLRB    ULDFLG(R1)         ;CLEAR UNLOAD FLAG
043212  032764  010000  000010          BIT     #BIT12,RMCS2(R4)         ;'NED' SET ?
043220  005201                          INC     R1                 ;MOVE TO THE NEXT DRIVE
043222  062703  000002                  ADD     #2,R3
043226  042701  177770                  BIC     #^C7,R1
043232  001314                          BNE     1$                 ;BR IF MORE DRIVES
043234  012737  177777  040634          MOV     #-1,DTUW           ;NO DATA TRANSFERS UNDERWAY
043242  005037  040572                  CLR     TRNSWT             ;CLEAR THE 'TRANSFER WAIT' QUEUE
043246  004737  046336                  JSR     PC,CLRQUE          ;CLEAR ALL OF THE REQUEST QUEUES
043252  012764  000040  000010          MOV     #CLR,RMCS2(R4)     ;DO A MASSBUS INIT.
043260  000406                          BR      8$                 ;CONTINUE
043262  004737  046414          7$:     JSR     PC,EMPTYQ          ;CLEAR THE DRIVE'S QUEUE
043266  105061  040532                  CLRB    DRVSTA(R1)         ;SET DRIVE TO OFFLINE
043272  105061  040542                  CLRB    DRVTYP(R1)         ;CLEAR THE DRIVE TYPE INDICATOR
043276  004737  045772          8$:     JSR     PC,SET.IE          ;SET ''IE'' WITHOUT ''TRE''
043302  104413                          RESREG                     ;RESTORE R0 - R5
043304  000207                          RTS     PC                 ;RETURN

                                ;INTERRUPT SERVICE ROUTINE
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690
691 043306  112737  000001  040576  ISR:    MOVB    #1,ACTDRV          ;SET ''ACTIVE DRIVER'' FLAG
692 043314  104412                          SAVREG                     ;SAVE R0 - R5
693 043316  013704  040650                  MOV     RMADR,R4           ;ADDRESS OF RMCS1
694 043322  013701  040634                  MOV     DTUW,R1            ;GET 'DATA TRANSFER UNDERWAY'' INDICATOR
695 043326  002402                          BLT     1$                 ;BR IF NO DATA TRANSFER UNDERWAY
696 043330  004737  043350                  JSR     PC,TD              ;CALL TRANSFER DONE
697 043334  004737  043520          1$:     JSR     PC,SC              ;CALL SPECIAL CONDITIONS
698 043340  104413                  2$:     RESREG                     ;RESTORE R0 - R5
699 043342  105037  040576                  CLRB    ACTDRV             ;CLEAR ''ACTIVE DRIVER'' FLAG
700 043346  000002                          RTI                        ;RETURN
701
702                                 ;TRANSFER DONE ROUTINE
703
704 043350  105061  040522          TD:     CLRB    DRVACT(R1)         ;SET DRIVE ACTIVE INDICATOR TO IDLE
705 043354  012737  177777  040634          MOV     #-1,DTUW           ;NO DATA TRANSFERS UNDERWAY
706 043362  006301                          ASL     R1
707 043364  012761  177777  040614          MOV     #-1,TIMER(R1)      ;CANCEL TIMEOUT
708 043372  006201                          ASR     R1
709 043374  013702  040572                  MOV     TRNSWT,R2          ;GET 'DPB'' ADDRESS FROM THE
710 043400  005037  040572                  CLR     TRNSWT             ;TRANSFER WAIT QUEUE--CLEAR QUEUE
711 043404  052762  000200  000016          BIS     #BIT07,16(R2)      ;SET DONE
712 043412  010164  000010                  MOV     R1,RMCS2(R4)       ;SELECT THE DRIVE
713 043416  004037  045302                  JSR     R0,RD.RM           ;TRANSFER ERROR(TRE=1)?
714 043422  000000                          RMCS1
715 043424  042756                          CI7
716 043426  006126                          ROL     (SP)+              ;IS TRE=1 ?
717 043430  100417                          BMI     3$                 ;BR IF YES
718 043432  005737  040610                  TST     SAVEFG             ;SAVE THE RH/RM REGISTERS?
719 043436  100002                          BPL     1$                 ;BR IF NO
720 043440  004737  045654                  JSR     PC,SVRH70          ;YES--SAVE THE REGISTERS
725 043444  004737  046510          1$:     JSR     PC,GETREQ          ;GET DPB POINTER
727 043450  005702                          TST     R2                 ;ENTRY FOR DRIVE ?
728 043452  001403                          BEQ     2$                 ;BR IF NOT
729 043454  004737  041700                  JSR     PC,OPT             ;CALL OPTIMIZER
730 043460  000207                          RTS     PC                 ;RETURN
731 043462  012714  000113          2$:     MOV     #113,(R4)          ;RELEASE THE DRIVE
732 043466  000207                          RTS     PC                 ;RETURN
733
734 043470  052762  100100  000016  3$:     BIS     #BIT15!BIT06,16(R2)     ;SET DATA ERROR FLAG
735 043476  004737  046414                  JSR     PC,EMPTYQ          ;EMPTY THE 'DRIVE'S WAIT'' QUEUE
736 043502  004737  045654                  JSR     PC,SVRH70          ;SAVE THE RH/RM REGISTERS
737 043506  012714  040111                  MOV     #40111,(R4)        ;ISSUE A 'DRIVE CLEAR''
738 043512  012714  000113                  MOV     #113,(R4)          ;ISSUE A RELEASE TO THE DRIVE
739 043516  000207                          RTS     PC                 ;RETURN
740
763                                 ;SPECIAL CONDITION ROUTINE
764
765 043520  116403  000016          SC:     MOVB    RMAS(R4),R3        ;READ 'RMAS''
766 043524  001014                          BNE     2$                 ;BR IF ANY 'ATA' BITS SET
767 043526  004037  045302                  JSR     R0,RD.RM           ;READ CONTROL AND STATUS REGISTER
768 043532  000000                          RMCS1
769 043534  043056                          CI8
770 043536  106126                          ROLB    (SP)+              ;IS ''IE''=1?
771 043540  100405                          BMI     1$                 ;YES, NO DRIVES TO CHECK
772 043542  004037  046600                  JSR     R0,ES.SAV          ;SAVE THE ADDRESS IN '$ESCAPE'
    043546  104001                          EMT     1                  ;REPORT AN ILLEGAL INTERRUPT
```

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043550  004737  045772                  JSR     PC,SET.IE           ;SET INTERRUPT ENABLE
043554  000207                  1$:     RTS     PC                  ;RETURN
043556  005046                  2$:     CLR     -(SP)               ;PROCESS ALL DRIVES THAT HAVE
043560  110316                          MOVB    R3,(SP)             ;AN ''ATA''=1
043562  012703  000001                  MOV     #1,R3
043566  005001                          CLR     R1

043570  030316                  SC3:    BIT     R3,(SP)             ;ATA=1?
043572  001005                          BNE     SC5                 ;YES

043574  005201                  SC4:    INC     R1                  ;MOVE TO THE NEXT DRIVE
043576  106303                          ASLB    R3
043600  001373                          BNE     SC3                 ;BR IF MORE TO CHECK?
043602  005726                          TST     (SP)+               ;CLEAN OFF THE STACK
043604  000207                          RTS     PC                  ;RETURN TO USER

043606  105761  040552          SC5:    TSTB    DPINT(R1)           ;INITIALIZING THE DRIVE ?
043612  001402                          BEQ     1$                  ;BR IF NOT
043614  000137  044532                  JMP     SC13                ;PROCESS THE DRIVE
043620  105761  040562          1$:     TSTB    DPRQS(R1)           ;PORT REQUEST OUTSTANDING ?
043624  001402                          BEQ     2$                  ;BR IF NOT
043626  000137  044532                  JMP     SC13                ;START THE OUTSTANDING COMMAND
043632  105761  040532          2$:     TSTB    DRVSTA(R1)          ;CHECK THE DRIVE STATUS
043636  003023                          BGT     4$                  ;BR IF ONLINE
043640  105761  040600                  TSTB    ULDFLG(R1)          ;UNLOAD IN PROGRESS?
043644  003420                          BLE     4$                  ;BR IF NOT
043646  004737  046510                  JSR     PC,GETREQ           ;GET DPB POINTER
043652  004737  045654                  JSR     PC,SVRH70           ;SAVE THE RH/RM REGISTERS
043656  004737  044462                  JSR     PC,SC12             ;SAVE RMDS, RMER1, RMER2, AND RMMR2
                                                                    ;ALSO DO A DRIVE INIT (DRVINT)
043662  105761  040532                  TSTB    DRVSTA(R1)          ;DID DRIVE COME ONLINE?
043666  003414                          BLE     5$                  ;NO
043670  032737  040000  040512          BIT     #BIT14,RMERRS       ;WAS THERE AN ERROR?
043676  001000                          BNE     3$                  ;BR IF ERROR
043700  013705  040514          3$:     MOV     RMERRS+2,R5         ;YES -- PICKUP RMER1 AND
043704  000504                          BR      SC6A                ;GO PROCESS THE ERROR
043706  105761  040522          4$:     TSTB    DRVACT(R1)          ;DRIVE ACTIVE WITH COMMAND OR ERROR RECOVERY ?
043712  001033                          BNE     SC6                 ;BR IF EITHER
043714  004737  044462                  JSR     PC,SC12             ;SAVE RMDS, RMER1, RMER2, AND RMMR2
                                                                    ;ALSO DO A DRVINT
043720  105761  040552          5$:     TSTB    DPINT(R1)           ;TRYING TO INIT THE DRIVE ?
043724  001323                          BNE     SC4                 ;BR IF YES, CHECK ON MORE DRIVES
043726  105761  040532                  TSTB    DRVSTA(R1)          ;CHECK ON DRIVE'S STATUS
043732  100412                          BMI     6$                  ;BR IF UNSAFE
043734  032737  020000  040516          BIT     #BIT13,RMERRS+4     ;ADDRESS PLUG CHANGED ?
043742  001013                          BNE     7$                  ;BR IF YES
043744  012746  000111                  MOV     #111,-(SP)          ;DRIVE CLEAR
043750  004037  045462                  JSR     R0,WRT.RM           ;WRITE THE COMMAND INTO RMCS1
043754  000000                          RMCS1                       ;REGISTER INDEX
043756  044322                          SC8                         ;PARITY EXIT ADDRESS
043760  011605                  6$:     MOV     (SP),R5             ;PICKUP (RMAS) BEFORE THE ERROR CALL
043762  004037  046600                  JSR     R0,ES.SAV           ;SAVE THE ADDRESS IN '$ESCAPE'
043766  104002                          EMT     2                   ;REPORT THE UNEXPECTED ATTENTION
043770  000701                          BR      SC4                 ;GO CHECK FOR MORE ATA'S
043772                          7$:
043772  004037  046600                  JSR     R0,ES.SAV           ;SAVE THE ADDRESS IN '$ESCAPE'
043776  104005                          EMT     5                   ;REPORT THE ADDRESS PLUG CHANGE
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833 044000  000675                           BR      SC4                ;CHECK FOR MORE DRIVES
834
835 044002  006301                   SC6.    ASL     R1                 ;SETUP TO ADDRESS WORDS
836 044004  012761  177777  040614           MOV     #-1,TIMER(R1)      ;STOP THE TIMER
837 044012  006201                           ASR     R1                 ;RESTORE THE DRIVE ADDRESS
838 044014  004737  046510                   JSR     PC,GETREQ          ;GET THE DPB POINTER FROM THE QUEUE
839 044020  010164  000010                   MOV     R1,RMCS2(R4)       ;SELECT DRIVE
840 044024  000137  044352                   JMP     SC11               ;PROCESS THE SEARCH
841 044030  004037  045302                   JSR     R0,RD.RM           ;READ THE RM'S STATUS REG.
842 044034  000012                           RMDS
843 044036  044322                           SC8
844 044040  011605                           MOV     (SP),R5            ;AND PUT IT IN R5
845 044042  006126                           ROL     (SP)+              ;WAS THERE AN ERROR?
846 044044  100407                           BMI     1$                 ;BR IF ERROR
847 044046  105761  040522                   TSTB    DRVACT(R1)         ;CHECK DRIVE'S STATE
848 044052  003137                           BGT     SC11               ;BR IF DRIVE ACTIVE WITH ORDER
849 044054  052762  100210  000016           BIS     #BIT15!BIT07!BIT03,16(R2)      ;INFORM USER OF ERROR RECOVER COMPLETION
850 044062  000470                           BR      SC7
851 044064  004037  045302           1$:     JSR     R0,RD.RM           ;READ ERROR REGISTER #1
852 044070  000014                           RMER1
853 044072  044322                           SC8
854 044074  012605                           MOV     (SP)+,R5           ;AND SAVE IT IN R5
855 044076  004737  045654                   JSR     PC,SVRH70          ;SAVE RH/RM REGISTERS
856 044102  012746  000111                   MOV     #111,-(SP)         ;ISSUE A DRIVE CLEAR
857 044106  004037  045462                   JSR     R0,WRT.RM
858 044112  000000                           RMCS1
859 044114  044322                           SC8
860
861 044116  006105                   SC6A:   ROL     R5                 ;WAS 'UNSAFE'' CONDITION -1?
862 044120  100406                           BMI     1$                 ;BR IF YES
863 044122  005702                           TST     R2                 ;ANYTHING IN QUEUE ?
864 044124  001447                           BEQ     SC7                ;BR IF NOT
865 044126  052762  100240  000016           BIS     #BIT15!BIT07!BIT05,16(R2)      ;INFORM USER OF ERROR
866 044134  000443                           BR      SC7
867 044136  004037  045302           1$:     JSR     R0,RD.RM           ;READ DRIVE STATUS REG. #1
868 044142  000012                           RMDS
869 044144  044322                           SC8
870 044146  011605                           MOV     (SP),R5            ;SAVE RMDS IN R5
871 044150  006126                           ROL     (SP)+              ;'ERR''=1?
872 044152  100011                           BPL     2$                 ;BR IF NO--UNSAFE CLEARED
873 044154  112761  177777  040532           MOVB    #-1,DRVSTA(R1)     ;DRIVE IS UNSAFE
874 044162  004737  045654                   JSR     PC,SVRH70          ;SAVE RH/RM REGISTERS
875 044166  052762  110000  000016           BIS     #BIT15!BIT12,16(R2)     ;INFORM USER OF UNSAFE ERROR
876 044174  000423                           BR      SC7
877 044176  032705  010000           2$:     BIT     #BIT12,R5          ;'MOL'' = 1 ?
878 044202  001015                           BNE     3$                 ;BR IF YES
879 044204  112761  177777  040522           MOVB    #-1,DRVACT(R1)     ;ACTIVE ERROR RECOVER
880 044212  112761  000001  040532           MOVB    #1,DRVSTA(R1)      ;ONLINE
881 044220  006301                           ASL     R1
882 044222  012761  035230  040614           MOV     #15000.,TIMER(R1)          ;START 15. SECOND TIMER
883 044230  006201                           ASR     R1
884 044232  000137  043574                   JMP     SC4
885 044236  052762  100220  000016   3$:     BIS     #BIT15!BIT07!BIT04,16(R2)      ;INFORM USER OF ERROR
886
887 044244  105061  040522           SC7:    CLRB    DRVACT(R1)         ;DRIVE IS IDLE
891 044250  004737  046532                   JSR     PC,POPQUE          ;REMOVE THE QUEUE
892 044254  105761  040600                   TSTB    ULDFLG(R1)         ;UNLOAD IN PROGRESS OR QUEUE?
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044260  003002                          BGT     1$                      ;BR IF NOT
044262  105061  040600                  CLRB    ULDFLG(R1)              ;CLEAR UNLOAD FLAG
044266  116164  040636  000016  1$:     MOVB    ATABIT(R1),RMAS(R4)     ;CLEAR ATTENTION BIT
044274  105761  040532                  TSTB    DRVSTA(R1)              ;IS THE DRIVE UNSAFE ?
044300  100406                          BMI     2$                      ;BR IF IT IS
044302  012746  000111                  MOV     #111,-(SP)              ;DRIVE CLEAR COMMAND
044306  004037  045462                  JSR     R0,WRT.RM               ;WRITE THE COMMAND INTO RPCS1
044312  000000                          RMCS1                           ;REGISTER INDEX
044314  044322                          SC8                             ;PARITY EXIT ADDRESS
044316  000137  043574          2$:     JMP     SC4                     ;CHECK FOR MORE DRIVES

044322  105761  040522          SC8:    TSTB    DRVACT(R1)              ;IS DRIVE IDLE?
044326  001405                          BEQ     1$                      ;YES
044330  004737  046510                  JSR     PC,GETREQ               ;GET DPB POINTER
044334  004737  042756                  JSR     PC,CI7                  ;PROCESS THE PARITY ERROR
044340  000402                          BR      2$                      ;CONTINUE
044342                          1$:
044342  004737  043000                  JSR     PC,CI7B                 ;PROCESS THE UNCORRECTABLE PARITY ERROR
044346  000137  043574          2$:     JMP     SC4                     ;CHECK MORE DRIVES

044352  105761  040600          SC11:   TSTB    ULDFLG(R1)              ;'UNLOAD IN PROGRESS"?
044356  003402                          BLE     1$                      ;BR IF NO
044360  105061  040600                  CLRB    ULDFLG(R1)              ;CLEAR UNLOAD FLAG
044364  105061  040522          1$:     CLRB    DRVACT(R1)              ;SET DRIVE IDLE
044370  136137  040636  040574          BITB    ATABIT(R1),SRCHWT               ;DOING A SEARCH OPERATION FOR
                                                                                ;AN I/O COMMAND?
044376  001012                          BNE     2$                      ;BR IF YES
044400  004737  046532                  JSR     PC,POPQUE               ;REMOVE REQUEST FROM QUEUE
044404  052762  000200  000016          BIS     #BIT07,16(R2)           ;SET 'DONE" BIT
044412  005737  040610                  TST     SAVEFG                  ;SAVE THE REGISTERS?
044416  100002                          BPL     2$                      ;BR IF NO
044420  004737  045654                  JSR     PC,SVRH70               ;YES--SAVE ALL OF THE RH/RM REG'S
044424  116164  040636  000016  2$:     MOVB    ATABIT(R1),RMAS(R4)             ;CLEAR ATTENTION BIT
044432  146137  040636  040574          BICB    ATABIT(R1),SRCHWT               ;CLEAR IMPLIED SEEK SET
044440  006301                          ASL     R1                      ;WORD INDEX
044442  012761  177777  040614          MOV     #-1,TIMER(R1)           ;STOP CLOCK
044450  006201                          ASR     R1                      ;RESTORE R1
044452  004737  046700                  JSR     PC,OPT                  ;START A REQUEST
044456  000137  043574                  JMP     SC4                     ;CHECK FOR MORE DRIVES

044462  010164  000010          SC12:   MOV     R1,RMCS2(R4)            ;SELECT DRIVE
044466  016437  000012  040512          MOV     RMDS(R4),RMERRS ;SAVE THE FOUR REGISTERS THAT
044474  016437  000014  040514          MOV     RMER1(R4),RMERRS+2              ;WILL TELL US SOMETHING
044502  016437  000042  040516          MOV     RMER2(R4),RMERRS+4
044510  016437  000040  040520          MOV     RMMR2(R4),RMERRS+6
044516  004037  041072                  JSR     R0,DRVINT               ;INIT. THE STATE OF THE DRIVE
044522  000401                          BR      1$                      ;TAKE ERROR EXIT
044524  000207                          RTS     PC                      ;RETURN
044526  005726                  1$:     TST     (SP)+                   ;POP PC OFF OF THE STACK
044530  000674                          BR      SC8                     ;PROCESS THE PARITY ERROR

044532  006301                  SC13:   ASL     R1                      ;SETUP TO ADDRESS WORDS
044534  012761  177777  040614          MOV     #-1,TIMER(R1)           ;STOP THE TIMER
044542  006201                          ASR     R1                      ;
044544  010164  000010                  MOV     R1,RMCS2(R4)            ;SELECT THE DRIVE
044550  116164  040636  000016          MOVB    ATABIT(R1),RMAS(R4)             ;CLEAR THE ATTENTION BIT
044556  105761  040552          1$:     TSTB    DPINT(R1)               ;INITIALIZING THE DRIVE ?
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044562  001424                             BEQ     2$                 ;BR IF NOT
044564  105061  040552                     CLRB    DPINT(R1)          ;CLEAR THE INIT INDICATOR
044570  004037  041072                     JSR     R0,DRVINT          ;GO INIT THE DRIVE
044574  000240                             NOP                        ;DUMMY PARITY ERROR RETURN
044576  105761  040532                     TSTB    DRVSTA(R1)         ;DRIVE ONLINE ?
044602  003014                             BGT     2$                 ;BR IF YES -- START ORDER
044604  005702                             TST     R2                 ;QUEUE ENTRY FOR THE DRIVE
044606  001426                             BEQ     3$                 ;BR IF NOT
044610  004737  046510                     JSR     PC,GETREQ          ;GET DPB ADDRESS
044614  052762  140000  000016             BIS     #BIT15.BIT14,16(R2)     ;INFORM USER THAT DRIVE OFFLINE
044622  004737  045654                     JSR     PC,SVRH70          ;SAVE THE REGISTERS
044626  004737  046532                     JSR     PC,POPQUE          ;REMOVE THE QUEUE
044632  000414                             BR      3$
044634  032764  004000  000000  2$:        BIT     #BIT11,RMCS1(R4)        ;DVA SET ?
044642  001006                             BNE     4$                 ;SET THEN CALL OPT
044644  006301                             ASL     R1
044646  012761  035230  040614             MOV     #15000.,TIMER(R1)       ;START 15. SECOND TIMER
044654  006201                             ASR     R1
044656  000402                             BR      3$
044660  004737  041700          4$:        JSR     PC,OPT             ;START THE PENDING REQUEST
044664  000137  043574          3$:        JMP     SC4                ;PROCESS OTHER DRIVES

                                ;RM TIMER ROUTINE
                                ;CALL
                                ;          MOV     #TIME,-(SP)        ;ELASPED TIME IN MILLISECONDS ON THE STACK
                                ;          JSR     PC,RMTMR           ;CALL RM05 TIME ROUTINE

044670  005737  040576          RMTMR:     TST     ACTDRV             ;CHECK ''ACTDRV & ACTSTR''
044674  001027                             BNE     4$                 ;IF NON ZERO EXIT
044676  112737  000001  040577             MOVB    #1,ACTSTR          ;SET ''ACTSTR''
044704  104412                             SAVREG                     ;SAVE R0 - R5
044706  005001                             CLR     R1                 ;START WITH DRIVE 0
044710  005003                             CLR     R3
044712  005763  040614          1$:        TST     TIMER(R3)          ;IS THE TIMER RUNNING?
044716  002406                             BLT     2$                 ;BR IF NO
044720  166663  000002  040614             SUB     2(SP),TIMER(R3)    ;COUNT THE INTERVAL
044726  003002                             BGT     2$                 ;BR IF NO SOFTWARE TIMEOUT
044730  004737  044760                     JSR     PC,STO             ;CALL SOFTWARE TIMEOUT ROUTINE
044734  005201                  2$:        INC     R1                 ;MOVE TO NEXT DRIVE
044736  005723                             TST     (R3)+
044740  022701  000010                     CMP     #8.,R1             ;OUT OF DRIVES?
044744  003362                             BGT     1$                 ;BR IF NO
044746  104413                  3$:        RESREG                     ;RESTORE R0 - R5
044750  105037  040577                     CLRB    ACTSTR             ;ZERO ACTIVE SOFTWARE TIMEOUT ROUTINE FLAG
044754  012616                  4$:        MOV     (SP)+,(SP)         ;ADJUST THE STACK
044756  000207                             RTS     PC                 ;RETURN

                                ;SOFTWARE TIMEOUT ROUTINE
                                ;
                                ;NOTE: THIS ROUTINE MUST BE ENTERED AT PRIORITY 6
                                ;          OR GREATER
                                ;
                                ;CALL:     STO
                                ;          MOV     #DRVNUM,R1         ;DRIVE NUMBER
                                ;          JSR     PC,STO             ;CALL
                                ;          RETURN

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044760  010146                    ST0:    MOV     R1,-(SP)        ;SAVE R1
044762  010246                            MOV     R2,-(SP)        ;SAVE R2
044764  010346                            MOV     R3,-(SP)        ;SAVE R3
044766  010446                            MOV     R4,-(SP)        ;SAVE R4
044770  013704  040650                    MOV     RMADR,R4        ;GET ADDRESS OF 'RMCS1''
044774  010164  000010                    MOV     R1,RMCS2(R4)    ;SELECT THE DRIVE
045000  004037  045302                    JSR     R0,RD.RM        ;READ 'DRIVE STATUS REG''
045004  000012                            RMDS
045006  045270                            ST09
045010  105726                            TSTB    (SP)+           ;IS 'DRY''=1?
045012  100436                            BMI     ST02            ;BR IF YES
045014  105761  040552            ST01:   TSTB    DPINT(R1)       ;TRYING TO INTIALIZE THE DRIVE ?
045020  001033                            BNE     ST02            ;BR IF YES
045022  105761  040562                    TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
045026  001030                            BNE     ST02            ;BR IF YES
045030  013702  040572                    MOV     TRNSWT,R2       ;PICKUP TRANSFER WAIT QUEUE
045034  020137  040634                    CMP     R1,DTUW         ;TRANSFER UNDERWAY ON THIS DRIVE?
045040  001404                            BEQ     1$              ;BR IF YES
045042  000137  045270                    JMP     ST09            ;IF NOT DON'T BOTHER DRIVES
045046  004737  046510                    JSR     PC,GETREQ       ;GET DPB ADDRESS
045052  052762  101000  000016    1$:     BIS     #BIT15!BIT09,16(R2)     ;SET THE ERROR FLAGS
045060  004737  045654                    JSR     PC,SVRH70       ;SAVE RH/RM REGISTERS
045064  105061  040522                    CLRB    DRVACT(R1)      ;DRIVE IS IDLE
045070  105061  040600                    CLRB    ULDFLG(R1)      ;CLEAR THE UNLOAD FLAG
045074  005037  040572                    CLR     TRNSWT          ;CLEAR DPB ADDRESS
045100  012737  177777  040634            MOV     #-1,DTUW        ;CLEAR THE TRANSFER DRIVE #
045106  000470                            BR      ST09            ;DON'T BOTHER OTHER DRIVES

045110  116405  000016            ST02:   MOVB    RMAS(R4),R5     ;READ ATTENTION REG
045114  136105  040636                    BITB    ATABIT(R1),R5   ;IS ATTENTION FOR THIS DRIVE UP ?
045120  001007                            BNE     ST03            ;YES
045122  105761  040552                    TSTB    DPINT(R1)       ;TRYING TO INTIALIZE THE DRIVE ?
045126  001021                            BNE     ST06            ;BR IF YES - DRIVE NOT ONLINE
045130  105761  040562                    TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
045134  001035                            BNE     ST07            ;BR IF YES - NO RESPONSE TO REQUEST
045136  000454                            BR      ST09            ;OTHER WISE EXIT

045140  105761  040552            ST03:   TSTB    DPINT(R1)       ;INITIALIZING THE DRIVE ?
045144  001003                            BNE     1$              ;BR IF INIT PENDING
045146  105761  040562                    TSTB    DPRQS(R1)       ;PORT REQUEST PENDING ?
045152  001446                            BEQ     ST09            ;BR IF NOT
045154  012763  177777  040614    1$:     MOV     #-1,TIMER(R3)   ;STOP THE TIMER
045162  000442                            BR      ST09            ;EXIT

045164  004737  043056            ST05:   JSR     PC,CI8          ;GO HANDLE THE PARITY ERROR
045170  000437                            BR      ST09

045172  105061  040552            ST06:   CLRB    DPINT(R1)       ;CLEAR THE INITIALIZE INDICATOR
045176  105061  040532                    CLRB    DRVSTA(R1)      ;SET UNIT OFFLINE
045202  012763  177777  040614            MOV     #-1,TIMER(R3)   ;STOP THE TIMER
045210  004737  046510                    JSR     PC,GETREQ       ;GET THE DPB ADDRESS
045214  005702                            TST     R2              ;REQUEST IN QUEUE ?
045216  001424                            BEQ     ST09            ;BR IF NOT
045220  052762  140000  000016            BIS     #BIT15.BIT14,16(R2)     ;INFORM THE USER DRIVE NOT AVAILABLE
045226  000414                            BR      ST08            ;FINISH

045230  012763  177777  040614    ST07:   MOV     #-1,TIMER(R3)   ;STOP THE TIMER
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045236  105061  040562                   CLRB    DPRQS(R1)          ;CLEAR PORT REQUEST INDICATOR
045242  004737  046510                   JSR     PC,GETREQ          ;GET DPB ADDRESS
045246  005702                           TST     R2                 ;QUEUE ENTRY FOR DRIVE ?
045250  001407                           BEQ     ST09               ;BR IF NONE
045252  012762  100004  000016           MOV     #BIT15!BIT2,16(R2)     ;INFORM USER OF PORT REQUEST ERROR
045260  004737  046414          ST08:    JSR     PC,EMPTYQ          ;CLEAR THE QUEUE FOR THE DRIVE
045264  004737  045654                   JSR     PC,SVRH70          ;SAVE THE REGISTERS
045270  012604                  ST09:    MOV     (SP)+,R4           ;RESTORE R4
045272  012603                           MOV     (SP)+,R3           ;RESTORE R3
045274  012602                           MOV     (SP)+,R2           ;RESTORE R2
045276  012601                           MOV     (SP)+,R1           ;RESTORE R1
045300  000207                           RTS     PC                 ;RETURN

                                ;ROUTINE TO READ A RH/RM REGISTER
                                ;
                                ;CALL
                                ;        JSR     R0,RD.RM           ;GO READ A REGISTER
                                ;        INDEX                      ;REG. INDEX FROM BASE
                                ;        ERRADR                     ;ERROR ADDRESS--PROCESS ERROR STARTING
                                ;                                   ;AT THIS ADDRESS
                                ;        RETURN                     ;CONTENTS OF REG. IS ON THE STACK
                                ;
045302  013737  040646  045450  RD.RM:   MOV     MCPEMX,RD.RM2      ;MAX. RETRYS ALLOWED
045310  011646                           MOV     (SP),-(SP)         ;SAVE R0 FOR RETURN
045312  013737  040650  045326           MOV     RMADR,RD.ADR       ;FORM THE DESIRED ADDRESS
045320  062037  045326                   ADD     (R0)+,RD.ADR       ;USING THE BASE AND THE INDEX
045324  013727                  RD.RM1:  MOV     @(PC)+,(PC)+       ;READ THE DESIRED REGISTER OF THE RM DRIVE
045326  000000                  RD.ADR:  .WORD   0                  ;ADDRESS IS FORMED HERE
045330  000000                  RD.WRD:  .WORD   0                  ;REG. CONTENTS PUT HERE
045332  013766  045330  000002           MOV     RD.WRD,2(SP)       ;RETURN IT TO THE USER
045340  013746  040650                   MOV     RMADR,-(SP)        ;PUT THE ADDRESS ON THE STACK
045344  062716  000010                   ADD     #RMCS2,(SP)        ;FORM THE ADDRESS OF RMCS2
045350  032736  010000                   BIT     #BIT12,@(SP)+      ;CHECK THE 'NED' BIT
045354  001037                           BNE     RD.RM3             ;BR IF DRIVE NON-EXISTENT
045356  017746  173266                   MOV     @RMADR,-(SP)       ;READ RMCS1
045362  032716  020000                   BIT     #BIT13,(SP)        ;DID MCPE SET?
045366  001002                           BNE     1$                 ;BR IF YES
045370  022620                           CMP     (SP)+,(R0)+        ;ADJUST FOR RETURN
045372  000432                           BR      RD.RM4             ;EXIT
045374                          1$:
045374  004037  046600                   JSR     R0,ES.SAV          ;SAVE THE ADDRESS IN '$ESCAPE'
045400  104003                           EMT     3                  ;REPORT 'MCPE'' ERROR
045402  005737  040634                   TST     DTUW               ;DATA TRANSFER UNDERWAY?
045406  100405                           BMI     2$                 ;NO
045410  032716  040000                   BIT     #BIT14,(SP)        ;''TRE'' = 1 ?
045414  001402                           BEQ     2$                 ;NO
045416  005726                           TST     (SP)+              ;YES--CLEAN OFF THE STACK AND
045420  000415                           BR      RD.RM3             ;TAKE THE FATAL ERROR EXIT
045422  052716  040000          2$:      BIS     #BIT14,(SP)        ;CLEAR 'MCPE'' BY SENDING A ''1'' TO ''TRE''
045426  000316                           SWAB    (SP)               ;POSITION BEFORE WRITING
045430  013737  040650  045444           MOV     RMADR,3$           ;FORM ADDRESS OF HIGH BYTE
045436  005237  045444                   INC     3$
045442  112637                           MOVB    (SP)+,@(PC)+       ;WRITE THE HIGH BYTE OF RMCS1
045444  000000                  3$:      .WORD   0                  ;ADDRESS STORAGE
045446  005327                           DEC     (PC)+              ;EXCEEDED MAX. RETRYS
045450  000003                  PD.RM2:  .WORD   3
045452  002324                           BGE     RD.RM1             ;BR IF NO
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1134 045454  011000                    RD.RM3: MOV     (R0),R0          ;FATAL ERROR EXIT
1135 045456  012616                            MOV     (SP)+,(SP)
1136 045460  000200                    RD.RM4: RTS     R0
1137
1138                                           ;ROUTINE TO WRITE A REGISTER
1139                                           ;
1140                                           ;CALL
1141                                           ;       MOV     DATA,-(SP)       ;DATA TO BE LOADED ON THE STACK
1142                                           ;       JSR     R0,WRT.RM        ;CALL THE ROUTINE TO LOAD(WRITE) THE REG.
1143                                           ;       INDEX                    ;INDEX OF THE REGISTER TO BE LOADED
1144                                           ;       ERRADR                   ;ADDRESS TO RETURN TO ON AN ERROR
1145                                           ;       RETURN                   ;ERROR FREE RETURN
1146
1147 045462  013737  040646  045640    WRT.RM: MOV     MCPEMX,WRT.R2    ;MAX RETRYS ALLOWED
1148 045470  016637  000002  045550            MOV     2(SP),WRT.WD     ;SAVE THE WORD TO WRITE
1149 045476  012616                            MOV     (SP)+,(SP)       ;ADJUST THE STACK
1150 045500  012037  045552                    MOV     (R0)+,WRT.AD     ;GET INDEX OF REGISTER TO BE WRITTEN
1151 045504  001015                            BNE     1$               ;BR IF NOT RMCS1
1152 045506  122737  000150  045550            CMPB    #150,WRT.WD      ;IS THE COMMAND FOR DATA TRANSFERS?
1153 045514  002411                            BLT     1$               ;YES--DON'T GET THE OLD A16 & A17, & PSEL
1154 045516  004037  045302                    JSR     R0,RD.RM         ;NO---COMBINE A16&A17, & PSEL WITH
1155 045522  000000                            RMCS1                    ;THE COMMAND BEFORE SENDING IT TO
1156 045524  045644                            WRT.R3                   ;THE RH/RM
1157 045526  000316                            SWAB    (SP)
1158 045530  042716  177770                    BIC     #^C7,(SP)
1159 045534  112637  045551                    MOVB    (SP)+,WRT.WD+1
1160 045540  063737  040650  045552    1$:     ADD     RMADR,WRT.AD     ;FORM THE ADDRESS OF THE DISK REG.
1161 045546  012737                    WRT.R1: MOV     (PC)+,@(PC)+     ;LOAD THE DESIRED REG.
1162 045550  000000                    WRT.WD: .WORD   0                ;WORD TO WRITE GOES HERE
1163 045552  000000                    WRT.AD: .WORD   0                ;ADDRESS IS FORMED HERE
1164 045554  013746  040650                    MOV     RMADR,-(SP)      ;PUT THE ADDRESS ON THE STACK
1165 045560  062716  000010                    ADD     #RMCS2,(SP)      ;FORM THE ADDRESS OF RMCS2
1166 045564  032736  010000                    BIT     #BIT12,@(SP)+    ;CHECK THE 'NED' BIT
1167 045570  001025                            BNE     WRT.R3           ;BR IF DRIVE NON-EXISTENT
1168 045572  004037  045302                    JSR     R0,RD.RM         ;CHECK FOR PARITY ERROR ON WRITE
1169 045576  000014                            RMER1
1170 045600  045644                            WRT.R3
1171 045602  032726  000010                    BIT     #BIT03,(SP)+
1172 045606  001420                            BEQ     WRT.R4           ;BR IF 'PAR=0''
1173 045610  016037  177776  045622            MOV     -2(R0),1$        ;PICKUP THE INDEX
1174 045616  004037  045302                    JSR     R0,RD.RM         ;READ THE REG.
1175 045622  000000                    1$:     .WORD   0                ;REG. INDEX
1176 045624  045644                            WRT.R3                   ;RETURN TO THIS ADDRESS ON ERROR
1177 045626  004037  046600                    JSR     R0,ES.SAV        ;SAVE THE ADDRESS IN '$ESCAPE'
     045632  104004                            EMT     4                ;REPORT THE PARITY ON WRITE ERROR
1178 045634  005726                            TST     (SP)+            ;CLEAR OFF THE STACK
1179 045636  005327                            DEC     (PC)+            ;DECREMENT THE ERROR COUNT
1180 045640  000003                    WRT.R2: .WORD   3                ;RETRY COUNTER
1181 045642  002341                            BGE     WRT.R1           ;TRY AGAIN IF NOT FINISHED
1182 045644  011000                    WRT.R3: MOV     (R0),R0          ;TAKE THE 'PARITY ON WRITE'' ERROR EXIT
1183 045646  000401                            BR      WRT.R5           ;EXIT
1184 045650  005720                    WRT.R4: TST     (R0)+            ;ADJUST FOR ERROR FREE EXIT
1185 045652  000200                    WRT.R5: RTS     R0
1186
1187                                           ;ROUTINE TO SAVE THE RH/RM REGISTERS AS PER DPB+14
1188                                           ;
1189                                           ;CALL
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1190                                        ;       MOV     #DPBNUM,R2      ;DPB POINTER TO R2
1191                                        ;       JSR     PC,SVRH70       ;SAVE THE DRIVES REG'S
1192
1193 045654  104412                         SVRH70: SAVREG                  ;SAVE R0 - R5
1194 045656  005702                                 TST     R2              ;QUEUE ENTRY FOR THE DRIVE ?
1195 045660  001442                                 BEQ     6$              ;BR IF NONE
1196 045662  013704  040650                         MOV     RMADR,R4
1197 045666  111264  000010                         MOVB    (R2),RMCS2(R4)  ;SELECT DRIVE
1198 045672  016203  000014                         MOV     14(R2),R3       ;GET THE ERROR TABLE POINTER
1199 045676  001433                                 BEQ     6$              ;EXIT IF NO ADDRESS
1200 045700  005037  045734                         CLR     3$              ;COUNTER & POINTER
1201 045704  023727  045734  000022         1$:     CMP     3$,#RMDB        ;REACHED THE BUFFER REGISTER ?
1202 045712  001006                                 BNE     2$              ;BR IF NOT
1203 045714  032764  000200  000010                 BIT     #BIT07,RMCS2(R4)        ;'OR' SET ?
1204 045722  001002                                 BNE     2$              ;BR IF SET
1205 045724  005023                                 CLR     (R3)+           ;STORE RMDB AS ZEROES
1206 045726  000405                                 BR      4$              ;CONTINUE
1207 045730  004037  045302                 2$:     JSR     R0,RD.RM        ;READ THE SELECTED REGISTER
1208 045734  000000                         3$:     .WORD   0               ;REGISTER INDEX
1209 045736  045762                                 5$                      ;ERROR RETURN ADDRESS
1210 045740  012623                                 MOV     (SP)+,(R3)+     ;STORE THE REGISTER CONTENTS
1211 045742  023727  045734  000046         4$:     CMP     3$,#RMEC2       ;REACHED THE END ?
1212 045750  001406                                 BEQ     6$              ;BR IF YES
1213 045752  062737  000002  045734                 ADD     #2,3$           ;INCREMENT THE REGISTER INDEX
1214 045760  000751                                 BR      1$              ;CONTINUE READING THE REGISTERS
1215 045762  004737  042756                 5$:     JSR     PC,CI7          ;PROCESS THE UNCORRECTABLE PARITY ERROR
1226 045766  104413                         6$:     RESREG                  ;RESTORE R0 - R5
1228 045770  000207                                 RTS     PC              ;RETURN
1229
1230                                        ;ROUTINE TO SET THE INTERRUPT WITHOUT GETTING A "TRE"
1231                                        ;CALL
1232                                        ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
1233                                        ;       JSR     PC,SET.IE       ;SET "IE"
1234                                        ;       RETURN
1235
1236 045772  010446                         SET.IE: MOV     R4,-(SP)        ;SAVE R4
1237 045774  013704  040650                         MOV     RMADR,R4        ;PICKUP ADDRESS OF RMCS1
1238 046000  010164  000010                         MOV     R1,RMCS2(R4)    ;SELECT DRIVE
1239 046004  011446                                 MOV     (R4),-(SP)      ;READ RMCS1
1240 046006  052716  040000                         BIS     #BIT14,(SP)     ;SET THE "TRE" BIT OF THE WORD READ
1241 046012  000316                                 SWAB    (SP)            ;ADJUST FOR DATO
1242 046014  112714  000100                         MOVB    #BIT06,(R4)     ;SET "IE"
1243 046020  032764  010000  000010                 BIT     #BIT12,RMCS2(R4)        ;IS 'NED'=1?
1244 046026  001002                                 BNE     1$              ;YES--CLEAR "TRE"
1245 046030  005726                                 TST     (SP)+           ;CLEAN OFF THE STACK
1246 046032  000402                                 BR      2$
1247 046034  112664  000001                 1$:     MOVB    (SP)+,1(R4)     ;CLEAR "TRE"
1248 046040  012604                         2$:     MOV     (SP)+,R4        ;RESTORE R4
1249 046042  000207                                 RTS     PC              ;RETURN TO CALLER
1250
1251                                        ;QUEUE COUNT
1252
1253 046044     000                         QCNT:   .BYTE   0               ;DRIVE 0
1256 046045     000                                 .BYTE   0               ;DRIVE 1
     046046     000                                 .BYTE   0               ;DRIVE 2
     046047     000                                 .BYTE   0               ;DRIVE 3
     046050     000                                 .BYTE   0               ;DRIVE 4
```

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 046051      000                                       .BYTE   0                 ;DRIVE 5
 046052      000                                       .BYTE   0                 ;DRIVE 6
 046053      000                                       .BYTE   0                 ;DRIVE 7

                                              ;QUEUE INPUT POINTERS

046054   046136                               QINPT:   .WORD   QDRV0             ;DRIVE 0
046056   046156                                        .WORD   QDRV1             ;DRIVE 1
046060   046176                                        .WORD   QDRV2             ;DRIVE 2
046062   046216                                        .WORD   QDRV3             ;DRIVE 3
046064   046236                                        .WORD   QDRV4             ;DRIVE 4
046066   046256                                        .WORD   QDRV5             ;DRIVE 5
046070   046276                                        .WORD   QDRV6             ;DRIVE 6
046072   046316                                        .WORD   QDRV7             ;DRIVE 7

                                              ;QUEUE OUTPUT POINTERS

046074   046136                               QOUTPT:  .WORD   QDRV0             ;DRIVE 0
046076   046156                                        .WORD   QDRV1             ;DRIVE 1
046100   046176                                        .WORD   QDRV2             ;DRIVE 2
046102   046216                                        .WORD   QDRV3             ;DRIVE 3
046104   046236                                        .WORD   QDRV4             ;DRIVE 4
046106   046256                                        .WORD   QDRV5             ;DRIVE 5
046110   046276                                        .WORD   QDRV6             ;DRIVE 6
046112   046316                                        .WORD   QDRV7             ;DRIVE 7

046114   046136                               QSTART:  .WORD   QDRV0             ;DRIVE 0 START ADDRESS
046116   046156                               QSTOP:   .WORD   QDRV1             ;DRIVE 0 STOP ADDRESS & DRIVE 1 START ADDRESS
046120   046176                                        .WORD   QDRV2             ;STOP DRIVE 1--START DRIVE 2
046122   046216                                        .WORD   QDRV3             ;STOP DRIVE 2--START DRIVE 3
046124   046236                                        .WORD   QDRV4             ;STOP DRIVE 3--START DRIVE 4
046126   046256                                        .WORD   QDRV5             ;STOP DRIVE 4--START DRIVE 5
046130   046276                                        .WORD   QDRV6             ;STOP DRIVE 5--START DRIVE 6
046132   046316                                        .WORD   QDRV7             ;STOP DRIVE 6--START DRIVE 7
046134   046336                                        .WORD   QTERM             ;STOP DRIVE 7

                                              ;DRIVE REQUEST QUEUES

046136                                        QDRV0:   .BLKW   10
046156                                        QDRV1:   .BLKW   10
046176                                        QDRV2:   .BLKW   10
046216                                        QDRV3:   .BLKW   10
046236                                        QDRV4:   .BLKW   10
046256                                        QDRV5:   .BLKW   10
046276                                        QDRV6:   .BLKW   10
046316                                        QDRV7:   .BLKW   10
         046336                               QTERM=.

                                              ;ROUTINE TO CLEAR ALL OF THE REQUEST QUEUES
                                              ;
                                              ;CALL
                                              ;        JSR     PC,CLRQUE

046336   104412                               CLRQUE:  SAVREG                    ;SAVE R0 - R5
046340   012702   046044                               MOV     #QCNT,R2          ;ZERO THE QUEUE COUNTS
046344   005022                                        CLR     (R2)+             ;DRIVES 0 & 1
046346   005022                                        CLR     (R2)+             ;DRIVES 2 & 3
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046350  005022                                  CLR     (R2)+                   ;DRIVES 4 & 5
046352  005022                                  CLR     (R2)+                   ;DRIVES 6 & 7
046354  012703  000010                          MOV     #8.,R3                  ;MOVE THE STARTING
046360  012701  046114                          MOV     #QSTART,R1              ;ADDRESS OF THE QUEUE INTO
046364  012122                          1$:     MOV     (R1)+,(R2)+             ;THE QUEUE INPUT POINTER
046366  005303                                  DEC     R3
046370  001375                                  BNE     1$
046372  012703  000010                          MOV     #8.,R3                  ;MOVE THE STARTING ADDRESS
046376  012701  046114                          MOV     #QSTART,R1              ;OF THE QUEUE INTO THE
046402  012122                          2$:     MOV     (R1)+,(R2)+             ;QUEUE OUTPUT POINTER
046404  005303                                  DEC     R3
046406  001375                                  BNE     2$
046410  104413                                  RESREG                          ;RESTORE R0 - R5
046412  000207                                  RTS     PC

                                        ;EMPTY THE QUEUE SPECIFIED BY R1
                                        ;
                                        ;CALL
                                        ;       MOV     DRVNUM,R1               ;DRIVE NUMBER TO R1
                                        ;       JSR     PC,EMPTYQ

046414  105061  046044                  EMPTYQ: CLRB    QCNT(R1)                ;CLEAR NUMBER OF ITEMS IN QUEUE
046420  006301                                  ASL     R1
046422  016161  046054  046074                  MOV     QINPT(R1),QOUTPT(R1)        ;SET OUTPUT QUEUE POINTER-INPUT POINTER
046430  006201                                  ASR     R1
046432  000207                                  RTS     PC

                                        ;ROUTINE TO PUT A REQUEST IN QUEUE
                                        ;
                                        ;CALL
                                        ;       MOV     #DRVNUM,R1              ;DRIVE NUMBER
                                        ;       MOV     #DPB,R2                 ;ADDRESS OF PARAMETER BLOCK
                                        ;       JSR     R0,DRVQUE               ;GO PUT REQUEST IN QUEUE
                                        ;       RETURN1                         ;RETURN HERE IF QUEUE IS FULL
                                        ;       RETURN2                         ;RETURN HERE IF REQUEST IS IN QUEUE

046434  122761  000010  046044          DRVQUE: CMPB    #10,QCNT(R1)            ;IS QUEUE FULL?
046442  001421                                  BEQ     2$                      ;BR IF YES-TAKE RETURN1
046444  105261  046044                          INCB    QCNT(R1)                ;INCREMENT QUEUE COUNT
046450  006301                                  ASL     R1
046452  010271  046054                          MOV     R2,@QINPT(R1)           ;PUT THIS REQUEST IN QUEUE
046456  062761  000002  046054                  ADD     #2,QINPT(R1)            ;UPDATE THE QUEUE POINTER
046464  026161  046054  046116                  CMP     QINPT(R1),QSTOP(R1)         ;TIME TO RESET THE POINTER
046472  001003                                  BNE     1$                      ;BR IF NO
046474  016161  046114  046054                  MOV     QSTART(R1),QINPT(R1)        ;YES--RESET POINTER
046502  006201                          1$:     ASR     R1
046504  005720                                  TST     (R0)+                   ;TAKE RETURN 2
046506  000200                          2$:     RTS     R0                      ;RETURN TO USER

                                        ;ROUTINE TO GET THE 'DPB'' ADDRESS OF NEXT REQUEST IN QUEUE
                                        ;
                                        ;CALL
                                        ;       MOV     #DRVNUM,R1              ;DRIVE NUMBER TO R1
                                        ;       JSR     PC,GETREQ               ;GO GET THE REQUEST
                                        ;       RETURN                          ;R2='DPB'' ADDRESS OF THE REQUEST
                                        ;                                       ;R2=0 IF NO REQUEST IN QUEUE

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046510  005002                          GETREQ: CLR     R2
046512  105761  046044                          TSTB    QCNT(R1)                ;IS THERE ANY REQUEST IN QUEUE?
046516  001404                                  BEQ     2$                      ;NO
046520  006301                          1$:     ASL     R1
046522  017102  046074                          MOV     @QOUTPT(R1),R2          ;PICKUP 'DPB'' POINTER FOR THIS DRIVE
046526  006201                                  ASR     R1
046530  000207                          2$:     RTS     PC                      ;RETURN TO USER

                                        ;ROUTINE TO 'POP'' THE REQUEST FROM QUEUE
                                        ;
                                        ;CALL
                                        ;       MOV     #DRVNUM,R1              ;DRIVE NUMBER TO R1
                                        ;       JSR     PC,POPQUE               ;CALL TO REMOVE REQUEST
                                        ;       RETURN                          ;R2=ADDRESS OF DPB REMOVED

046532  105361  046044                  POPQUE: DECB    QCNT(R1)                ;DECREMENT QUEUE COUNT
046536  006301                                  ASL     R1
046540  017102  046074                          MOV     @QOUTPT(R1),R2          ;GET THE 'DPB'' POINTER
046544  005071  046074                          CLR     @QOUTPT(R1)             ;REMOVE DPB ADDRESS FROM THE QUEUE
046550  062761  000002  046074                  ADD     #2,QOUTPT(R1)           ;UPDATE THE QUEUE POINTER
046556  026161  046074  046116                  CMP     QOUTPT(R1),QSTOP(R1)      ;TIME TO RESET THE POINTER?
046564  001003                                  BNE     1$                      ;NO--BR TO EXIT
046566  016161  046114  046074                  MOV     QSTART(R1),QOUTPT(R1)     ;YES--RESET THE POINTEP
046574  006201                          1$:     ASR     R1
046576  000207                                  RTS     PC                      ;RETURN TO USER

                                        ;ROUTINE TO SAVE THE CONTENTS OF '$ESCAPE' WHEN THE DRIVER
                                        ;REPORTS AN ERROR DIRECTLY.
                                        ;
                                        ;CALL
                                        ;       JSR     R0.ES.SAV
                                        ;       ERROR   N                       ;;THE ERROR CALL
                                        ;       RETURN                          ;THE RETURN IS PAST THE ERROR CALL

046600  012037  046614                  ES.SAV: MOV     (R0)+,1$                ;GET THE ERROR CALL
046604  013746  001222                          MOV     $ESCAPE,-(SP,           ;SAVE THE ADDRESS IN '$ESCAPE'
046610  005037  001222                          CLR     $ESCAPE                 ;CLEAR THE ESCAPE RETURN
046614  000000                          1$:     .WORD   0                       ;THE ERROR CALL IS MOVED HERE
046616  012637  001222                          MOV     (SP)+,$ESCAPE           ;RESTORE THE ESCAPE ADDRESS
046622  000200                                  RTS     R0                      ;RETURN
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                                    .SBTTL  GETADR - GET BUS ADDRESS AND VECTOR ADDRESS

                                    ;THIS ROUTINE IS USED TO ENSURE THE BUS ADDRESS
                                    ;OF THE RH/RM IS SETUP TO READ THE PROPER VALUE.
                                    ;IT WILL ALSO READ THE ADDRESS FROM THE TTY IF
                                    ;REQUIRED.
                                    ;NOTE: THIS ROUTINE DESTROYS R0-R4
                                    ;CALL
                                    ;
                                    ;       JSR     PC,GETADR
                                    ;       RETURN

046624  005737  001324              GETADR: TST     BUSADR          ;INPUT FROM TTY REQUESTED?
046630  001427                              BEQ     5$              ;NO--BRANCH
046632  005037  001324                      CLR     BUSADR          ;YES--CLEAR THE REQUEST FLAG
046636  012700  001502              1$:     MOV     #RH.ADR,R0      ;FIRST ADDRESS
046642  012703  046776                      MOV     #MRMCS1,R3      ;"RMCS1="
046646  011004                              MOV     (R0),R4         ;PRESENT RMCS1 ADDRESS
046650  004037  035542                      JSR     R0,GETNUM       ;GET NEW RMCS1
046654  000402                              BR      2$              ;COMMA
046656  000767                              BR      1$              ;PERIOD
046660  000412                              BR      4$              ;DOUBLE PERIOD
046662  010420                      2$:     MOV     R4,(R0)+        ;SAVE NEW RMCS1
046664  012703  047006                      MOV     #MRMVEC,R3      ;"RMVEC="
046670  011004                              MOV     (R0),R4         ;PRESENT RH/RM VECTOR ADDRESS
046672  004037  035542                      JSR     R0,GETNUM       ;GET NEW RMVEC
046676  000402                              BR      3$              ;COMMA
046700  000756                              BR      1$              ;PERIOD
046702  000401                              BR      4$              ;DOUBLE PERIOD
046704  010420                      3$:     MOV     R4,(R0)+        ;SAVE NEW RMVEC
046706  010410                      4$:     MOV     R4,(R0)         ;SAVE INPUT
046710  013701  000004              5$:     MOV     ERRVEC,R1       ;SAVE THE ERROR VECTOR
046714  012737  046750  000004              MOV     #6$,ERRVEC      ;SETUP FOR TRAP
046722  005777  132554                      TST     @RH.ADR         ;CHECK FOR RH/RM
046726  010137  000004                      MOV     R1,ERRVEC       ;RESTORE ERROR VECTOR
046732  012700  001502                      MOV     #RH.ADR,R0      ;FIRST ADDRESS OF NEW PARAMETERS
046736  012701  040650                      MOV     #RMADR,R1       ;FIRST ADDRESS OF WHERE TO PUT THEM
046742  012021                              MOV     (R0)+,(R1)+     ;BUS ADDRESS
046744  012021                              MOV     (R0)+,(R1)+     ;VECTOR ADDRESS
046746  000207                              RTS     PC              ;RETURN
046750  010137  000004              6$:     MOV     R1,ERRVEC       ;RESTORE ERROR VECTOR
046754  022626                              CMP     (SP)+,(SP)+     ;CLEAN OFF THE STACK
046756  104010                              EMT     10
046760  005737  000042                      TST     @#42            ;IS THERE A MONITOR?
046764  001724                              BEQ     1$              ;NO--GO ASK FOR ADDRESS
046766  005037  001330                      CLR     DRVSEL          ;FUDGE NO DRIVES SELECTED
046772  000137  021334                      JMP     $EOP            ;RETURN TO $EOP

046776     200     122     115      MRMCS1: .ASCIZ  <CRLF>/RMCS1=/
047006     200     122     115      MRMVEC: .ASCIZ  <CRLF>/RMVEC=/
```

```
                                .SBTTL  DPB (DATA PARAMETER BLOCKS)

047016     000                  DPB.A:  .BYTE   0               ;(0) DRIVE NUMBER
047017     000                          .BYTE   0               ;(1) OFFSET VALUE OR FMT16, ECI, AND HCI
047020     000                          .BYTE   0               ;(2) COMMAND
047021     000                          .BYTE   0               ;(3) PSEL AND A17 AND A16
047022  000000                          .WORD   0               ;(4) WORD COUNT (MUST BE NEG.)
047024  054522                          .WORD   BUFFER          ;(6) BUFFER ADDRESS OR
                                                                ;REGISTER TABLE POINTER
047026     000                          .BYTE   0               ;(10) SECTOR ADDRESS OR
                                                                ;FIRST REG. INDEX
047027     000                          .BYTE   0               ;(11) TRACK ADDRESS OR
                                                                ;LAST REG. INDEX
047030  000000                          .WORD   0               ;(12) CYLINDER ADDRESS
047032  047140                          .WORD   RM.REG          ;(14) ERROR TABLE POINTER
                                                                ;POINTS TO THE FIRST OF TWENTY
                                                                ;LOCATIONS OF WHERE THE DRIVER
                                                                ;IS TO STORE THE RH/RM
                                                                ;REGISTERS ON AN ERROR. IF LEFT
                                                                ;ZERO REGISTERS ARE NOT SAVED.
047034  000000                          .WORD   0               ;(16) STATUS/ERROR INDICATOR
                                                                ;BIT15=1=>ERROR OCCURRED
                                                                ;BIT07=1=>DONE
                                                                ;BIT14-BIT09 AND BIT06-BIT03
                                                                ;INDICATE TYPE OF ERROR

047036     000                  DPB.B:  .BYTE   0               ;(0) DRIVE NUMBER
047037     000                          .BYTE   0               ;(1) OFFSET VALUE OR FMT16, ECI, AND HCI
047040     000                          .BYTE   0               ;(2) COMMAND
047041     000                          .BYTE   0               ;(3) PSEL AND A17 AND A16
047042  177776                          .WORD   -2              ;(4) WORD COUNT (MUST BE NEG.)
047044  054522                          .WORD   BUFFER          ;(6) BUFFER ADDRESS OR
                                                                ;REGISTER TABLE POINTER
047046     000                          .BYTE   0               ;(10) SECTOR ADDRESS OR
                                                                ;FIRST REG. INDEX
047047     000                          .BYTE   0               ;(11) TRACK ADDRESS OR
                                                                ;LAST REG. INDEX
047050  000000                          .WORD   0               ;(12) CYLINDER ADDRESS
047052  047140                          .WORD   RM.REG          ;(14) ERROR TABLE POINTER
                                                                ;POINTS TO THE FIRST OF TWENTY
                                                                ;LOCATIONS OF WHERE THE DRIVER
                                                                ;IS TO STORE THE RH/RM
                                                                ;REGISTERS ON AN ERROR. IF LEFT
                                                                ;ZERO REGISTERS ARE NOT SAVED.
047054  000000                          .WORD   0               ;(16) STATUS/ERROR INDICATOR
                                                                ;BIT15=1=>ERROR OCCURRED
                                                                ;BIT07=1=>DONE
                                                                ;BIT14-BIT09 AND BIT06-BIT03
                                                                ;INDICATE TYPE OF ERROR

047056     000                  DPB.C:  .BYTE   0               ;(0) DRIVE NUMBER
047057     000                          .BYTE   0               ;(1) OFFSET VALUE OR FMT16, ECI, AND HCI
047060     000                          .BYTE   0               ;(2) COMMAND
047061     000                          .BYTE   0               ;(3) PSEL AND A17 AND A16
047062  177776                          .WORD   -2              ;(4) WORD COUNT (MUST BE NEG.)
047064  054522                          .WORD   BUFFER          ;(6) BUFFER ADDRESS OR
                                                                ;REGISTER TABLE POINTER
```

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047066     000             .BYTE   0         ;(10) SECTOR ADDRESS OR
                                             ;FIRST REG. INDEX
047067     000             .BYTE   0         ;(11) TRACK ADDRESS OR
                                             ;LAST REG. INDEX
047070  000000             .WORD   0         ;(12) CYLINDER ADDRESS
047072  047140             .WORD   RM.REG    ;(14) ERROR TABLE POINTER
                                             ;POINTS TO THE FIRST OF TWENTY
                                             ;LOCATIONS OF WHERE THE DRIVER
                                             ;IS TO STORE THE RH/RM
                                             ;REGISTERS ON AN ERROR. IF LEFT
                                             ;ZERO REGISTERS ARE NOT SAVED.
047074  000000             .WORD   0         ;(16) STATUS/ERROR INDICATOR
                                             ;BIT15=1=>ERROR OCCURRED
                                             ;BIT07=1=>DONE
                                             ;BIT14-BIT09 AND BIT06-BIT03
                                             ;INDICATE TYPE OF ERROR

047076     000    DTADPB:  .BYTE   0         ;(0) DRIVE NUMBER
047077     000             .BYTE   0         ;(1) OFFSET VALUE OR FMT16, ECI, AND HCI
047100     000             .BYTE   0         ;(2) COMMAND
047101     000             .BYTE   0         ;(3) PSEL AND A17 AND A16
047102  000000             .WORD   0         ;(4) WORD COUNT (MUST BE NEG.)
047104  054522             .WORD   BUFFER    ;(6) BUFFER ADDRESS OR
                                             ;REGISTER TABLE POINTER
047106     000             .BYTE   0         ;(10) SECTOR ADDRESS OR
                                             ;FIRST REG. INDEX
047107     000             .BYTE   0         ;(11) TRACK ADDRESS OR
                                             ;LAST REG. INDEX
047110  000000             .WORD   0         ;(12) CYLINDER ADDRESS
047112  047140             .WORD   RM.REG    ;(14) ERROR TABLE POINTER
                                             ;POINTS TO THE FIRST OF TWENTY
                                             ;LOCATIONS OF WHERE THE DRIVER
                                             ;IS TO STORE THE RH/RM
                                             ;REGISTERS ON AN ERROR. IF LEFT
                                             ;ZERO REGISTERS ARE NOT SAVED.
047114  000000             .WORD   0         ;(16) STATUS/ERROR INDICATOR
                                             ;BIT15=1=>ERROR OCCURRED
                                             ;BIT07=1=>DONE
                                             ;BIT14-BIT09 AND BIT06-BIT03
                                             ;INDICATE TYPE OF ERROR

047116     000    DPB.R:   .BYTE   0         ;(0) DRIVE NUMBER
047117     000             .BYTE   0         ;(1) OFFSET VALUE OR FMT16, ECI, AND HCI
047120     107             .BYTE   RECAL     ;(2) COMMAND
047121     000             .BYTE   0         ;(3) PSEL AND A17 AND A16
047122  000000             .WORD   0         ;(4) WORD COUNT (MUST BE NEG.)
047124  054522             .WORD   BUFFER    ;(6) BUFFER ADDRESS OR
                                             ;REGISTER TABLE POINTER
047126     000             .BYTE   0         ;(10) SECTOR ADDRESS OR
                                             ;FIRST REG. INDEX
047127     000             .BYTE   0         ;(11) TRACK ADDRESS OR
                                             ;LAST REG. INDEX
047130  000000             .WORD   0         ;(12) CYLINDER ADDRESS
047132  047140             .WORD   RM.REG    ;(14) ERROR TABLE POINTER
                                             ;POINTS TO THE FIRST OF TWENTY
                                             ;LOCATIONS OF WHERE THE DRIVER
                                             ;IS TO STORE THE RH/RM
```

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                                                          ;REGISTERS ON AN ERROR. IF LEFT
                                                          ;ZERO REGISTERS ARE NOT SAVED.
 047134  000000                     .WORD   0             ;(16) STATUS/ERROR INDICATOR
                                                          ;BIT15=1=>ERROR OCCURRED
                                                          ;BIT07=1=>DONE
                                                          ;BIT14-BIT09 AND BIT06-BIT03
                                                          ;INDICATE TYPE OF ERROR
 047136  000000                     .WORD   0             ;SKIP SECTOR ENABLE INDICATOR (ENABLED =1)

                          ;SAVE RH/RM REGISTERS HERE ON ERROR

 047140  000000           RM.REG:   .WORD   0             ;RMCS1 (776700) CONTROL & STATUS #1
 047142  000000                     .WORD   0             ;RMWC (776702) WORD COUNT
 047144  000000                     .WORD   0             ;RMBA (776704) BUS ADDRESS
 047146  000000                     .WORD   0             ;RMDA (776706) DESIRED SECTOR/TRACK
 047150  000000                     .WORD   0             ;RMCS2 (776710) CONTROL & STATUS #2
 047152  000000                     .WORD   0             ;RMDS (776712) DISK STATUS
 047154  000000                     .WORD   0             ;RMER1 (776714) ERROR REG. #1
 047156  000000                     .WORD   0             ;RMAS (776716) ATTENTION SUMMARY
 047160  000000                     .WORD   0             ;RMLA (776720) LOOK AHEAD
 047162  000000                     .WORD   0             ;RMDB (776722) DATA BUFFER
 047164  000000                     .WORD   0             ;RMMR1 (776724) MAINTAINABILITY
 047166  000000                     .WORD   0             ;RMDT (776726) DRIVE TYPE
 047170  000000                     .WORD   0             ;RMSN (776730) SERIAL NUMBER
 047172  000000                     .WORD   0             ;RMOF (776732) OFFSET
 047174  000000                     .WORD   0             ;RMDC (776734) DESIRED CYLINDER
 047176  000000                     .WORD   0             ;RMHR (776736) CURRENT CYLINDER
 047200  000000                     .WORD   0             ;RMMR2 (776740) ERROR REG #2
 047202  000000                     .WORD   0             ;RMER2 (776742) ERROR REG #3
 047204  000000                     .WORD   0             ;RMEC1 (776744) ECC POSITION
 047206  000000                     .WORD   0             ;RMEC2 (776746) ECC PATTERN
                          .EVEN
```

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                                .SBTTL  ASCIZ MESSAGES

  047210   122     000          MSG.R:  .ASCIZ  /R/
  047212   106     103     000  MSG.FC: .ASCIZ  /FC/
  047215   114     103     000  MSG.LC: .ASCIZ  /LC/
  047220   111     103     000  MSG.IC: .ASCIZ  /IC/
  047223   106     124     000  MSG.FT: .ASCIZ  /FT/
  047226   114     124     000  MSG.LT: .ASCIZ  /LT/
  047231   111     124     000  MSG.IT: .ASCIZ  /IT/
  047234   106     124     047  MES.FT: .ASCIZ  /FT'/
  047240   114     124     047  MES.LT: .ASCIZ  /LT'/
  047244   111     124     047  MES.IT: .ASCIZ  /IT'/
  047250   106     123     000  MSG.FS: .ASCIZ  /FS/
  047253   114     123     000  MSG.LS: .ASCIZ  /LS/
  047256   120     101     124  MSG.PAT:.ASCIZ  /PAT/
  047262   075     000          MSG.EQ: .ASCIZ  /=/
  047264   200     103     117  MSG.CS: .ASCIZ  <CRLF>/CONTROL SWITCHES=/

  047307   040     057     040  SLASH:  .ASCIZ  @ / @
  047313   200     125     116  UNSTAT: .ASCIZ  <CRLF>/UNIT STATUS:/
  047331   040     117     106  UNTOFF: .ASCIZ  / OFFLINE/
  047342   040     117     116  UNTON:  .ASCIZ  / ONLINE/
  047352   040     116     117  NOTPRS: .ASCIZ  / NOT PRESENT/
  047367   040     125     116  NOTSAF: .ASCIZ  / UNSAFE/
  047377   040     116     117  NOTRM:  .ASCIZ  @ NOT AN RM05/3/2@
  047420   040     111     123  LODEV:  .ASCIZ  / IS LOAD DEVICE/
  047440   122     115     060  $RM02:  .ASCIZ  /RM02/
  047445   122     115     060  $RM03:  .ASCIZ  /RM03/
  047452   122     115     060  $RM05:  .ASCIZ  /RM05/
  047457   200     104     122  DRIVES: .ASCIZ  <CRLF>/DRIVE(S) TO BE TESTED, /
  047510   116     117     116  NONE:   .ASCIZ  /NONE/
  047515   054     040     000  COMMA:  .ASCIZ  /, /
  047520   200     116     117  NOCLOK: .ASCIZ  <CRLF>/NO KW11-P CLOCK, TIMING TESTS WILL NOT BE PERFORMED/
  047605   115     102     101  SERIAL: .ASCIZ  @MBA S/N: @
  047617   200     124     105  MSGTST: .ASCIZ  <CRLF>/TEST/
  047625   200     104     122  MSDRIV: .ASCIZ  <CRLF>/DRIVE/
  047634   040     104     122  DROP:   .ASCIZ  / DROPPED/
  047645   105     130     103  EXCEED: .ASCIZ  /EXCEEDED MAXIMUM ERROR LIMIT/<CRLF>
  047703   200     116     117  NODRVS: .ASCIZ  <CRLF>/NO DRIVES TO TEST/<CRLF>
  047727   200     116     117  NOTEST: .ASCIZ  <CRLF>/NO TESTS SPECIFIED/<CRLF>

  047754   200     012     122  ROTATE: .ASCIZ  <CRLF><LF>/ROTATIONAL SPEED TIMES/
  050005   200     012     117  ONECYL: .ASCIZ  <CRLF><LF>/ONE CYLINDER SEEK TIMES/<CRLF>/ * FORWARD/
  050052   200     012     101  AVERGE: .ASCIZ  <CRLF><LF>/AVERAGE SEEK TIMES/<CRLF>/ * FORWARD/
  050112   200     012     115  MXSEEK: .ASCII  <CRLF><LF>/MAXIMUM SEEK TIMES/
  050136   200     040     052  FWD:    .ASCIZ  <CRLF>/ * FORWARD/
  050152   200     040     052  REV:    .ASCIZ  <CRLF>/ * REVERSE/

  050166   200     115     111  MSGMIN: .ASCIZ  <CRLF>/MIN=/
  050174   200     115     101  MSGMAX: .ASCIZ  <CRLF>/MAX=/
  050202   200     101     126  MSGAVG: .ASCIZ  <CRLF>/AVG=/
  050210   060     040     125  MSGOUS: .ASCIZ  /0 US/
  050215   040     102     105  MBELOW: .ASCIZ  / BELOW THE MINIMUM OF /
  050244   040     101     102  MABOVE: .ASCIZ  / ABOVE THE MAXIMUM OF /
  050273   040     123     105  MSGSEA: .ASCIZ  / SEARCHES TIMED/
  050313   040     123     105  MSGNUM: .ASCIZ  / SEEKS TIMED/
  050330   040     116     117  MSGNON: .ASCIZ  / NOT TIMED/
```

```
     58 050343     040                    BLNKS4: .ASCII  / /
     59 050344     040                    BLNKS3: .ASCII  / /
     60 050345     040                    BLNKS2: .ASCII  / /
     61 050346     040     000            BLNKS1: .ASCIZ  / /
     62 050350     101     114      114   MSG7XA: .ASCIZ  @ALLOWABLE ROTATIONAL SPEED LIMITS FOR RM05/3@
     63 050425     101     114      114   MSG7XB: .ASCIZ  /ALLOWABLE ROTATIONAL SPEED LIMITS FOR RM02/
     64 050500     101     114      114   MSG10X: .ASCIZ  /ALLOWABLE UNE CYLINDER SEEK LIMIT/
     65 050542     101     114      114   MSG11X: .ASCIZ  /ALLOWABLE AVERAGE SEEK TIME LIMIT/
     66 050604     101     114      114   MSG12X: .ASCIZ  /ALLOWABLE MAXIMUM (FORWARD) SEEK TIME LIMIT/
```

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                                             .SBTTL  ERROR HEADER (EM) MESSAGES

 050660      122      110      040    EM1:      .ASCIZ  /RH CONTROLLER INTERRUPT OCCURRED (RMAS 0)/
 050732      125      116      105    EM2:      .ASCIZ  /UNEXPECTED ATTENTION OCCURRED/
 050770      115      101      123    EM3:      .ASCIZ  /MASSBUS PARITY ERROR(MCPE=1)/
 051025      115      101      123    EM4:      .ASCIZ  /MASSBUS PARITY ERROR(PAR=1)/
 051061      101      104      104    EM5:      .ASCIZ  /ADDRESS PLUG CHANGE BIT SET/
 051115      122      110      040    EM10:     .ASCIZ  /RH CONTROLLER FAILED TO RESPOND TO ADDRESSING/
 051173      104      122      111    EM11:     .ASCIZ  /DRIVE SELECTED IS NOT ONLINE/
 051230      111      115      120    EM12:     .ASCIZ  /IMPROPER HEADER DATA/
 051255      104      101      124    EM13:     .ASCIZ  /DATA COMPARE FAILURE/
 051302      104      111      123    EM17:     .ASCIZ  /DISK ERROR IN TIMING TEST/
 051334      103      114      117    EM20:     .ASCIZ  /CLOCK (KW11-P) OVERFLOW IN TIMING TEST/
 051403      104      111      123    EM23:     .ASCIZ  /DISK ERROR DURING SEEK/
 051432      123      105      105    EM24:     .ASCIZ  /SEEK NOT COMPLETE WITHIN 120 MS/
 051472      122      110      057    EM41:     .ASCIZ  @RH/RM ERROR@
 051506      106      101      124    EM46:     .ASCIZ  /FATAL WRITE CHECK ERROR/
```

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                                        .SBTTL  STATUS/ERROR INDICATOR MESSAGES

  051536    117    106    106  MSGB14: .ASCIZ  /OFFLINE OR UNSAFE DRIVE REQUESTED/
  051600    125    116    114  MSGB13: .ASCIZ  /UNLOADED DRIVE REQUESTED/
  051631    120    105    122  MSGB12: .ASCIZ  /PERSISTENT UNSAFE/
  051653    120    101    122  MSGB11: .ASCIZ  /PARITY ERROR OCCURRED/
  051701    106    101    124  MSGB10: .ASCIZ  /FATAL PARITY ERROR/
  051724    123    117    106  MSGB09: .ASCIZ  /SOFTWARE TIMEOUT ON THIS DRIVE/
  051763    123    117    106  MSGB08: .ASCIZ  /SOFTWARE TIMEOUT ON ANOTHER DRIVE/
  052025    105    122    122  MSGB06: .ASCIZ  'ERROR OCCURRED DURING I/O OPERATION'
  052071    105    122    122  MSGB05: .ASCIZ  'ERROR OCCURRED DURING NON-I/O OPERATION'
  052141    125    116    123  MSGB04: .ASCIZ  /UNSAFE OCCURRED/
  052161    101    125    124  MSGB03: .ASCIZ  /AUTOMATIC RECALIBRATE SEQUENCE OCCURRED/
  052231    104    122    111  MSGB02: .ASCIZ  /DRIVE HAS NOT RESPONDED TO PORT REQUEST/
  052301    104    122    111  MSGB01: .ASCIZ  /DRIVE HAS BECOME NON-EXISTENT/
```

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                                        .SBTTL  DATA HEADER (DT) MESSAGES

  052337     105     122     122   DH1:     .ASCIZ  /ERR PC   RMAS/
  052354     105     122     122   DH2:     .ASCIZ  /ERR PC   DRIVE    RMAS     RMDS    RMER1    RMMR2    RMER2/
  052441     124     105     123   DH3:     .ASCIZ  /TEST     ERR PC   ADDRESS  DATA/
  052476     124     105     123   DH4:     .ASCIZ  /TEST     ERR PC   ADDRESS  GDDATA   BDDATA/
  052545     122     115     103   DH10:    .ASCIZ  /RMCS1    ERR PC/
  052564     104     122     111   DH11:    .ASCIZ  /DRIVE    ERR PC/
  052603     124     105     123   DH12:    .ASCIZ  /TEST     ERR PC   TST PC   DRIVE    CYLNDR   TRACK    SECTOR/
  052672     107     104     103   DH12A:   .ASCIZ  /GDCYL    GDTRK    GDSCTR   BDCYL    BDTRK    BDSCTR/
  052751     107     104     104   DH13A:   .ASCIZ  /GDDAT    BDDAT    WRDCNT   GDADR    BDADR/
  053017     124     105     123   DH17:    .ASCIZ  /TEST     ERR PC   DRIVE    RMCS1    RMDS     RMER1    RMMR2    RMER2/
  053114     124     105     123   DH21:    .ASCIZ  /TEST     ERR PC   TST PC   DRIVE    CYLNDR   TRACK/
  053172     107     104     104   DH21A:   .ASCIZ  /GDDAT    BDDAT    WRDCNT   SECTOR/
  053231     124     105     123   DH23:    .ASCIZ  /TEST     ERR PC   DRIVE    CYLNDR   RMCS1    RMCS2    RMDS/
  053316     122     115     105   DH23A:   .ASCIZ  /RMER1    RMMR2    RMER2    RMDC     RMHR/
  053363     124     105     123   DH41:    .ASCIZ  /TEST     ERR PC   TST PC   DRIVE/
  053421     124     105     123   DH42:    .ASCIZ  /TEST     ERR PC   TST PC   DRIVE    RMCS1    RMCS2    RMDS/
  053506     122     115     105   DH43A:   .ASCIZ  /RMER1    RMMR2    RMER2/
  053534     122     115     103   DH44A:   .ASCIZ  /RMCS1    RMCS2    RMDS    RMHR     RMDC     RMDA/
  053610     122     115     105   DH44B:   .ASCIZ  /RMER1    RMMR2    RMER2/
  053636     122     115     105   DH45A:   .ASCIZ  /RMER1    RMMR2    RMER2    RMWC     RMBA     RMDB/
                                   .EVEN
```

```
 1                                        .SBTTL  DATA TABLE (DT)
 2
 3 053714  001132  001204                 DT1:    .WORD   $ERRPC,$REG3
 4 053720  001132  001200  001204         DT2:    .WORD   $ERRPC,$REG1,$REG3,RMERRS,RMERRS+2,RMERRS+6,RMERRS+4
 5 053736  001212  001132  045326         DT3:    .WORD   $TMP0,$ERRPC,RD.ADR,RD.WRD
 6 053746  001212  001132  045552         DT4:    .WORD   $TMP0,$ERRPC,WRT.ADR,WRT.WD,RD.WRD
 7 053760  001212  001132  001200         DT5:    .WORD   $TMP0,$ERRPC,$REG1,$REG5,RMERRS,RMERRS+2,RMERRS+6,RMERRS+4
 8 054000  001502  001132                 DT10:   .WORD   RH.ADR,$ERRPC
 9 054004  001202  001132                 DT11:   .WORD   $REG2,$ERRPC
10 054010  001212  001132  001176         DT12:   .WORD   $TMP0,$ERRPC,$REG0,CHKDRV,CYL.DS,TRK.DS,SEC.DS
11 054026  001366  001372  001370         DT12A:  .WORD   CYL.DS,TRK.DS,SEC.DS,CYL.RD,TRK.RD,SEC.RD
12 054042  001212  001132  001176         DT13:   .WORD   $TMP0,$ERRPC,$REG0,CHKDRV,CYL.DS,TRK.DS,SEC.DS
13 054060  001140  001142  001206         DT13A:  .WORD   $GDDAT,$BDDAT,$REG4,$GDADR,$BDADR
14 054072  001212  001132  001352         DT17:   .WORD   $TMP0,$ERRPC,CHKDRV,RM.REG,RM.REG+12,RM.REG+14,RM.REG+40,RM.REG+42
15 054112  001212  001132  001176         DT21:   .WORD   $TMP0,$ERRPC,$REG0,CHKDRV,CYL.DS,TRK.DS
16 054126  001200  001142  001206         DT21A:  .WORD   $REG1,$BDDAT,$REG4,$REG1
17 054136  001212  001132  001352         DT23:   .WORD   $TMP0,$ERRPC,CHKDRV,CYL.DS,RM.REG,RM.REG+10,RM.REG+12
18 054154  047154  047200  047202         DT23A:  .WORD   RM.REG+14,RM.REG+40,RM.REG+42,RM.REG+34,RM.REG+36
19 054166  001212  001132  001176         DT41:   .WORD   $TMP0,$ERRPC,$REG0,CHKDRV
20 054176  001212  001132  001176         DT42:   .WORD   $TMP0,$ERRPC,$REG0,CHKDRV,RM.REG,RM.REG+10,RM.REG+12
21 054214  001212  001132  001176         DT43:   .WORD   $TMP0,$ERRPC,$REG0,CHKDRV,RM.REG,RM.REG+10,RM.REG+12
22 054232  047154  047200  047202         DT43A:  .WORD   RM.REG+14,RM.REG+40,RM.REG+42
23 054240  001212  001132  001176         DT44:   .WORD   $TMP0,$ERRPC,$REG0,CHKDRV,CYL.DS,TRK.DS,SEC.DS
24 054256  047140  047150  047152         DT44A:  .WORD   RM.REG,RM.REG+10,RM.REG+12,RM.REG+36,RM.REG+34,RM.REG+06
25 054272  047154  047200  047202         DT44B:  .WORD   RM.REG+14,RM.REG+40,RM.REG+42
26 054300  001212  001132  001176         DT45:   .WORD   $TMP0,$ERRPC,$REG0,CHKDRV,CYL.DS,TRK.DS,SEC.DS
27 054316  047140  047150  047152         DT45A:  .WORD   RM.REG,RM.REG+10,RM.REG+12,RM.REG+36,RM.REG+34,RM.REG+06
28 054332  047154  047200  047202         DT45B:  .WORD   RM.REG+14,RM.REG+40,RM.REG+42,RM.REG+2,RM.REG+4,RM.REG+22
```

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                                .SBTTL  DATA FORMAT (DF) TABLE

 054346  000001         DF1:    .WORD   1                       ;NUMBER OF DATA HEADERS
 054350     002                 .BYTE   2                       ;NUMBER OF WORDS IN DATA TABLE
 054351     000                 .BYTE   0                       ;ALL 3 NUMBERS ARE OCTAL

 054352  000001         DF2:    .WORD   1
 054354     007                 .BYTE   7
 054355     000                 .BYTE   0

 054356  000001         DF3:    .WORD   1
 054360     004                 .BYTE   4
 054361     000                 .BYTE   0

 054362  000001         DF4:    .WORD   1
 054364     005                 .BYTE   5
 054365     000                 .BYTE   0

 054366  000001         DF10:   .WORD   1
 054370     002                 .BYTE   2
 054371     000                 .BYTE   0

 054372  000001         DF11:   .WORD   1
 054374     002                 .BYTE   2
 054375     000                 .BYTE   0

 054376  000002         DF12:   .WORD   2                       ;2 DH'S TO BE TYPED
 054400     007                 .BYTE   7                       ;7 DATA WORDS FOLLOW THE 1ST DH
 054401     160                 .BYTE   160                     ;WORDS 1-4 ARE OCTAL 5-7 ARE DECIMAL
 054402  052672                 .WORD   DH12A                   ;ADDRESS OF 2ND DH
 054404     006                 .BYTE   6                       ;6 DATA WORDS FOLLOW THE 2ND DH
 054405     000                 .BYTE   0                       ;ALL WORDS ARE OCTAL

 054406  000002         DF13:   .WORD   2
 054410     007                 .BYTE   7
 054411     160                 .BYTE   160
 054412  052751                 .WORD   DH13A
 054414     005                 .BYTE   5
 054415     004                 .BYTE   4                       ;WORD 3 IS DECIMAL

 054416  000000         DF14:   .WORD   0
 054420     005                 .BYTE   5
 054421     004                 .BYTE   4                       ;WORD 3 IS DECIMAL

 054422  000001         DF17:   .WORD   1
 054424     010                 .BYTE   ^D8
 054425     000                 .BYTE   0

 054426  000002         DF21:   .WORD   2
 054430     006                 .BYTE   6
 054431     060                 .BYTE   60
 054432  053172                 .WORD   DH21A
 054434     004                 .BYTE   4
 054435     014                 .BYTE   14

 054436  000000         DF22:   .WORD   0
 054440     004                 .BYTE   4
```

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     58 054441      014                  .BYTE   14
     59
     60 054442  000002          DF23:    .WORD   2
     61 054444     007                   .BYTE   7
     62 054445     010                   .BYTE   10              ;WORD 4 IS DECIMAL
     63 054446  053316                   .WORD   DH23A
     64 054450     005                   .BYTE   5
     65 054451     000                   .BYTE   0
     66
     67
     68 054452  000001          DF41:    .WORD   1
     69 054454     004                   .BYTE   4
     70 054455     000                   .BYTE   0
     71
     72 054456  000001          DF42:    .WORD   1
     73 054460     007                   .BYTE   7
     74 054461     000                   .BYTE   0
     75
     76 054462  000002          DF43:    .WORD   2
     77 054464     007                   .BYTE   7
     78 054465     000                   .BYTE   0
     79 054466  053506                   .WORD   DH43A
     80 054470     003                   .BYTE   3
     81 054471     000                   .BYTE   0
     82
     83 054472  000003          DF44:    .WORD   3
     84 054474     007                   .BYTE   7
     85 054475     160                   .BYTE   160
     86 054476  053534                   .WORD   DH44A
     87 054500     006                   .BYTE   6
     88 054501     000                   .BYTE   0
     89 054502  053610                   .WORD   DH44B
     90 054504     003                   .BYTE   3
     91 054505     000                   .BYTE   0
     92
     93 054506  000003          DF45:    .WORD   3
     94 054510     007                   .BYTE   7
     95 054511     160                   .BYTE   160
     96 054512  053534                   .WORD   DH44A
     97 054514     006                   .BYTE   6
     98 054515     000                   .BYTE   0
     99 054516  053636                   .WORD   DH45A
    100 054520     006                   .BYTE   6
    101 054521     000                   .BYTE   0
    102
    103                         .SBTTL  START OF READ/WRITE BUFFER
    104 054522                  BUFFER:
    105
    106         000200          .END    200
```

```
ABASE = 000000     AT4   = 000020     CI4     042342     DH11    052564     DT07  = 000200
ACDW1 = 000000     AT5   = 000040     CI5     042720     DH12    052603     DT08  = 000400
ACDW2 = 000000     AT6   = 000100     CI6     042742     DH12A   052672     DT1     053714
ACPUOP= 000000     AT7   = 000200     CI7     042756     DH13A   052751     DT10    054000
ACTDRV  040576     AUNIT = 000000     CI7B    043000     DH17    053017     DT11    054004
ACTSTR  040577     AUSWR = 000000     CI8     043056     DH2     052354     DT12    054010
ADDW0 = 000000     AVECT1= 000000     CKSCTR  034034     DH21    053114     DT12A   054026
ADDW1 = 000000     AVECT2= 000000     CKSWR = 104407     DH21A   053172     DT13    054042
ADDW10= 000000     AVERGE  050052     CK.CHR  040132     DH23    053231     DT13A   054060
ADDW11= 000000     A16   = 000400     CK.DEC  040104     DH23A   053316     DT17    054072
ADDW12= 000000     A17   = 001000     CK.DIG  040206     DH3     052441     DT2     053720
ADDW13= 000000     BADTMO  004576     CK.NUM  040372     DH4     052476     DT21    054112
ADDW14= 000000     BAI   = 000010     CK.OCT  040056     DH41    053363     DT21A   054126
ADDW15= 000000     BASFLG  001466     CLKSTA  001342     DH42    053421     DT23    054136
ADDW2 = 000000     BITS    001540     CLOSE   037776     DH43A   053506     DT23A   054154
ADDW3   000000     BIT0  = 000001     CLR   = 000040     DH44A   053534     DT3     053736
ADDW4 = 000000     BIT00 = 000001     CLRBUF  033766     DH44B   053610     DT4     053746
ADDW5 = 000000     BIT01 = 000002     CLRQUE  046336     DH45A   053636     DT41    054166
ADDW6   000000     BIT02 = 000004     CLSWDS  037676     DISPLA  001156     DT42    054176
ADDW7 = 000000     BIT03 = 000010     CNTCLR  027334     DISPRE  000174     DT43    054214
ADDW8 = 000000     BIT04 = 000020     CNTRLC  001322     DLT   = 100000     DT43A   054232
ADDW9   000000     BIT05 = 000040     COMMA   047515     DMD   = 000001     DT44    054240
ADEVCT= 000000     BIT06 = 000100     CONT  = 000100     DORTI   032734     DT44A   054256
ADEVM = 000000     BIT07   000200     COUNT   033000     DPB.A   047016     DT44B   054272
AENV  = 000000     BIT08   000400     CPSAVE  022256     DPB.B   047036     DT45    054300
AENVM   000000     BIT09 = 001000     CR    = 000015     DPB.C   047056     DT45A   054316
AFATAL  000000     BIT1  = 000002     CRLF  = 000200     DPB.R   047116     DT45B   054332
AMADR1= 000000     BIT10   002000     CYL.DS  001366     DPINT   040552     DT5     053760
AMADR2  000000     BIT11 = 004000     CYL.RD  001360     DPR   = 000400     DVA   = 004000
AMADR3= 000000     BIT12 = 010000     C.SWR   001314     DPRQS   040562     EBL   = 020000
AMADR4= 000000     BIT13   020000     DATCMP  034474     DRIVES  047457     ECH   = 000100
AMAMS1= 000000     BIT14 = 040000     DCK   = 100000     DROP    047634     ECI   = 004000
AMAMS2  000000     BIT15 = 100000     DDISP = 177570     DRQ   = 004000     ECRC  = 001000
AMAMS3= 000000     BIT2    000004     DECSEC  033704     DRVACT  040522     EECC  = 000020
AMAMS4= 000000     BIT3  = 000010     DECSK   010110     DRVCAL  031204     EMPTYQ  046414
AMSGAD  000000     BIT4    000020     DELTA   001450     DRVCLR= 000111     EMTVEC= 000030
AMSGLG= 000000     BIT5  = 000040     DFLT    002526     DRVCL1  031224     EM1     050660
AMSGTY= 000000     BIT6  = 000100     DF1     054346     DRVINT  041072     EM10    051115
AMTYP1= 000000     BIT7  = 000200     DF10    054366     DRVMSK  001354     EM11    051173
AMTYP2= 000000     BIT8    000400     DF11    054372     DRVQUE  046434     EM12    051230
AMTYP3= 000000     BIT9  = 001000     DF12    054376     DRVSEL  001330     EM13    051255
AMTYP4= 000000     BLNKS1  050346     DF13    054406     DRVSTA  040532     EM17    051302
AOE   = 001000     BLNKS2  050345     DF14    054416     DRVTYP  040542     EM2     050732
APASS = 000000     BLNKS3  050344     DF17    054422     DRY   = 000200     EM20    051334
APRIOR= 000000     BLNKS4  050343     DF2     054352     DSWR  = 177570     EM23    051403
APTCSU= 000040     BPTVEC= 000014     DF21    054426     DTADPB  047076     EM24    051432
APTENV= 000001     BSE   = 100000     DF22    054436     DTE   = 010000     EM3     050770
APTSIZ= 000200     BUFFER  054522     DF23    054442     DTG   = 000020     EM4     051023
APTSPO= 000100     BUSADR  001324     DF3     054356     DTO     020000     EM41    051472
ASWREG= 000000     BYPASS  001350     DF4     054362     DTUW    040634     EM46    051506
ATA   = 100000     CALL.A  030402     DF41    054452     DT00  = 000001     EM5     051061
ATABIT  040636     CALL.B  030550     DF42    054456     DT01  = 000002     ERINDX  032170
ATESTN= 000000     CALL.C  030766     DF43    054462     DT02  = 000004     ERMAX   001316
AT0   = 000001     CALL.R  032016     DF44    054472     DT03  = 000010     ERR   = 040000
AT1   = 000002     CHKDRV  001352     DF45    054506     DT04  = 000020     ERRCN   001472
AT2   = 000004     CI1     042126     DH1     052337     DT05  = 000040     ERROR = 104000
AT3     000010     CI3     042234     DH10    052545     DT06  = 000100     ERRVEC= 000004
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ERR.CT   001464     IAE    - 002000     MSGB02   052231     OCC    - 100000     PKV      001510
ESRC   = 004000     IBSAVE   022260     MSGB03   052161     OFD    = 000200     PLFS   - 002000
ES.SAV   046600     IC       002344     MSGB04   052141     OFFSET=  000115     POPQUE   046532
EXCEED   047645     IE     = 000100     MSGB05   052071     OM     = 000001     PRM      002334
EXIT.A   014424     ILF    = 000001     MSGB06   052025     ONECYL   050005     PRMLMT   002444
EXIT0    007462     ILR    = 000002     MSGB08   051763     OPE    = 020000     PRMMSG   002476
EXIT1    007670     INCCYL   033654     MSGB09   051724     OPI    = 020000     PRMPT    002374
EXIT10   013252     INCEC    027216     MSGB10   051701     OPNFLG   001336     PRM0     003132
EXIT11   013516     INCSK    010046     MSGB11   051653     OPNPAT   037364     PRM1     003150
EXIT12   014440     INCTRK   033624     MSGB12   051631     OPNPRM   037162     PRM10    003336
EXIT13   015142     IOTVEC-  000020     MSGB13   051600     OPNTST   037010     PRM11    003354
EXIT14   015702     IR       000100     MSGB14   051536     OPNWDS   037506     PRM12    003374
EXIT15   016452     ISR      043306     MSGMAX   050174     OPN.CT   037014     PRM13    003410
EXIT16   017074     IT       002352     MSGMIN   050166     OPN.N1   037720     PRM14    003420
EXIT17   017540     ITEM41   002254     MSGNON   050330     OPN.N2   037724     PRM15    003430
EXIT2    010132     LC       002342     MSGNUM   050313     OPN.X1   037736     PRM16    003440
EXIT20   020320     LDCMD    030336     MSGSEA   050273     OPN.X2   037742     PRM17    003452
EXIT21   021136     LF     = 000012     MSGTST   047617     OPN.1    037020     PRM2     003176
EXIT22   021332     LKS      001526     MSG.CS   047264     OPN.2    037042     PRM20    003462
EXIT3    010352     LKV      001522     MSG.EQ   047262     OPT      041700     PRM21    003516
EXIT4    010764     LODEV    047420     MSG.FC   047212     OR     = 000200     PRM22    003526
EXIT5    011210     LODFLT   027704     MSG.FS   047250     PACK   = 000123     PRM3     003216
EXIT6    011500     LODPRM   030142     MSG.FT   047223     PAR    = 000010     PRM4     003236
EXIT7    012076     LOP.CK   032130     MSG.IC   047220     PAT      002360     PRM5     003256
FC       002340     LPB      001536     MSG.IT   047231     PAT.PT   003536     PRM6     003276
FER    = 000020     LPS      001534     MSG.LC   047215     PAT0     003576     PRM7     003316
FILBUF   033730     LPTAVL   001326     MSG.LS   047253     PAT1     003636     PR0    - 000000
FILRAN   035012     LP.AVL   027364     MSG.LT   047226     PAT10    004276     PR1      000040
FMT16  = 010000     LS       002356     MSG.PA   047256     PAT11    004336     PR2    - 000100
FS       002354     LSIT   = 000002     MSG.R    047210     PAT12    004376     PR3    = 000140
FT       002346     LST    - 002000     MSGOUS   050210     PAT13    004436     PR4    = 000200
FWD      050136     LSTRK    001374     MSG10X   050500     PAT14    004476     PR5    = 000240
F1     = 000002     LT       002350     MSG11X   050542     PAT15    004536     PR6    - 000300
F2     = 000004     MABOVE   050244     MSG12X   050604     PAT2     003676     PR7    - 000340
F3     = 000010     MBELOW   050215     MSG7XA   050350     PAT3     003736     PS       177776
F4     = 000020     MCLK   = 004000     MSG7XB   050425     PAT4     003776     PSEL   - 002000
F5     = 000040     MCPE   = 020000     MUR    = 001000     PAT5     004036     PSW      177776
GETADR   046624     MCPEMX   040646     MWP    = 000010     PAT6     004076     PTRN15   003514
GETNUM   035542     MDF      000100     MXF    = 001000     PAT7     004136     PWRVEC=  000024
GETREG-  000141     MES.FT   047234     MXSEEK   050112     PAT8     004176     QCNT     046044
GETREQ   046510     MES.IT   047244     MXSTAL   001462     PAT9     004236     QDRV0    046136
GETSWR   035450     MES.LT   047240     MXWNDW   040656     PDA    = 000400     QDRV1    046156
GO     - 000001     MI       000004     NBA    = 100000     PFECH    022700     QDRV2    046176
GTSWR  = 104406     MOC      000400     NC1      002370     PFECH1   022710     QDRV3    046216
GTTST1   036036     MOH      020000     NC2      002372     PFECH2   022772     QDRV4    046236
GTTST2   036122     MOL    = 010000     NED    = 010000     PFECH3   023024     QDRV5    046256
GTTST3   036464     MPE    = 000400     NEM    = 004000     PFECH4   023034     QDRV6    046276
GTTST4   036466     MRD    - 002000     NOCLOK   047520     PFTSTN   023040     QDRV7    046316
GTTST5   036716     MRMCS1   046776     NODRVS   047703     PGE    - 002000     QINPT    046054
GTTST6   036756     MRMVEC   047006     NONE     047510     PGM    = 001000     QOUTPT   046074
GT.PRM   035700     MS     = 000040     NOOP   = 000101     PHA    = 000200     QSTART   046114
GT.PR1   035702     MSC    = 000002     NOTEST   047727     PIP    = 020000     QSTOP    046116
GT.PR2   036032     MSDRIV   047625     NOTPRS   047352     PIRQ   = 177772     QTERM  = 046336
HCE    = 000200     MSEN     010000     NOTRM    047377     PIRQVE=  000240     RANADR   035266
HCI    = 002000     MSER   - 000200     NOTSAF   047367     PKB      001516     RANCK    035034
HCRC   = 000400     MSGAVG   050202     OBCK   - 100000     PKC      001520     RANPAT   035232
HT     = 000011     MSGB01   052301     OBEN     040000     PKCS     001514     RDCHR  = 104410
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RDLIN     4411     SAVEFG  040610     START4  004702     TEST12  014116     TST7    011502
RDY     000200     SAVREG- 104412     STATBL  001762     TEST'3  014652     TYPDS = 104405
RD.ADR  045326     SC      043520     STKLMT= 177774     TEST14  015354     TYPE  = 104401
RD.RM   045302     SCOPE = 000004     ST0     044760     TEST15  016114     TYPERR  022262
RD.RM1  045324     SCTRWC= 177400     ST01    045014     TEST16  016574     TYPOC = 104402
RD.RM2  045450     SC0   = 000100     ST02    045110     TEST17  017216     TYPON = 104404
RD.RM3  045454     SC1   = 000200     ST03    045140     TEST2   010026     TYPOS = 104403
RD.RM4  045460     SC11    044352     ST05    045164     TEST20  017770     TYPTIM  033240
RD.WRD  045330     SC12    044462     ST06    045172     TEST21  020616     T10     001660
READ  = 0C0171     SC13    044532     ST07    045230     TEST22  021252     T11     001670
READHD= 000173     SC2   = 000400     ST08    045260     TEST3   010270     T12     001700
READIN= 000121     SC3     043570     ST09    045270     TEST4   010524     T7A     001620
RECAL = 000107     SC4     043574     STRTMR  032736     TEST5   011122     T7A1    001640
RELEAS= 000113     SC5     043606     STRT1A  004674     TEST6   011346     T7B     001630
RESREG= 104413     SC6     044002     STRT2A  004716     TEST7   011642     T7B1    001650
RESVEC= 000010     SC6A    044116     ST.CLK  027426     TICKMS  001344     ULDFLG  040600
REV     050152     SC7     044244     ST.LCL  027636     TICKUS  001346     UNLOAD= 000103
REX   = 010000     SC8     044322     ST.PCL  027574     TIMER   040614     UNS   = 040000
RHVEC   001504     SEARCH= 000131     SVADR   001440     TIM.DN  001414     UNSTAT  047313
RH.ADR  C01502     SEC.DS  001370     SVRH70  045654     TIM.PT  001432     UNTOFF  047331
RMADR   040650     SEC.RD  001364     SVSTAT  001356     TIM.UP  001376     UNTON   047342
RMAS  - 000016     SEEK  - 000105     SWR     001154     TKVEC = 000060     UPE   = 020000
RMBA  = 000004     SEEKFG  040612     SWREG   000176     TPB     001532     US1   = 000001
RMCS1   000000     SEKCNT  001446     SW0   = 000001     TPS     001530     US2   = 000002
RMCS2   000010     SEKTMR  001444     SW00  = 000001     TPS50   014436     US4   = 000004
RMDA  - 000006     SELDRV= 000145     SW01  = 000002     TPS60   014420     VERIFY  032410
RMDB  - 000022     SERIAL  047605     SW02  = 000004     TPVEC = 000064     VV    = 000100
RMDC  - 000034     SETBUF  034404     SW03  = 000010     TP50    014430     WC    = 000040
RMDS    000012     SETFOR- 000143     SW04  = 000020     TP60    014412     WCE   = 040000
RMDT  - 000026     SETVEC  006060     SW05  = 000040     TRAPVE= 000034     WCEFLG  001434
RMEC1 - 000044     SET.IE  045772     SW06  = 000100     TRCKWC  001452     WCF   = 000040
RMEC2 - 000046     SHUT    025334     SW07  = 000200     TRE   = 040000     WD    = 000010
RMERRS  040512     SKI   - 040000     SW08  = 000400     TRK.DS  001372     WLE   = 004000
RMER1 - 000014     SLASH   047307     SW09  = 001000     TRK.RD  001362     WRCKD = 000151
RMER2 - 000042     SPTYP   033132     SW1   = 000002     TRNSWT  040572     WRCKHD= 000153
RMHR  - 000036     SP10    001740     SW10  = 002000     TRTVEC= 000014     WRITE = 000161
RMINIT  040660     SP11    001746     SW11  = 004000     TSTNMS  001332     WRL     004000
RMLA    000020     SP12    001754     SW12  = 010000     TST0    007222     WRTHD - 000163
RMMR1 - 000024     SP7A    001710     SW13  = 020000     TST1    007464     WRT.AD  045552
RMMR2   000040     SP7A1   001724     SW14  = 040000     TST10   012100     WRT.RM  045462
RMOF  - 000032     SP7B    001716     SW15  = 100000     TST10A  012614     WRT.R1  045546
RMR   = C00004     SP7B1   001732     SW2   = 000004     TST10B  013206     WRT.R2  045640
RMSN  - 000030     SRCHWT  040574     SW3   = 000010     TST11   013254     WRT.R3  045644
RMTMR   044670     SRCH00  032552     SW4   = 000020     TST12   013520     WRT.R4  045650
RMVEC   040652     SRTDRV  006334     SW5   = 000040     TST13   014442     WRT.R5  045652
RMWC    000002     SRTINT  006002     SW6   = 000100     TST14   015144     WRT.WD  045550
RM.REG  047140     SRVCLK  027672     SW7   = 000200     TST15   015704     XXDP    001470
RM05    041406     STACK - 001100     SW8   = 000400     TST16   016454     $APTHD  001100
ROTATE  047754     STALL   032326     SW9   = 001000     TST17   017076     $ATYC   026774
RPT     002336     STALL0  001436     TAB.XY= 001114     TST2    007672     $ATY1   026750
RSTART  006662     STALL1  001454     TAP   - 040000     TST20   017542     $ATY3   026756
RSTRT1  006712     STALL2  001456     TBITVE= 000014     TST21   020322     $ATY4   026766
RTC   = 000117     STALL3  001460     TD      043350     TST22   021140     $AUTOB  001150
RTURN   021600     START   004724     TEST0   007372     TST3    010134     $BASE   001310
R6    -%000006     START1  004670     TEST1   007654     TST4    010354     $BDADR  001136
R7    =%000007     START2  004712     TEST10  012356     TST5    010766     $BDDAT  001142
SAVCSW  001320     START3  004660     TEST11  013440     TST6    011212     $BELL   001224
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$CHARC  023372        $ERRTB  002014        $MAMS3  001274        $REG4   001206        $TMP2   001216
$CKSWR  024360        $ERTTL  001126        $MAMS4  001300        $REG5   001210        $TN   = 000023
$CMTAG  001114        $ESCAP  001222        $MBADR  001102        $RESRE  026014        $TNPWR  026302
$CM1  = 000006        $ETABL  001254        $MFLG   027212        $RM02   047440        $TPB    001166
$CM2  - 000014        $ETEND  001314        $MNEW   025322        $RM03   047445        $TPFLG  001173
$CM3  = 000006        $FATAL  001236        $MSGAD  001250        $RM05   047452        $TPS    001164
$CM4  = 000003        $FFLG   027214        $MSGLG  001252        $RTNAD  021572        $TRAP   026052
$CNTLC  025272        $FILLC  001172        $MSGTY  001234        $SAVRE  025756        $TRAP2  026074
$CNTLG  025304        $FILLS  001171        $MSWR   025311        $SB2D   026136        $TRP  = 000014
$CNTLU  025277        $GDADR  001134        $MTYP1  001265        $SCOPE  025356        $TRPAD  026106
$CPUOP  001262        $GDDAT  001140        $MTYP2  001271        $SETUP= 000167        $TSTM   001104
$CRLF   001231        $GET42  021550        $MTYP3  001275        $STUP = 177777        $TSTNM  001116
$DBLK   024040        $GTSWR  024450        $MTYP4  001301        $SUPRS  026366        $TTYIN  025246
$DB2D   026172        $HD   = 000000        $MXCNT  025754        $SVLAD  025704        $TYPDS  023624
$DECVL  026352        $HIBTS  001100        $NULL   001170        $SVPC = 000220        $TYPE   023042
$DEVCT  001244        $HINUM  026524        $NWTST= 000001        $SWR  = 167000        $TYPEC  023254
$DEVM   001312        $ICNT   001120        $OCNT   023620        $SWREG  001256        $TYPEX  023374
$DIV    026530        $INTAG  001151        $OMODE  023622        $SWRMK= 000000        $TYPOC  023422
$DOAGN  021570        $ITEMB  001130        $OVER   025740        $TESTN  001240        $TYPON  023436
$DTBL   024030        $LF     001232        $PASS   001242        $TIMES  001220        $TYPOS  023376
$ENDAD  021560        $LFLG   027213        $PASTM  001106        $TKB    001162        $UNIT   001246
$ENDCT  021514        $LONUM  026526        $QUES   001230        $TKCNT  024050        $UNITM  001110
$ENULL  021574        $LPADR  001122        $RAND   026426        $TKINT  024060        $USWR   001260
$ENV    001254        $LPERR  001124        $RDCHR  024722        $TKQEN= 024057        $VECT1  001304
$ENVM   001255        $MADR1  001266        $RDLIN  025012        $TKQIN  024052        $VECT2  001306
$EOP    021334        $MADR2  001272        $RDSZ = 000024        $TKQOU  024054        $XOFF = 000023
$EOPCT  021506       .$MADR3  001276        $REGAD  001174        $TKQSR  024056        $XON  = 000021
$ERFLG  001117        $MADR4  001302        $REG0   001176        $TKS    001160        $XTSTR  025374
$ERMAX  001131        $MAIL   001234        $REG1   001200        $TKSRV  024130        $$GET4= 000000
$ERROR  021620        $MAMS1  001264        $REG2   001202        $TMP0   001212        $OFILL  023621
$ERRPC  001132        $MAMS2  001270        $REG3   001204        $TMP1   001214        .$X   = 001100


. ABS.  054522     000
        000000     001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  62464 WORDS  ( 244 PAGES)
DYNAMIC MEMORY AVAILABLE FOR  70 PAGES
CZRMVB.BIC,CZRMVB/C CZRMVB.DOC,CZRMVB,SYSMAC/M
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$$GET4    17-1     17-1#
$0FILL    21-1     21-1#    21-1*    21-1*
$40CAT    18-1     24-1
$APTHD     5-12     5-12#
$ASTAT    32-1     32-1
$ATY1     32-1#
$ATY3     20-1     32-1#
$ATY4     18-1     32-1#
$ATYC     32-1     32-1#
$AUTOB     6-0#    11-38*   23-1     23-1     23-1
$BASE      6-0#
$BDADR     6-0#    33-987*  33-:52*  41-13
$BDDAT     6-0#    33-917*  33-989*  33-:54*  41-13    41-16
$BELL      6-0#    11-42    18-1     18-1     18-1     23-1     23-1     23-1
$CHARC    20-1     20-1#    20-1*    20-1*    20-1*
$CKSWR    23-1#    26-1     26-1
$CM1       6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0#     6-0#
           6-0#     6-0#     6-0#     6-0#     6-0#
$CM2       6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0      6-0#     6-0#
           6-0#     6-0#     6-0#     6-0#     6-0#
$CM3       6-0      6-0      6-0#
$CM4       6-0      6-0      6-0      6-0      6-0      6-0      6-0#     6-0#     6-0#     6-0#
$CMTAG     6-0#    11-33    11-33    11-33    11-33    11-33    11-33    11-33
$CNTLC    23-1     23-1     23-1     23-1     23-1#
$CNTLG    23-1     23-1#
$CNTLU    23-1     23-1     23-1#
$CPUOP     6-0#
$CRLF      6-0#    11-65    11-105   11-150   12-45    12-65    13-46    13-68    18-1     18-1     18-1     19-42    19-58    19-69
          19-79    19-93    19-100   20-1     20-1     20-1     23-1     23-1     23-1     23-1     33-15    33-692   33-693   33-708
          33->35
$DB2D     27-1     28-1#
$DBLK     22-1     22-1     22-1#
$DECVL    28-1     28-1#
$DEVCT     6-0#
$DEVM      6-0#
$DIV      14-70    14-336   14-528   31-1#    33-765
$DOAGN    17-1     17-1     17-1#
$DTBL     22-1     22-1#
$ENDAD     5-9     11-38    17-1#    18-1
$ENDCT    11-33    12-40*   12-57*   12-66    17-1#
$ENULL    17-1     17-1#
$ENV       6-0#    11-38    18-1     20-1     32-1     32-1
$ENVM      6-0#    11-33    20-1     20-1     32-1
$EOP      13-37    16-372   17-1#    23-7     33-23    33-475   35-47
$EOPCT    11-33*   12-66*   13-27*   17-1     17-1#    33-22*
$ERFLG     6-0#    18-1     18-1     18-1*    24-1     24-1     24-1     24-1     24-1     24-1*    33-432   33-902   33-933   33-:07
          33-:66
$ERMAX     6-0#    11-33*   13-69*   14-44*   14-79*   14-109*  14-141*  14-170*  14-239*  14-274*  14-316*  14-392*  14-543*  15-29*
          15-154*  15-233*  15-318*  16-20*   16-77*   16-156*  16-287*  16-372*  24-1     24-1     24-1     24-1*
$ERROR    11-33    18-1#
$ERRPC     6-0#    18-1     18-1     18-1     18-1*    18-1*    19-111   41-3     41-4     41-5     41-6     41-7     41-8     41-9
          41-10    41-12    41-14    41-15    41-17    41-19    41-20    41-21    41-23    41-26
$ERRTB     8-0#    19-37    19-38
$ERTTL     6-0#    17-1     17-1     17-1*    18-1     18-1     18-1*
$ESCAP     6-0#    11-33*   15-60*   15-175*  15-254*  15-339*  18-1     18-1     18-1     18-1     24-1*    33-242*  33-249*  33-272*
          33-279*  33-312*  33-319*  33-355*  33-365*  33-386*  33-393*  33-417*  33-447*  33-454*  33-471*  33-579*  33-584*  33-608*
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        33-615*   33-922*   33-927*   33-997*   33-:03*   33-:50*   34-772    34-830    34-832    34-;18    34-;77    34-=81    34-=91    34-=92*
        34-=94*
$ETABL   6-0#
$ETEND   5-12      6-0#
$FATAL   6-0#     32-1*
$FFLG   32-1      32-1#     32-1*     32-1*     32-1*
$FILLC   6-0#     20-1      20-1      20-1
$FILLS   6-0#     20-1      20-1
$GDADR   6-0#     33-988*   33-:53*   41-13
$GDDAT   6-0#     33-990*   33-:55*   41-13
$GET42  12-53     13-9      17-1#
$GTSWR  23-1#     26-1      26-1
$HD      4-37      4-37      4-37
$HIBTS   5-12#
$HINUM  11-33*    14-70     14-331    14-528    16-293*   30-1      30-1      30-1#     30-1*     33-:37    33-:43*   33-:46*   33-:90    33-;06
$ICNT    6-0#     11-91*    24-1      24-1      24-1      24-1*     24-1*
$INTAG   6-0#     23-1      23-1      23-1      23-1      23-1*
$ITEMB   6-0#     18-1      18-1      18-1      18-1      18-1      18-1*     18-1*     19-20
$LF      6-0#     18-1      18-1      20-1      20-1      23-1      23-1      23-1
$LFLG   32-1#     32-1*
$LONUM  11-33*    16-294*   30-1      30-1      30-1#     30-1*     33-547    33-:38    33-:42*   33-:45*   33-:89    33-;04    33-;05
$LPADR   6-0#     11-33*    14-70*    14-92*    14-111*   14-143*   14-172*   14-241*   14-276*   14-325*   14-394*   14-545*   15-36*    15-60*
        15-161*   15-175*   15-240*   15-254*   15-325*   15-339*   16-26*    16-83*    16-161*   16-289*   16-318*   16-377*   24-1      24-1
        24-1      24-1*     24-1*
$LPERR   6-0#     11-33*    14-44*    14-79*    14-109*   14-119*   14-126*   14-141*   14-151*   14-154*   14-170*   14-185*   14-206*   14-239*
        14-250*   14-274*   14-286*   14-316*   14-340*   14-342*   14-392*   14-454*   14-455*   14-543*   15-29*    15-154*   15-233*   15-318*
        16-20*    16-34*    16-38*    16-40*    16-47*    16-53*    16-77*    16-92*    16-102*   16-120*   16-126*   16-156*   16-234*   16-242*
        16-251*   16-287*   16-303*   16-318*   16-328*   16-334*   16-345*   16-351*   16-361*   16-372*   18-1      24-1      24-1      24-1
        24-1*     33-470    33-587
$MADR1   6-0#
$MADR2   6-0#
$MADR3   6-0#
$MADR4   6-0#
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        14-543    15-29     15-154    15-233    15-318    16-20     16-77     16-156    16-287    16-372    18-1      20-1      24-1
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$MAMS2   6-0#
$MAMS3   6-0#
$MAMS4   6-0#
$MBADR   5-12#
$MFLG   32-1      32-1#     32-1*     32-1*
$MNEW   23-1      23-1#
$MSGAD   6-0#     32-1      32-1*
$MSGLG   6-0#     32-1*
$MSGTY   6-0#     32-1      32-1      32-1*     32-1*
$MSWR   23-1      23-1#
$MTYP1   6-0#
$MTYP2   6-0#
$MTYP3   6-0#
$MTYP4   6-0#
$MXCNT  24-1      24-1      24-1      24-1#
$NULL    6-0#     20-1      20-1      20-1
$NWTST  14-44     14-44     14-44#    14-44#    14-79     14-79     14-79#    14-79#    14-109    14-109    14-109#   14-109#   14-141    14-141
        14-141#   14-141#   14-170    14-170    14-170#   14-170#   14-239    14-239    14-239#   14-239#   14-274    14-274    14-274#   14-274#
        14-316    14-316    14-316#   14-316#   14-392    14-392    14-392#   14-392#   14-543    14-543    14-543#   14-543#   15-29     15-29
        15-29#    15-29#    15-154    15-154    15-154#   15-154#   15-233    15-233    15-233#   15-233#   15-318    15-318    15-318#   15-318#
        16-20     16-20     16-20#    16-20#    16-77     16-77     16-77#    16-77#    16-156    16-156    16-156#   16-156#   16-287    16-287
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$PASTM    5-12#
$QUES     6-0#     18-1      18-1      20-1      20-1      23-1      23-1      23-1      23-1
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$RAND    14-70     14-330    14-528    30-1#     33-546    33-:88    33-;03
$RDCHR   23-1#     26-1      26-1
$RDDEC   26-1
$RDLIN   23-1#     26-1      26-1
$RDOC"   26-1
$RDSZ    23-1      23-1#
$REG0     6-0#     19-14*    41-10     41-12     41-15     41-19     41-20     41-21     41-23     41-26
$REG1     6-0#     19-15*    41-4      41-7      41-16     41-16
$REG2     6-0#     19-16*    41-9
$REG3     6-0#     19-17*    41-3      41-4
$REG4     6-0#     19-18*    41-13     41-16
$REG5     6-0#     19-19*    41-7
$9EGAD    6-0#     11-40
$RESRE   25-1#     26-1
$RHEXT   34-164    34-193    34-<16
$RM02    11-139    37-27#
$RM03    11-136    37-28#
$RM05    11-142    37-29#
$RTNAD   17-1#
$SAVRE   25-1#     26-1      26-1
$SB2D    27-1#     33-700    33-705    33-742    33-747    33-749    33-752    33-757    33-759    33-769    33-772    33->62    33-?13
$SCOPE   11-33     24-1#
$SETUP    4-298     4-298     4-298     4-298     4-298     4-298     4-298#    4-298#    4-298#    4-298#    4-298#    4-298#    4-298#   11-33
         11-33     11-"~     11-33     11-33     11-33     11-33     11-33     11-33     11-33     11-33     11-33     11-38     11-38     11-38
         17-1      17-ı      18-1      18-1      18-1      18-1      23-1      23-1      23-1      23-1      23-1      24-1
$STUP     4-298     4-298     4-298     4-298     4-298     4-298     4-298#    4-298#    4-298#    4-298#    4-298#    4-298#    4-298#    4-298#
          4-298#    4-298#    4-298#    4-298#
$SUPRS   29-1#     33-701    33-706    33-742    33-747    33-749    33-752    33-757    33-759    33-769    33-772    33->62    33-?13
$SVLAD   24-1      24-1#
$SVPC     5-9       5-9#
$SWR      4-27#     4-37      4-38      4-38      4-38      4-38      4-38      4-38      4-38      4-38      5-2?7#    6-0       6-0       6-0
         11-33     11-33     1:-33     11-33     11-33     14-44     14-79     14-109    14-141    14-170    14-239    14-274    14-316    14-392
         14-543    15-29     15-154    15-233    15-318    16-20     16-77     16-156    16-287    16-372    17-1      17-1      17-1      17-1
         17-1      18-1      18-1      18-1      18-1      18-1      18-1      18-1      18-1      18-1      18-1      18-1      24-1      24-1
         24-1      24-1      24-1      24-1      24-1      24-1      24-1      24-1      24-1      24-1      24-1      24-1      24-1      24-1
         24-1      24-1      24-1
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$SWRMK   24-1
$TESTN    6-0#     14-44*    14-45     14-79*    14-80     14-109*   14-110    14-141*   14-142    14-170*   14-171    14-239*   14-240    14-274*
         14-275    14-316*   14-317    14-392*   14-393    14-543*   14-544    15-29*    15-30     15-154*   15-155    15-233*   15-234    15-318*
         15-319    16-20*    16-21     16-77*    16-78     16-156*   16-157    16-287*   16-288    16-372*   16-373    19-24     19-27     24-1*
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         15-233*   15-318*   16-20*    16-77*    16-156*   16-287*   16-372*   17-1*     24-1      24-1      24-1      24-1*     24-1*
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$TKINT   11-81     17-4      23-1      23-1      23-1#
$TKQEN   23-1      23-1      23-1#
$TKQIN   23-1      23-1      23-1#     23-1*     23-1*     23-1*     23-1*
$TKQOU   23-1      23-1      23-1#     23-1*     23-1*     23-1*
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         41-26
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$TMP2     6-0#
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         14-88     14-96     14-109    14-109    14-109    14-109    14-109    14-109    14-109    14-109    14-109    14-109    14-109#   14-110
         14-114    14-132    14-141    14-141    14-141    14-141    14-141    14-141    14-141    14-141    14-141    14-141    14-141#   14-142
         14-146    14-160    14-170    14-170    14-170    14-170    14-170    14-170    14-170    14-170    14-170    14-170    14-170#   14-171
         14-175    14-226    14-239    14-239    14-239    14-239    14-239    14-239    14-239    14-239    14-239    14-239    14-239#   14-240
         14-244    14-258    14-263    14-274    14-274    14-274    14-274    14-274    14-274    14-274    14-274    14-274    14-274    14-274#
         14-275    14-279    14-288    14-305    14-316    14-316    14-316    14-316    14-316    14-316    14-316    14-316    14-316    14-316
         14-316#   14-317    14-321    14-364    14-368    14-392    14-392    14-392    14-392    14-392    14-392    14-392    14-392    14-392
         14-392    14-392#   14-393    14-414    14-494    14-530    14-543    14-543    14-543    14-543    14-543    14-543    14-543    14-543
         14-543    14-543    14-543#   14-544    14-552    14-566    15-29     15-29     15-29     15-29     15-29     15-29     15-29     15-29
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         15-154    15-154    15-154    15-154    15-154    15-154#   15-155    15-158    15-164    15-217    15-233    15-233    15-233    15-233
         15-233    15-233    15-233    15-233    15-233    15-233    15-233#   15-234    15-237    15-243    15-299    15-318    15-318    15-318
         15-318    15-318    15-318    15-318    15-318    15-318    15-318    15-318#   15-319    15-322    15-328    15-386    16-20     16-20
         16-20     16-20     16-20     16-20     16-20     16-20     16-20     16-20     16-20#    16-21     16-22     16-63     16-77     16-77
         16-77     16-77     16-77     16-77     16-77     16-77     16-77     16-77     16-77#    16-78     16-79     16-134    16-156    16-156
         16-156    16-156    16-156    16-156    16-156    16-156    16-156    16-156    16-156#   16-157    16-192    16-260    16-287    16-287
         16-287    16-287    16-287    16-287    16-287    16-287    16-287    16-287    16-287#   16-288    16-290    16-314    16-363    16-372
         16-372    16-372    16-372    16-372    16-372    16-372    16-372    16-372#   16-373    16-374    16-389    33-<85    33-=12    33->17
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$TRAP2   26-1      26-1#
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         15-318*   16-20*    16-77*    16-156*   16-287*   16-372*   17-1*     18-1      18-1      18-1      19-11     24-1      24-1      24-1
         24-1      24-1      24-1*     33-182    33-375    33-773
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$TYPDS   22-1#     26-1      26-1
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$TYPEC   20-1      20-1      20-1      20-1#     23-1
$TYPEX   20-1      20-1      20-1#
$TYPOC   21-1#     26-1      26-1
$TYPON   21-1      21-1#     26-1
$TYPOS   21-1#     26-1
$UNIT     6-0#
$UNITM    5-12#
$USWR     6-0#
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$VECT2    6-0#
$XOFF    20-1      20-1
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.$X       5-12      5-12#
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A17       4-80#
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ACTSTR   34-99#    34-988*   34-:02*
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ADDW4     6-0
ADDW5     6-0
ADDW6     6-0
ADDW7     6-0
ADDW8     6-0
ADDW9     6-0
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AMAMS3    6-0       6-0
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AMSGLG    6-0       6-0
AMSGTY    6-0       6-0
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AMTYP3    6-0       6-0
AMTYP4    6-0       6-0
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APRIOR    6-0
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APTENV   18-1      20-1      32-1      32-1#
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AT4       4-203#
AT5       4-204#
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AT7       4-206#
ATA       4-138#
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          34-.51
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AVECT2    6-0       6-0
AVERGE    7-0       37-44#
BADTMO    11-3#     11-35
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BIT01     4-71      4-71#     7-0       7-0       33-472    33-500    34-390    34-655
BIT02     4-71      4-71#     7-0       7-0       33-472    33-503
BIT03     4-71      4-71#     7-0       7-0       33-509    34-849    34-;71
BIT04     4-71      4-71#     7-0       7-0       33-506    34-885
BIT05     4-71      4-71#     7-0       7-0       33-509    34-865
BIT06     4-71      4-71#     7-0       7-0       33-512    34-328    34-381    34-454    34-734    34-<42
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BIT1      4-71#
BIT10     4-71#     7-0       18-1      33-472    33-503    33-?88    34-657
BIT11     4-71#     7-0       24-1      33-156    33-503    34-281    34-417    34-618    34-972
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BIT14     4-71#     7-0       24-1      33-381    33-472    33-506    34-387    34-422    34-805    34-965    34-:75    34-;21    34-;25    34-<40
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          34-849    34-865    34-875    34-885    34-965    34-:39    34-:75    34-:83
BIT2      4-71#     34-:83
BIT3      4-71#
BIT4      4-71#
BIT5      4-71#
BIT6      4-71#
BIT7      4-71#
BIT8      4-71#
BIT9      4-71#
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BLNKS1    33->90    37-61#
BLNKS2    11-133    19-63     19-89     19-96     19-103    33-746    33-756    33-771    33->57    33->86    37-60#
BLNKS3    37-59#
BLNKS4    11-107    37-58#
BPTVEC    4-71#
BSE       4-262#    33-254    33-286    33-326    33-370    33-398    33--422   33-521
BUFFER    14-407    16-33     16-45     16-56     16-90     16-100    16-115    16-191    16-297    16-324    16-333    16-343    16-350    16-360
          33-568*   33-569    33-571    33-573    33-574    33-575    33-637    33-674    33-841    33-860    33-861    33-885    33-946    33-965
          33-980    33-:22    33-:39    33-:40    33-:57    36-8      36-32     36-56     36-80     36-104    42-104#
BUSADR     7-0#     11-15*    11-18*    11-22*    11-25*    35-13     35-15*
BYPASS     7-0#     13-37*    14-70*    14-92*    14-117*   14-149*   14-182*   14-247*   14-282*   14-325*   14-454*   14-555*   15-60*    15-175*
          15-254*   15-339*   16-26*    16-83*    16-220*   16-292*   33-434    33-904    33-:09    33-:74
C.SWR      7-0#     12-6      12-9      12-35     13-39     14-182    15-64     15-124    16-299    33-93     33-103    33-113    33-144    33-226
          33-300    33-340    33-435    33-544    33-;61    33-;65    33-;66*
CALL.A    13-43     13-45     14-70     14-341    15-60     15-175    15-254    15-339    16-381    16-386    33-242#   33-245    33-583
CALL.B    14-70     14-95     14-121    14-128    14-152    14-156    14-187    14-193    14-208    14-214    14-252    14-254    14-292    14-294
          14-296    14-298    14-300    14-302    14-361    14-558    33-272#   33-275
CALL.C    14-94     14-557    33-312#   33-315
CALL.R    33-259    33-291    33-331    33-429    33-447#   33-450
CHKDRV     7-0#     13-13*    13-17*    13-22     17-1      33-35*    33-36     33-187    41-10     41-12     41-14     41-15     41-17     41-19
          41-20     41-21     41-23     41-26
CI1       34-444    34-472#
CI3       34-446    34-496#
CI4       34-438    34-518#
CI5       34-494    34-516    34-596#   34-606
CI6       34-534    34-544    34-546    34-548    34-602#
CI7       34-377    34-453    34-484    34-488    34-492    34-501    34-510    34-514    34-526    34-533    34-539    34-543    34-557    34-563
          34-567    34-577    34-588    34-605    34-608#   34-715    34-910    34-<15
CI7B      34-623#   34-916
CI8       34-626    34-640#   34-769    34-:66
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CK.DEC    33-@20#   33-@50
CK.DIG    33-<28    33->80    33-@73#
CK.NUM    33-;93    33-?02    33-?20    33-A19#
CK.OCT    33-<73    33-<77    33-=00    33-=04    33-@02#   33-A21    33-A31
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CKSWR     18-1      18-1      24-1      26-1#
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CLOSE     33-?55    33-?60    33-?72#
CLR        4-99#    14-454    14-454    14-528    33-34     33-604    34-233    34-680
CLRBUF    16-41     33-858#
CLRQUE    14-413    34-215    34-679    34-<94#
CLSWDS    33-?35    33-?39    33-?45#
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          15-365    15-378    15-380    33-33#
CNTRLC     7-0#     11-19*    11-26*    11-101    12-3
COMMA     12-61     13-49     33-19     37-32#
CONT       4-167#
COUNT     15-111    15-193    15-271    15-283    15-356    15-368    33-653#
CPSAVE    18-1      18-1      18-1      18-1      18-1      18-1#     18-1*     18-1*     19-111    24-1      24-1      24-1      24-1*     24-1*
CR         4-71#    20-1      20-1
CRLF       4-71#    11-6      11-38     11-38     11-59     11-70     11-76     11-77     17-1      17-1      17-1      20-1      20-1      33-;59
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          37-42     37-43     37-43     37-44     37-44     37-45     37-46     37-47     37-49     37-50     37-51
CYL.DS     7-0#     14-454*   33-250*   33-280*   33-320*   33-366*   33-394*   33-418*   33-455*   33-578*   33-616*   33-920*   33-993*   41-10
          41-11     41-12     41-15     41-17     41-23     41-26
CYL.RD     7-0#     33-573*   41-11
DATCMP    16-256    33-964#
DCK        4-157#
DDISP      4-71#     6-0      11-33
DECSEC    33-826#
DECSK     14-127#   14-131
DELTA      7-0#     14-401*   14-402*   14-403    14-405*   14-528    14-528    14-528*   14-528*   14-528*
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DF10       8-83     42-19#
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DF12      8-108     42-27#
DF13      8-122      8-145     42-34#
DF14      8-131      8-154     42-41#
DF17      8-165      8-176     42-45#
DF2       8-25       8-58      42-7#
DF21      8-190     42-49#
DF22      8-199     42-56#
DF23      8-212      8-225     42-60#
DF3       8-36      42-11#
DF4       8-47      42-15#
DF41      8-258     42-68#
DF42      8-269     42-72#
DF43      8-282     42-76#
DF44      8-298     42-83#
DF45      8-314      8-330     42-93#
DFLT      9-61#     33-133
DH1       8-12      40-3#
DH10      8-81      40-7#
DH11      8-92      40-8#
DH12      8-106      8-120      8-143     8-296     8-312     8-328     40-9#
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DH13A    40-11#     42-37
DH17      8-163      8-174     40-12#
DH2       8-23       8-56      40-4#
DH21      8-188     40-13#
DH21A    40-14#     42-52
DH23      8-210      8-223     40-15#
DH23A    40-16#     42-63
DH3       8-34      40-5#
DH4       8-45      40-6#
DH41      8-256     40-17#
DH42      8-267      8-280     40-18#
DH43A    40-19#     42-79
DH44A    40-20#     42-86      42-96
DH44B    40-21#     42-89
DH45A    40-22#     42-99
DISPLA    6-0#      11-33*     11-33*    18-1*     24-1*
DISPRE    5-1#      11-33
DLT       4-109#
DMD       4-161#     4-180#
DORTI    14-454     15-92      15-182    15-259    15-344    33-625#
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DPB.B    13-33*     14-47*     14-48*    14-49*    14-70*    14-70*    14-82*    14-84*    14-86*    14-112*   14-113*   14-118*   14-122*   14-123
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         33-320     33-320     33-320    33-320    33-332    33-335    33-338    36-51#
DPB.R    33-449     33-451     33-455    33-455    33-455    33-455    36-99#
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DRQ       4-222#
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         34-922*   34-:44*
DRVCAL   16-36     16-39     16-43     16-52     16-58     16-95     16-106    16-122    16-128    16-239    16-244    16-253    16-304    16-329
         16-335    16-346    16-352    16-362    33-355#   33-359
DRVCL1   14-488    33-361#   33-362
DRVCLR    4-277#   14-475
DRVINT   34-235    34-269#   34-359    34-944    34-958
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DRVQUE   34-366    34-379    34-=34#
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DT02      4-215#
DT03      4-216#
DT04      4-217#
DT05      4-218#
DT06      4-219#
DT07      4-220#
DT08      4-221#
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DT11      8-93     41-9#
DT12      8-107    41-10#
DT12A    41-11#
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DT13A     8-130     8-153    41-13#
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DT21      8-189    41-15#
DT21A     8-198    41-16#
DT23      8-211     8-224    41-17#
DT23A    41-18#
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DT4       8-46     41-6#
DT41      8-257    41-19#
DT42      8-268    41-20#
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DT43A    41-22#
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DT44B    41-25#
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DT45B    41-28#
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         15-196*   15-197    15-201*   15-202    15-209    15-268    15-280    15-291    15-353    15-365    15-378    16-29*    16-30*    16-31*
         16-32*    16-33*    16-35*    16-37*    16-42*    16-48*    16-49*    16-50*    16-51*    16-54*    16-55*    16-56*    16-57*    16-86*
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        16-124*   16-125*   16-127*   16-129    16-190*   16-191*   16-220*   16-220*   16-221*   16-226*   16-235*   16-243*   16-252*   16-295*
        16-296*   16-297*   16-298*   16-302*   16-305*   16-306    16-308*   16-309    16-313*   16-321    16-322    16-323*   16-325*   16-332*
        16-333*   16-340*   16-341*   16-342*   16-343*   16-349*   16-350*   16-357*   16-358*   16-359*   16-360*   33-358    33-361    33-366
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        33-407    33-411    33-413    33-418    33-418    33-418    33-418    33-430    33-605*   33-606*   33-607*   33-610    33-612    33-616
        33-616    33-616    33-616    33-920    33-921    33-947    33-966    33-993    33-994    33-995    33-;44*   33-;45*   33-;46*   36-75#
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DTG      4-184#
DTO      4-193#
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        34-;19
DVA      4-124#
EBL      4-174#
ECH      4-148#
ECI      4-245#
ECRC     4-170#
EECC     4-165#
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EM10     8-80     38-8#
EM11     8-91     38-9#
EM12     S-105    38-10#
EM13     8-119     8-142     8-187    38-11#
EM17     8-162    38-12#
EM2      8-22     38-4#
EM20     8-173    38-13#
EM23     8-209    38-14#
EM24     8-222    38-15#
EM3      8-33     38-5#
EM4      8-44     38-6#
EM41     8-255     8-266     8-279     8-295     8-311    38-16#
EM46     8-327    38-17#
EM5      8-55     38-7#
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ERMAX    7-0#     33-13
ERR      4-137#   14-454    15-98     15-107    15-189    15-266    15-278    15-351    15-363
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ESRC     4-172#
EXCEED  33-20     37-38#
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EXIT0   14-70     14-70#
EXIT1   14-92     14-96#
EXIT10  14-454    14-528    14-528    14-530#
EXIT11  14-555    14-566#
EXIT12  15-35     15-60     15-60     15-60     15-138    15-143#
EXIT13  15-160    15-175    15-175    15-175    15-217#
EXIT14  15-239    15-254    15-254    15-254    15-299#
EXIT15  15-324    15-339    15-339    15-339    15-386#
EXIT16  16-26     16-63#
EXIT17  16-83     16-134#
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EXIT2   14-117  14-132#
EXIT20  16-220  16-220  16-220  16-260#
EXIT21  16-292  16-363#
EXIT22  16-389#
EXIT3   14-149  14-160#
EXIT4   14-182  14-226#
EXIT5   14-247  14-260  14-263#
EXIT6   14-282  14-290  14-305#
EXIT7   14-325  14-366  14-368#
F1       4-119#
F2       4-120#
F3       4-121#
F4       4-122#
F5       4-123#
FC       9-7#   14-70   14-70   14-70   14-86   14-118  14-130  14-150  14-183  14-192  14-224  14-248  14-261  14-283
        14-327  14-328  14-335  14-398  14-399  14-400  14-402  14-528  14-550  14-551  14-562  15-60   15-60   15-175
        15-177  15-202  15-254  15-273  15-339  15-358  16-29   16-87   16-220  16-295  16-384  33-;21  33-;39
FER      4-146#
FILBUF  16-28   16-85   33-839#
FILRAN  16-301  33-:22#
FMT16    4-246#
FS       9-13#  14-47   14-82   14-112  14-144  14-173  14-242  14-277  14-546  14-547  15-60   16-88   16-165  16-182
        16-190
FT       9-10#  14-48   14-84   14-113  14-145  14-174  14-243  14-278  14-318  14-367  14-397  14-548  14-549  15-60
        16-30   16-220
FWD     37-46#
GETADR  11-84   35-13#
GETNUM  33-;62  33-;84# 35-19   35-26
GETREG   4-290#
GETREQ  34-412  34-650  34-725  34-799  34-838  34-909  34-964  34-:38  34-:72  34-:80  34-=55#
GETSWR  11-92   33-;57#
GNS      5-1     5-1    11-6    11-38   11-59   11-70   11-76   11-77   17-1    17-1    17-1    17-1    19-52   19-66
        26-1    26-1    26-1    26-1    26-1    26-1    26-1    26-1    26-1    26-1    26-1    26-1    26-1    26-1
        26-1    26-1    26-1    26-1    26-1    26-1    26-1    26-1    33-;59  33-<23  33-<39  33->33  33-?12
GO       4-118#
GT.PR1  33-<22# 33-<26  33-<26  33-<26  33-<26  33-<26  33-<28  33-<28
GT.PR2  33-<36# 33-<47  33-=97  33->07  33-?65
GT.PRM  12-11   33-<21#
GTSWR   11-38   26-1#
GTTST1  33-<34  33-<39# 33-<88  33-=01  33-=15  33-=18  33-=45  33-=76  33-=85  33-=92  33->02  33->22
GTTST2  33-<53# 33--80
GTTST3  33-<56  33-<60  33-<64  33-<68  33-<72  33-=38#
GTTST4  33-<74  33-<98  33--35  33-=39#
GTTST5  33-=40  33-=87#
GTTST6  33-=89  33--99#
HCE      4-149# 33-284  33-324
HCI      4-244#
HCRC     4-150#
HT       4-71#  20-1    20-1
IAE      4-152#
IBSAVE  18-1    18-1    18-1    18-1    18-1    18-1#   18-1*   18-1*   18-1*
IC       9-9#   14-122  14-129  14-153  14-202  14-223  14-255  14-256  14-303  14-403  14-405  14-492  14-528  14-528
        14-559  14-563  33-813
IE       4-77#
ILF      4-142#
ILR      4-143#
INCCYL  16-220  33-811#
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INCEC     19-41     33-6#
INCSK     14-120#   14-124
INCTRK    16-257    33-794#
IOTVEC     4-71#    11-33*    11-33*
IR         4-100#
ISR       14-454    15-123    15-213    15-295    15-382    33-602    34-230    34-691#
IT         9-12#    33-796
ITEM41     8-247#   19-37
LC         9-8#     14-49     14-70     14-70     14-87     14-123    14-125    14-158    14-203    14-205    14-213    14-249    14-257    14-284
          14-328    14-333    14-401    14-493    14-528    14-528    14-560    14-564    15-197    15-261    15-346    16-222    16-309    16-379
          33-811    33-814    33-816    33-;34
LDCMD     13-36     33-226#
LF         4-71#    17-1      20-1      20-1      37-42     37-43     37-44     37-45
LKS        7-0#     33-85     33-117*
LKV ´      7-0#     14-454    14-454    33-115*   33-116*
LODEV     11-130    37-26#
LODFLT    12-10     12-18     33-130#
LODPRM    14-44     14-79     14-109    14-141    14-170    14-239    14-274    14-316    14-392    14-543    15-29     15-154    15-233    15-318
          16-20     16-77     16-156    16-287    16-372    33-180#
LOP.CK    33-261    33-293    33-333    33-378    33-431    33-458    33-468#
LP.AVL    11-90     33-46#
LPB        7-0#     18-1
LPS        7-0#     18-1      33-49
LPTAVL     7-0#     18-1      33-46*    33-50*
LS         9-14#    14-83     16-164
LSIT       4-162#
LST        4-133#
LSTRK      7-0#     16-98     16-109    16-129    16-132    16-220    16-224    16-306    33-201*   33-213*   33-;16
LT         9-11#    14-85     14-363    33-794    33-797    33-799
MABOVE    33-758    37-54#
MBELOW    33-748    37-53#
MCLK       4-191#
MCPE       4-82#
MCPEMX    34-157#   34-;01    34-;47
MDF        4-186#
MES.FT     9-52     37-10#
MES.IT     9-54     37-12#
MES.LT     9-53     37-11#
MI         4-182#
MOC        4-188#
MOH        4-223#
MOL        4-135#
MPE        4-102#
MRD        4-190#
MRMCS1    35-17     35-49#
MRMVEC    35-24     35-50#
MS         4-185#
MSC        4-181#
MSDRIV    13-47     33-16     37-36#
MSEN       4-192#
MSER       4-187#
MSG.CS    33-;60    37-17#
MSG.EQ    33->61    33->88    33-?14    37-16#
MSG.FC     9-46     37-4#
MSG.FS     9-55     37-13#
MSG.FT     9-49     37-7#
MSG.IC     9-48     37-6#
MSG.IT   9-51     37-9#
MSG.LC   9-47     37-5#
MSG.LS   9-56     37-14#
MSG.LT   9-50     37-8#
MSG.PA  33->87    37-15#
MSG.R    9-45     37-3#
MSGOUS  33-702    33-707    33-743    33-750    33-753    33-760    33-770    37-52#
MSG10X   7-0      37-64#
MSG11X   7-0      37-65#
MSG12X   7-0      37-66#
MSG7XA   7-0       7-0      37-62#
MSG7XB   7-0       7-0      37-63#
MSGAVG  33-761    37-51#
MSGB01   7-0      39-15#
MSGB02   7-0      39-14#
MSGB03   7-0      39-13#
MSGB04   7-0      39-12#
MSGB05   7-0      39-11#
MSGB06   7-0      39-10#
MSGB08   7-0      39-9#
MSGB09   7-0      39-8#
MSGB10   7-0      39-7#
MSGB11   7-0      39-6#
MSGB12   7-0      39-5#
MSGB13   7-0      39-4#
MSGB14   7-0      39-3#
MSGMAX  33-703    33-751    37-50#
MSGMIN  33-699    33-741    37-49#
MSGNON  33-783    37-57#
MSGNUM  33-775    37-56#
MSGSEA  33-777    37-55#
MSGTST  14-45     14-80     14-110    14-142    14-171    14-240    14-275    14-317    14-393    14-544    15-30     15-155    15-234    15-319
        16-21     16-78     16-157    16-288    16-373    37-35#
MUR      4-189#
MWP      4-183#
MXF      4-103#
MXSEEK   7-0      37-45#
MXSTAL   7-0#     14-199    14-220
MXWNDW  34-169#   34-503
NBA      4-225#
NC1      9-19#    14-400*   14-492*   14-493    14-528    14-528
NC2      9-20#
NED      4-106#
NEM      4-105#
NOCLOK  12-71     37-33#
NODRVS  13-10     37-39#
NONE    12-44     37-31#
NOOP     4-273#
NOTEST  12-16     37-40#
NOTPRS  11-117    37-23#
NOTRM   11-114    37-25#
NOTSAF  11-123    37-24#
OBCK     4-195#
OBEN     4-194#
OCC      4-176#
OFD      4-243#
OFFSET   4-279#
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OM        4-128#
ONECYL    7-0       37-43#
OPE       4-260#
OPI       4-155#
OPN.1     33->16#   33->32    33-?56
OPN.2     33->14    33->20    33->24#
OPN.CT    33->13#   33->16*   33->19    33->24    33->26    33->34
OPN.N1    33->80    33-?02    33-?53#
OPN.N2    33->72    33->95    33-?37    33-?54#
OPN.X1    33->80    33-?02    33-?58#
OPN.X2    33->77    33->99    33-?41    33-?59#
OPNFLG    7-0#      33-<50*   33-<51*   33-=53*   33-=57*   33-=61*   33-=65*   33-=69*   33-=71*   33-=81    33-=83    33-=93    33-=95    33->03
          33->05    33->31
OPNPAT    33->56    33->86#   33->93    33->97    33-?00    33-?02
OPNPRM    33->42    33->48#   33->52    33->93    33->93    33-?05
OPNTST    33-=82    33-=84    33-=94    33-=96    33->04    33->06    33->11#
OPNWDS    33-?10#   33-?26
OPT       34-373    34-408#   34-729    34-936    34-978
OR        4-101#
PACK      4-282#
PAR       4-145#
PAT       9-15#     16-220    33-195
PAT.PT    10-3#     33-948    33-968    33-983
PAT0      10-3      10-8#     33-140    33-?11    33-?45
PAT1      10-6      10-25#
PAT10     10-6      10-178#
PAT11     10-6      10-195#
PAT12     10-6      10-212#
PAT13     10-6      10-229#
PAT14     10-6      10-246#
PAT15     10-6      10-263#
PAT2      10-6      10-42#
PAT3      10-6      10-59#
PAT4      10-6      10-76#
PAT5      10-6      10-93#
PAT6      10-6      10-110#
PAT7      10-6      10-127#
PAT8      10-6      10-144#   33-139
PAT9      10-6      10-161#   33-142
PDA       4-169#
PFECH     19-29     19-107#
PFECH1    19-107    19-108#
PFECH2    19-107    19-109#
PFECH3    19-107    19-111#
PFECH4    19-107    19-112#
PFTSTN    19-27*    19-111    19-115#
PGE       4-104#
PGM       4-132#
PHA       4-168#
PIP       4-136#
PIRQ      4-71#
PIRQVE    4-71#
PKB       7-0#      15-93*    15-102*   15-183*   15-260*   15-272*   15-345*   15-357*   33-107*
PKC       7-0#      33-657    33-659    33-660    33-664    33-666    33-667    33-671    33-676
PKCS      7-0#      15-94*    15-97*    15-104*   15-106*   15-115*   15-186*   15-188*   15-205*   15-263*   15-265*   15-275*   15-277*   15-287*
          15-348*   15-350*   15-360*   15-362*   15-374*   33-79     33-108*
PKV       7-0#      14-454    14-454    15-91*    15-181*   15-258*   15-343*   33-105*   33-106*
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PLFS      4-171#
POPQUE   34-421    34-472    34-589    34-891    34-926    34-970    34-=70*
PR0       4-71#
PR1       4-71#
PR2       4-71#
PR3       4-71#
PR4       4-71#
PR5       4-71#
PR6       4-71#    11-36
PR7       4-71#    14-454    14-454
PRM       9-4#     33-185    33-189*   33-203*   33-206*   33-209*   33->38    33->48    33-?73
PRM0      9-23      9-84#    33-134
PRM1      9-26      9-93#
PRM10     9-26      9-166#
PRM11     9-26      9-175#
PRM12     9-26      9-185#
PRM13     9-26      9-193#
PRM14     9-26      9-199#
PRM15     9-26      9-205#
PRM16     9-26      9-211#
PRM17     9-26      9-218#
PRM2      9-26      9-106#
PRM20     9-26      9-224#
PRM21     9-26      9-240#
PRM22     9-26      9-246#
PRM3      9-26      9-116#
PRM4      9-26      9-126#
PRM5      9-26      9-136#
PRM6      9-26      9-146#
PRM7      9-26      9-156#
PRMLMT    9-30#    14-353    14-466    16-61     16-168    16-181    33-146*   33-147*   33-150*   33-151*   33-167    33-169    33-201    33-213
         33-829    33-847    33-898    33-:23    33-;09    33->55    33->80
PRMMSG    9-45#    33->58
PRMPT     9-23#    33-153    33-184    33->36    33-?74
PS        4-71      4-71#    11-98*    13-31*    14-454*   14-454*   14-454*   14-487*   15-116*   15-206*   15-288*   15-375*   33-601*   34-213
         34-214*   34-243*   34-251*   34-345    34-346*   34-399*   34-409    34-457*
PSEL      4-81#
PSW       4-71#
PTRN15    9-237#
PWRVEC    4-71#
QCNT     34-<53#   34-<95    34-=19*   34-=34    34-=36*   34-=56    34-=70*
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QDRV1    34-<63    34-<70    34-<73    34-<86#
QDRV2    34-<63    34-<70    34-<74    34-<86#
QDRV3    34-<63    34-<70    34-<75    34-<86#
QDRV4    34-<63    34-<70    34-<76    34-<86#
QDRV5    34-<63    34-<70    34-<77    34-<86#
QDRV6    34-<63    34-<70    34-<78    34-<86#
QDRV7    34-<63    34-<70    34-<79    34-<86#
QINPT    34-<60#   34-=21    34-=38*   34-=39*   34-=40    34-=42*
QOUTPT   34-<67#   34-=21*   34-=59    34-=72    34-=73*   34-=74*   34-=75    34-=77*
QSTART   34-<72#   34-=01    34-=06    34-=42    34-=77
QSTOP    34-<73#   34-=40    34-=75
QTERM    34-<80    34-<87#
R6        4-71#    11-33     11-33*    11-33*
R7        4-71#
RANADR   16-320    16-331    16-348    33-;03#
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RANCK    16-338    16-355    33-:37#
RANPAT   16-326    33-:24    33-:44    33-:85#
RD.ADR   34-;03*   34-;04*   34-;06#   41-5
RD.RM    34-283    34-313    34-319    34-537    34-561    34-575    34-713    34-767    34-841    34-851    34-867    34-:22    34-;01#   34-;54
         34-;68    34-;74    34-<07
RD.RM1   34-;05#   34-;33
RD.RM2   34-;01*   34-;32#
RD.RM3   34-;12    34-;24    34-;34#
RD.RM4   34-;17    34-;36#
RD.WRD   34-;07#   34-;08    41-5      41-6
RDCHR    23-1      26-1#
RDLIN    26-1#     33-;89    33-<24    33-<40    33->64    33->91    33-?16
RDY       4-78#
READ      4-288#   16-42     16-252    16-332    16-349
READHD    4-289#   33-228    33-229    33-295    33-335
READIN    4-281#
RECAL     4-276#   13-44     13-44     14-46     14-46     33-582    33-607    36-101
RELEAS    4-278#
RESREG   15-100    15-109    15-119    15-191    15-209    15-268    15-280    15-291    15-353    15-365    15-378    19-105    26-1#     28-1
         33-640    33-849    33-872    33-906    33-954    33-976    33-<36    33->21    33-?36    33-?40    33-?64    33-?90    34-252    34-393
         34-396    34-458    34-686    34-698    34-:01    34-<26    34-=10
RESVEC    4-71#
REV       7-0       7-0       7-0      37-47#
REX       4-173#
RH.ADR    7-0#     35-16     35-34     35-36     41-8
RHVEC     7-0#
RM.REG   13-52     33-252    33-254    33-257    33-282    33-284    33-286    33-289    33-322    33-324    33-326    33-329    33-368    33-370
         33-381    33-396    33-398    33-420    33-422    33-427    33-519    33-521    33-826    36-15     36-39     36-63     36-87     36-111
         36-126#   41-14     41-14     41-14     41-14     41-14     41-17     41-17     41-17     41-18     41-18     41-18     41-18     41-18
         41-20     41-20     41-20     41-21     41-21     41-21     41-22     41-22     41-22     41-24     41-24     41-24     41-24     41-24
         41-24     41-25     41-25     41-25     41-27     41-27     41-27     41-27     41-27     41-27     41-28     41-28     41-28     41-28
         41-28     41-28
RM05     33-243    33-273    33-313    33-357    33-387    33-404    33-410    33-448    33-609    34-345#
RMADR    14-320    14-412    33-7      33-33     33-603    34-162#   34-232    34-352    34-475    34-496    34-518    34-693    34-:20    34-;03
         34-;09    34-;13    34-;27    34-;60    34-;64    34-;96    34-<37    35-37
RMAS     34-180#   34-318*   34-765    34-895*   34-931*   34-954*   34-:50
RMBA     14-477*   34-175#
RMCS1    14-454*   14-475*   14-486*   15-262*   15-274*   15-347*   15-359*   34-173#   34-274*   34-281    34-307    34-416*   34-417    34-491
         34-513    34-556    34-576    34-587    34-604    34-625    34-714    34-768    34-827    34-858    34-903    34-972    34-;55
RMCS2    14-343*   14-454*   14-454*   14-454*   14-454*   14-456*   14-528*   14-528*   33-8      33-34*    33-36*    33-604*   34-177#   34-233*
         34-273*   34-275    34-365*   34-415*   34-476*   34-497*   34-519*   34-608    34-653    34-669    34-680*   34-712*   34-839*   34-939*
         34-953*   34-:21*   34-;10    34-;65    34-;97*   34-<03    34-<38*   34-<43
RMDA     14-478*   15-60*    33-619*   33-826    34-176#   34-483    34-509    34-525
RMDB     34-182#   34-<01
RMDC     14-454*   15-60*    15-184*   15-261*   15-273*   15-346*   15-358*   33-620*   34-187#   34-487    34-500    34-532
RMDS     14-454    14-454    15-98     15-107    15-189    15-266    15-278    15-351    15-363    34-178#   34-314    34-842    34-868    34-940
         34-:23
RMDT     34-184#   34-284
RMEC1    34-191#
RMEC2    34-192#   34-<11
RMER1    33-252    33-282    33-284    33-322    33-324    33-368    33-396    33-420    33-519    34-179#   34-320    34-852    34-941    34-;69
RMER2    33-254    33-257    33-286    33-289    33-326    33-329    33-370    33-398    33-422    33-427    33-521    34-190#   34-942
RMERRS   34-23#    34-216    34-805    34-810    34-820    34-940*   34-941*   34-942*   34-943*   41-4      41-4      41-4      41-4      41-7
         41-7      41-7      41-7
RMHR     34-188#
RMINIT   11-95     34-212#
RMLA     14-344    14-457    34-181#
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RMMR2    34-189#  34-943
RMOF     34-186#  34-311   34-538   34-542   34-562   34-566
RMR       4-144#
RMSN     34-185#
RMTMR    33-121   34-986#
RMVEC    14-454*  14-454*  15-92*   15-123*  15-182*  15-213*  15-259*  15-295*  15-344*  15-382*  33-602*  34-163#  34-229   34-231
         34-346
RMWC     14-476*  34-174#
ROTATE    7-0      7-0      7-0      7-0     37-42#
RPT       9-6#    14-44    14-79    14-109   14-141   14-170   14-239   14-274   14-316   14-392   14-543   15-29    15-154   15-233
         15-318   16-20    16-77    16-156   16-287   16-372   33->62   33->81*  33->89   33-?03*  33-?53*  33-?58*
RSTART   13-5#    13-28    17-6
RSTRT1   12-72    13-13#   13-19
RTC       4-280#
RTURN    17-1     17-3#
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SAVEFG   11-96*   34-117#  34-591   34-718   34-928
SAVREG   15-100   15-109   15-119   15-191   15-209   15-268   15-280   15-291   15-353   15-365   15-378   19-12    26-1#    28-1
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SC12     34-801   34-814   34-939#
SC13     34-791   34-794   34-950#
SC2       4-232#
SC3      34-780#  34-785
SC4      34-783#  34-817   34-831   34-833   34-884   34-905   34-917   34-937   34-979
SC5      34-781   34-789#
SC6      34-813   34-835#
SC6A     34-811   34-861#
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SC8      34-828   34-843   34-853   34-859   34-869   34-904   34-907#  34-948
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         15-386   16-63    16-134   16-260   16-363   16-389
SCTRWC    4-296#  16-49    16-89    16-313
SEARCH    4-283#  15-95    15-103
SEC.DS    7-0#    33-250*  33-280*  33-320*  33-366*  33-394*  33-418*  33-455*  33-576*  33-616*  33-995*  41-10    41-11    41-12
         41-23    41-26
SEC.RD    7-0#    33-575*  41-11
SEEK      4-275#  14-319   14-319   14-395   14-395   14-454   15-60    15-60    15-175   15-175   15-185   15-254   15-254   15-262
         15-274   15-339   15-339   15-347   15-359   16-380   16-380   16-385   16-385   33-231   33-232
SEEKFG   12-34*   12-37*   34-125#  34-217   34-442
SEKCNT    7-0#    14-489   14-491*  14-528*
SEKTMR    7-0#    14-454*  14-528*
SELDRV    4-292#
SERIAL   13-50    37-34#
SET.IE   34-246   34-277   34-383   34-456   34-685   34-773   34-<36#
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SETFOK    4-291#  13-42    13-44    14-46    14-319   14-395   15-60    15-175   15-254   15-339   16-380   16-385
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SLASH    33-;88   33->63   37-19#
SP10      7-0#    15-216
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SP12     7-0#     15-385
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SP7A1    7-0#     15-76
SP7B     7-0#     15-73     15-142
SP7B1    7-0#     15-68
SPTYP   15-138    15-141    15-215    15-297    15-384    33-689#
SRCHOO  15-37     15-162    15-241    15-326    33-600#
SRCHWT  34-87#    34-410*   34-515*   34-923    34-932*
SRTDRV  11-102    12-3#
SRTINT  11-83     11-86#
SRVCLK  33-105    33-115    33-120#
ST.CLK  11-94     15-122    15-212    15-294    15-381    17-5      33-72#
ST.LCL  33-87     33-112#
ST.PCL  33-81     33-102#
STACK    4-71#    11-33     14-70     14-93     14-119    14-126    14-151    14-154    14-185    14-206    14-250    14-286    14-326    14-340
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        16-351    16-361    16-378    17-3
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STALL3   7-0#     16-383    16-388
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START3   5-5      11-15#
START4   5-7      11-22#
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STO2    34-:29    34-:31    34-:33    34-:50#
STO3    34-:52    34-:59#
STO5    34-:66#
STO6    34-:54    34-:69#
STO7    34-:56    34-:78#
STO8    34-:76    34-:84#
STO9    34-:27    34-:37    34-:48    34-:57    34-:62    34-:64    34-:67    34-:74    34-:82    34-:86#
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SVSTAT   7-0#     19-47     33-497*
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SWO3     4-71      4-71#    16-229    16-240
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TEST14  15-233   15-254#
TEST15  15-318   15-339#
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TEST17  16-77    16-83    16-83#
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TEST20  16-156   16-220#
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TICKUS   7-0#    33-96*   33-99*
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TIM.PT   7-0#    33-635   33-674   33-676*  33-677*
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TIMER    14-484*    34-130#   34-451*   34-597*   34-661*   34-707*   34-836*   34-882*   34-934*   34-951*   34-975*   34-992    34-994*   34-:63*
         34-:71*    34-:78*
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TP60     15-75*     15-80*    15-138#
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         17-1       18-1      18-1      19-42     19-43     19-52     19-58     19-59     19-63     19-66     19-69     19-70     19-79     19-89
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         33-741     33-743    33-746    33-748    33-750    33-751    33-753    33-756    33-758    33-760    33-761    33-770    33-771    33-775
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         33->87     33->88    33->90    33-?12    33-?14
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UNS       4-156#
UNSTAT   11-104   37-20#
UNTOFF   11-120   37-21#
UNTON    11-132   37-22#
UPE       4-107#
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US2       4-95#
US4       4-96#
VERIFY   33-297   33-337   33-566#
VV        4-129#
WC        4-166#
WCE       4-108#
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WCF       4-147#
WCHKX    34-721   34-741
WD        4-164#
WLE       4-153#
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WRT.R1   34-;61#  34-;81
WRT.R2   34-;47*  34-;80#
WRT.R3   34-;56   34-;67   34-;70   34-;76   34-;82#
WRT.R4   34-;72   34-;84#
WRT.R5   34-;83   34-;85#
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         34-603   34-624   34-826   34-857   34-902   34-;47#
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         15-318   16-20    16-77    16-156   16-287   16-372
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.SWRLO   4-38#    4-39     4-40     4-41     4-42     4-43     4-44     4-45     4-46
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CKNUM    10-429#  33-;93   33-?02   33-?20
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         14-214   14-252   14-254   14-292   14-294   14-296   14-298   14-300   14-302   14-341   14-361   14-557   14-558   15-60
         15-175   15-254   15-339   16-381   16-386   33-583
DODTA    10-370#  16-36    16-39    16-43    16-52    16-58    16-95    16-106   16-122   16-128   16-239   16-244   16-253   16-304
         16-329   16-335   16-346   16-352   16-362
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         16-345    16-351    16-361
MORE.S   10-326#   14-44     14-79     14-109    14-141    14-170    14-239    14-274    14-316    14-392    14-543    15-29     15-154    15-233
         15-318    16-20     16-77     16-156    16-287    16-372
MORETA    5-15#     6-0       8-1#
MSG      14-37#    14-44     14-72#    14-79     14-98#    14-109    14-134#   14-141    14-162#   14-170    14-228#   14-239    14-265#   14-274
         14-307#   14-316    14-370#   14-392    14-532#   14-543    15-13#    15-29     15-145#   15-154    15-219#   15-233    15-301#   15-318
         16-9#     16-20     16-65#    16-77     16-136#   16-156    16-262#   16-287    16-365#   16-372
MULT      4-71#
NEWTST    4-71#    14-44     14-79     14-109    14-141    14-170    14-239    14-274    14-316    14-392    14-543    15-29     15-154    15-233
         15-318    16-20     16-77     16-156    16-287    16-372
POP       4-71#    22-1      25-1      30-1      31-1      32-1      32-1      33-171    33-216    33-784
PUSH      4-71#    22-1      25-1      30-1      31-1      32-1      32-1      32-1      33-130    33-180    33-728
REPORT    4-71#    10-296#   15-214    15-296    15-383
SAV.RH   10-280#   15-100    15-109    15-119    15-191    15-209    15-268    15-280    15-291    15-353    15-365    15-378
SET.TN   10-301#   14-44     14-79     14-109    14-141    14-170    14-239    14-274    14-316    14-392    14-543    15-29     15-154    15-233
         15-318    16-20     16-77     16-156    16-287    16-372
SETPRI    4-71#    23-1
SETTRA   26-1      26-1      26-1      26-1      26-1      26-1      26-1      26-1      26-1      26-1      26-1      26-1#
SETUP     4-71#    11-33
SKIP      4-71#
SLASH     4-71#    14-1      14-25     14-29     14-35     15-3      15-11     16-5      16-7
STARS     4-71#     4-270     5-9       5-12      5-12      5-12      6-0       6-0       6-0       8-227     8-245    14-44     14-44     14-79
         14-79     14-109    14-109    14-141    14-141    14-170    14-170    14-239    14-239    14-274    14-274    14-316    14-316    14-392
         14-392    14-543    14-543    15-29     15-29     15-154    15-154    15-233    15-233    15-318    15-318    16-20     16-20     16-77
         16-77     16-156    16-156    16-287    16-287    16-372    16-372    17-1      18-1      20-1      21-1      22-1      23-1      23-1
         23-1      23-1      23-1      24-1      25-1      26-1      27-1      28-1      29-1      30-1      31-1      32-1      34-15
SWRSU     4-71#    11-33     11-33#
TRMTRP   26-1#
TSTTYP    4-14#    14-45     14-80     14-110    14-142    14-171    14-240    14-275    14-317    14-393    14-544    15-30     15-155    15-234
         15-319    16-21     16-78     16-157    16-288    16-373
TYPB2D   10-288#   33-742    33-747    33-749    33-752    33-757    33-759    33-769    33-772    33->62    33-?13
TYPBIN    4-71#
TYPDEC    4-71#    19-86
TYPEND   16-396#   17-1
TYPNAM    4-71#    11-38
TYPNUM    4-71#
TYPOCS    4-71#    11-106    12-58     13-48     14-45     14-80     14-110    14-142    14-171    14-240    14-275    14-317    14-393    14-544
         15-30     15-155    15-234    15-319    16-21     16-78     16-157    16-288    16-373    17-1      33-17     33->34
TYPOCT    4-71#    17-1      19-84     23-1      33-;87    33->89    33-?15
TYPTXT    4-71#    11-6      11-59     11-70     11-76     11-77     17-1      17-1      17-1      17-1      19-52     19-66     33-;59    33-<23
         33-<39    33->33    33-?12
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