RP04/05/06

FUNCTION CONTROL PART 2

MD-11-DZRJJ-A

EP-DZRJJ-A-DL-A

NOV 1976

FICHE 1 OF 2

MADE IN USA

RP04/05/06

functional cont. TEST 2

MD-11-DZRJJ-A

EP-DZRJJ-A-DL-A

FICHE 2 OF 2

NOV 1976

digital

MADE IN USA

B01

DZRJJA

SEQ

```
LPTSPL Version 101(2111) Running on MTB141
 *START* User WELLINGHAM,A[400,3722]  Job  DZRJJA Seq. 6617 Date 11-May-76 12:00:08 Monitor     RV242A KI10 SYS#514 *START*
Request created: 11-May-76 11:25:22
File: RPSB:DZRJJA.SEQ<055>[401,3722] Created: 03-May-76 10:13:49 Printed: 11-May-76 12:00:12
QUEUE Switches:  /PRINT:ARROW /FILE:ASCII /COPIES:1 /SPACING:1 /LIMIT:2000 /FORMS:NORMAL
```

PRODUCT CODE: MAINDEC-11-DZRJJ-A-D

PRODUCT NAME: RP04/5/6 FUNCTIONAL CONTROLLER TEST PART II

DATE CREATED: MAY 1975

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: PETE BLACKSTONE

CONTENTS

1.0 ABSTRACT

THIS DIAGNOSTIC TESTS THE DCL OF THE RP04/5/6 DISK SUBSYSTEM WHEN CONNECTED TO EITHER AN RH11 OR RH70 CONTROLLER.

IT USES THE DISK SURFACE AND THE DRIVE MECHANICS TO PROVE THE PROPER WORKING OF THE SUBSYSTEM. IT DOES NOT NEED A FORMATTED DISK PACK. A DISK PACK WITH NO VITAL INFORMATION WRITTEN ON IT IS ESSENTIAL. AFTER A SUCCESSFUL RUN (WITH NO ERRORS) OF THIS DIAGNOSTIC IT CAN BE ASSERTED THAT THE DCL IN THE RP04/5/6 SUBSYSTEM WORKS SUCCESSFULLY WHILE STANDING ALONE. SYSTEMS INTERACTION AND DRIVE TIMING IS LEFT TO OTHER DIAGNOSTICS. THIS IS WITH THE ASSUMPTION THAT STATIC 1 (DZRPS AND DZRPT) HAS BEEN RUN SUCCESSFULLY.

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP-11 COMPUTER WITH CONSOLE TELETYPE, AND A RP04/5/6 DISK SYSTEM. THE RP04/5/6 DISK SYSTEM WILL CONSIST OF AN RH11 CONTROLLER, A DISK CONTROL LOGIC (DCL), A DEC 733 DISK DRIVE, AND ITS APPROPRIATE DISK PACK. THE DISK PACK NEED NOT BE FORMATTED. USED SECTION OF THE DISK SURFACE SHALL BE GOOD (HOLE FREE). THE SURFACE FOR THE FOLLOWING SECTORS MUST BE GOOD, THAT IS, FREE OF ANY HOLES OR SURFACE IRREGULARITY BEFORE ANY DATA ERROR CAN BE ATTRIBUTED TO THE LOGIC.

```
CYLINDER 00, TRACK 00, SECTOR 00
CYLINDER 00, TRACK 00, SECTOR 01
CYLINDER 00, TRACK 18, SECTOR 21
CYLINDER 01, TRACK 00, SECTOR 00
CYLINDER 02, TRACK 00, SECTOR 00
CYLINDER 03, TRACK 00, SECTOR 00
CYLINDER 04, TRACK 00, SECTOR 00
CYLINDER 05, TRACK 00, SECTOR 00
CYLINDER 05, TRACK 07, SECTOR 04
CYLINDER 06, TRACK 00, SECTOR 00
CYLINDER 07, TRACK 00, SECTOR 00
CYLINDER 08, TRACK 00, SECTOR 00
CYLINDER 09, TRACK 18, SECTOR 21
CYLINDER 410,TRACK 18, SECTOR 21
```

2.2 STORAGE

THIS PROGRAM REQUIRES 16K WORDS OF MEMORY

2.3 PRELIMINARY PROGRAMS

THIS PROGRAM ASSUMES THAT MAINDEC-11-DZRJG-(LATEST REV) HAS BEEN RUN WITHOUT ERRORS.

IT ASSUMES THAT MAINDEC-11-DZRJH-(LATEST REV) HAS BEEN RUN WITHOUT ERRORS.

AND IT ASSUMES THAT MAINDEC-11-DZRJI-(LATEST REV) HAS BEEN RUN WITHOUT ERRORS.

3.0 LOADING PROCEDURE

USE STANDARD PROCEDURE FOR LOADING .ABS TAPES

4.0 STARTING PROCEDURE

SWITCH 12 MUST BE SET WHEN THIS PROGRAM IS TO BE RUN USING AN RH70 CONTROLLER. IT CAN BE SET AT THE FRONT PANEL, OR IN THE SOFTWARE SWITCH REGISTER IF THE OPERATOR SO DERSIRES. SEE PARAGRAPH 5.1 FOR A DESCRIPTION OF SOFTWARE SWITCH REGISTER OPERATION.

4.1 CONTROL SWITCH SETTINGS

SEE SECTION 5.1

4.2 STARTING ADDRESS

START AT ADDRESS 200---FOR NORMAL RUN
START AT ADDRESS 210---FOR UNIT SELECTION

200 START
ALL SWITCHES MUST BE DOWN FOR WORST CASE RUN. WITH THIS STARTING ADDRESS ALL THE RP04/5/6S ON THE SYSTEM WILL BE TESTED ONE AT A TIME BEFORE "END PASS" IS PRINTED OUT. TESTING WILL START WITH THE LOWEST UNIT NUMBER DRIVE THAT IS POWERED UP (THAT IS THE LOWEST UNIT NUMBER RHAS REGISTER THAT RESPONDS)THEN GO ON TO THE NEXT HIGHER UNIT NUMBER THAT IS POWERED UP.

210 START
ALL SWITCHES MUST BE DOWN FOR WORST CASE RUN. WITH THIS STARTING ADDRESS THE CONSOLE TELETYPE WILL ASK FOR THE UNIT NUMBER TO BE TESTED. THEN ONLY THAT UNIT WILL BE TESTED FOR EACH PASS OF THE PROGRAM.

4.3 PROGRAM AND/OR OPERATOR ACTION

1. LOAD THE PROGRAM INTO MEMORY.
2. SET STARTING ADDRESS ON THE SWITCH REGISTER
3. PRESS "LOAD ADDRESS".
4. SET "OPERATIONAL SWITCH SETTINGS" (SEE SECTION 5.1) WORST CASE IS ALL SWITCHES DOWN.
5. PRESS "START".
6. FOR THE FIRST PASS EACH TEST WILL BE EXECUTED ONCE ON THE DRIVES PRESENT OR DRIVE SELECTED BEFORE "END PASS" IS PRINTED. THE FIRST PASS WILL REQUIRE OPERATOR INTERVENTION IF THE PROGRAM IS NOT RUN UNDER AN "ACT-11" MONITOR. THE SECOND AND SUBSEQUENT PASSES WILL EXECUTE EACH TEST FOUR TIMES ON EACH DRIVES PRESENT OR DRIVE SELECTED BEFORE "END PASS" IS PRINTED. THE SECOND AND SUBSEQUENT PASSED DO NOT NEED ANY OPERATOR INTERVENTION.

5.0 OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

IF THE PROGRAM IS BEING RUN ON A SWITCHLESS PROCESSOR (I. E. AN 11/34) IT WILL DETERMINE THAT A HARDWARE SWITCH REGISTER IS NOT PRESENT, AND WILL USE A "SOFTWARE" SWITCH REGISTER. THE SETTINGS OF THE "SOFTWARE" SWITCHES ARE CONTROLLED THROUGH A KEYBOARD ROUTINE WHICH IS CALED BY TYPING A 'CONTROL G'. THE PROGRAM WILL RECOGNIZE A 'CONTROL G' AT ANY TIME EXCEPT WHEN IT IS AT A HIGHER PRIORITY PROCESSING AN RP04/5/6 INTERRUPT. THE "SOFTWARE" SWITCH VALUES ARE ENTERED AS AN OCTAL NUMBER IN RESPONSE TO PROMPTING 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 ALSO BE USED. IF THE PROGRAM FINDS ALL 16 SWITCHES IN THE 'UP' POSITION WHEN IT IS STARTED, ALL SWITCH REGISTER REFERENCES WILL BE TO THE "SOFTWARE" REGISTER AND THE PROCEDURES DESCRIBED ABOVE MUST BE FOLLOWED.

SWITCH DEFINITIONS ARE GIVEN IN SECTION 9 "OPERATIONAL SWITCH SETTINGS" HOWEVER THE DETAIL DESCRIPTION ARE GIVEN HERE.

SWITCH 15 - HALT ON ERROR
WHEN THIS SWITCH IS SET, IF THE PROGRAM FINDS AN ERROR THEN THE APPROPIATE INFORMATION WILL BE PRINTED OUT AND THEN THE PROGRAM WILL HALT. AFTER THIS HALT, PRESSING "CONTINUE" WILL CONTINUE WITH THE PROGRAM TILL THE NEXT ERROR IS FOUND WHEN THE SAME THING WILL HAPPEN.

SWITCH 14 - LOOP ON TEST
WHEN THIS SWITCH IS SET THE PROGRAM WILL BEGIN TO LOOP ON THE CURRENT TEST BEING EXECUTED. FOR EXAMPLE IF THIS SWITCH IS SET WHEN THE PROGRAM IS IN TEST 10 THEN THE PROGRAM WILL KEEP EXECUTING ALL OF TEST 10 REPEATEDLY. ONE WAY TO BE SURE THAT THE PROGRAM IS IN THE EXPECTED TEST IS TO SET THIS SWITCH DURING AN ERROR PRINTOUT OR DURING A PROGRAM HALT.

SWITCH 13 - INHIBIT ERROR TYPEOUTS
WHEN THIS SWITCH IS SET FURTHER ERROR PRINTOUTS WILL CEASE, HOWEVER OPERATOR INSTRUCTIONS SUCH AS "STOP DRIVE X" WILL CONTINUE. AT THE END OF PASS "TOTAL NUMBER OF ERRORS ON THIS PASS ON DRIVE X" WILL BE TRUE, THAT IS, ALTHOUGH PRINTOUTS WERE INHIBITED IF THAT PASS FOUND 6 ERRORS, IT WILL SAY SO.

SWITCH 12 - RH70 CONTROLLER SELECT
THIS SWITCH MUST BE SET AT THE START OF THE PROGRAM WHEN THE DISK DRIVES TO TESTED ARE CONNECTED TO AN RH70 CONTROLLER.

IT MUST NOT BE SET WHEN DISK DRIVES TO BE TESTED ARE CONNECTED TO AN RH11 CONTROLLER.

SWITCH 11 - INHIBIT ITERATIONS
WHEN THIS SWITCH IS SET THE PROGRAM ON SECOND PASS WILL NOT REPEAT EACH TEST FOUR TIMES BUT WILL DO EACH TEST ONCE ONLY.

SWITCH 10 - BELL ON ERROR
WHEN THIS SWITCH IS SET, IF THE PROGRAM FINDS AN ERROR THE "BELL" OR "ALARM" WILL BE SOUNDED. THIS SWITCH IS USEFUL WHEN SWITCH 11 IS SET YET INFORMATION IS NEEDED WHEN ANY ERROR IS DETECTED. TAKE THE EXAMPLE OF A PROGRAM LOOPING ON A TEST WITH SWITCH 11 SET TO HELP SCOPING. THEN IF THIS SWITCH IS SET AND THE BELL OR ALARM SOUNDS IT MEANS THAT THE ERROR IS PRESENT BUT IF THE BELL OR ALARM STOPS IT MEANS THAT THE ERROR IS NOT PRESENT.

SWITCH 9 - LOOP ON ERROR
WHEN THIS SWITCH IS SET, IF THE PROGRAM FINDS AN ERROR THEN GENERALLY THE PROGRAM WILL LOOP BACK TO THE LAST EXECUTED "SCOPE" STATEMENT. IF ON THE SECOND TIME THROUGH AN ERROR IS FOUND IT WILL AGAIN LOOP BACK TO THAT "SCOPE" STATEMENT. THIS LOOPING WILL CONTINUE AS LONG AS THE ERROR IS PRESENT AND THIS SWITCH IS SET. HOWEVER IF THE ERROR IS NOT PRESENT AT ANY TIME THEN IT WILL CONTINUE NORMALLY WITH THE PROGRAM. EACH TIME THE ERROR IS ENCOUNTERED PRINTOUT WILL TAKE PLACE UNLESS SWITCH 11 IS ALSO SET. DURING BEGUG, USING A SCOPE, IT IS RECOMMENDED THAT SWITCH 11 IS ALSO SET.

NOTE: SEE SECTION 8.3

SWITCH 8 - LOOP ON TEST IN SWR <7:0>
THIS IS A SPECIAL SWITCH. WHEN SET SWITCHES 0 THRU 7 HAVE ONE MEANING AND WHEN RESET SWITCHES 0 THRU 7 HAVE ANOTHER MEANING. THIS MEANS THAT ANY SETTING OF SWITCH 0 THRU 7 MUST BE DONE WITH SWITCH 8 IN THE APPROPIATE POSITION. WHEN THIS SWITCH IS SET THEN SWITCHES 0 THRU 7 GIVE THE TEST NUMBER TO BE LOOPED ON. FOR EXAMPLE WITH SWITCH 8 SET AND SWITCH 3 SET THE PROGRAM WILL LOOP ON TEST 10. HOWEVER THIS SETTING MUST BE DONE AT THE BEGINNING OF THE PROGRAM THEN ALL THE TESTS FROM 1 TO 10 WILL BE EXECUTED AND THEN TEST 10 WILL BE REPEATED OVER AND OVER AGAIN. WHEN THIS SWITCH IS NOT SET THEN SWITCHES 0 THRU 7 HAVE THE MEAING ITS NAME INDICATES.
FOR EXAMPLE SWITCH 7 IS "STOP FURTHER COMPARES: THAT IS IF SWITCH 8 IS NOT SET AND SWITCH 7 IS SET THEN WHEN A DATA ERROR IS DETECTED NO FURTHER COMPARES WILL BE DONE. FOR EXAMPLE IN A 256 WORD BUFFER IF ALL THE WORDS ARE IN ERROR THEN AFTER SEEING THE PRINTOUT FOR THE FIRST FEW WORDS SETTING SWITCH 7 ONLY WILL STOP FURTHER PRINTOUTS OF THIS ERROR AND GO ON WITH THE TEST RATHER THAN PRINT ALL THE 256 WORDS. HOWEVER IF THIS WAS DONE WITH SWITCH 11 THEN THE NEXT ERROR THAT THE PROGRAM DETECTS IN A SUB-SEQUENT TEST WILL ALSO BE LOST. BUT WITH SWITCH 7, ONLY

THIS GROUP OF DATA ERRORS ARE NOT PRINTED OUT. ANOTHER EXAMPLE OF SWITCH 8 BEING LOW IS WITH SWITCH 6, WHICH IS "ECC TEST-COMPARE END RESULT ONLY". THAT IS IF SWITCH 8 IS NOT SET AND SWITCH 6 IS SET THEN ON ECC TESTS (TEST 120 THRU TEST 134) INSTEAD OF COMPARING CONTENTS OF THE POSITION REGISTER AND PATTERN REGISTER AFTER EVERY CLOCK, COMPARES WILL ONLY BE DONE AT THE END OF ALL THE CLOCKS.

NOTE: SEE SECTION 8.3

SWITCH 7 - STOP FURTHER COMPARES IF SW08 IS LOW.
IF SWITCH 8 IS SET AND THIS SWITCH IS ALSO SET THEN THIS SWITCH GIVES THE TEST NUMBER TO BE LOOPED ON AS INDICATED IN THE DESCRIPTION OF SWITCH 8. IF SWITCH 8 IS NOT SET AND THIS SWITCH IS SET THEN THE PROGRAM WILL DO AS THE NAME INDICATES. FOR EXAMPLE IN A 256 WORD BUFFER IF ALL THE WORDS ARE IN ERROR THEN AFTER SEEING THE ERROR PRINTOUTS FOR THE FIRST FEW WORDS THEN SETTING SWITCH 7 WITH SWITCH 8 NOT SET WILL STOP THE PRINTOUT OF ALL 256 WORDS BUT WILL NOT STOP THE PRINTOUT OF ANOTHER ERROR IN ANY SUBSEQUENT TEST. IT IS EXPECTED THAT SWITCH 7 AFTER BEING SET FOR A WHILE TO STOP PRINTING ALL THE 256 WORDS WILL BE RESET AGAIN TO ENABLE THE PRINTING OF OTHER DATA ERRORS.

SWITCH 6 - TYPE ALL REGISTERS WITH ERROR IF SW08 IS LOW
IF SWITCH 8 IS SET AND THIS SWITCH IS ALSO SET THEN THIS SWITCH GIVES THE TEST NUMBER TO BE LOOPED ON AS INDICATED IN THE DESCRIPTION OF SWITCH 8. IF SWITCH 8 IS NOT SET AND THIS SWITCH IS SET THEN THE PROGRAM WILL DO AS THE NAME INDICATES. THAT IS ON FINDING AN ERROR INSTEAD OF ONLY GIVING THE ERROR MESSAGE AND RELEVANT REGISTERS AS WILL BE DONE IF SWITCH 11 IS NOT SET BUT WILL ALSO GIVE ALL THE REGISTER CONTENTS (EXCEPT "DATA BUFFER" RHDB).

5.2 SUB-ROUTINE ABSTRACTS

SEE SECTION 9 "SUBROUTINES".

6.0 ERRORS

ERROR PRINTOUTS CONTAIN THE ERROR ADDRESS AND OTHER PERTINENT INFORMATION CONCERNING THE PARTICULAR FAILURE. THIS INFORMATION MAY BE THE CONTENTS OF RELEVANT RP04/5/6 REGISTERS OR GOOD/RECEIVED DATA. IF THE ERROR OCCURRED IN A SUBROUTINE, THE ADDRESS OF THE SUBROUTINE CALL IS ALSO GIVEN. REFER TO THE PROGRAM LISTING AT THE STATED ADDRESS TO DETERMINE THE CAUSE OF THE ERROR.

6.1 'FATAL' ERRORS

IN THE EVENT THAT THE DISK DRIVE ECOMES UNAVAILABLE TO THE CONTROLLER, POWERS DOWN, OR CERTAIN CRITICAL STATUS BITS CANOT BE CLEARED PRIOR TO THE START OF ATEST SEQUENCE - THIS INFORMATION WILL BE COMMUNICATED TO THE OPERATOR. IN ADDITION, THE TTY BELL WILL RING AND THE PROGRAM WILL HALT.

IT IS SUGGESTED THAT IF THIS HAPPENS, THE OPERATOR LOAD ADDRESS 200 (210) AND RESTART THE PROGRAM AS A FIRST ATTEMPT TO SOLVE THE PROBLEM. IF THE FILURE CONTINUES TO OCCUR, THERE ARE TWO OPTIONS FOR THE OPERATOR:

1. LOOK IN THE TEST LISTING FOR THE 'HALT' INSTRUCTION AND REPLACE IT, PLUS THE TWO WORDS ("TYPE ,CPHALT") ABOVE WITH 'NOP'S. WITH TTY ERROR PRINTOUTS INHIBITED, A SCOPE LOOP CAN BE INITIATED FOR THE TEST IN QUESTION.

2. GO BACK AND RERUN THE DZRPS DIAGNOSTIC AS IT IS QUITE POSSIBLE THAT A HARD FAILURE HAS OCCURRED IN ONE OF THE HARDWARE REGISTERS.

IT IS ALSO POSSIBLE TO CONTINUE FROM THE 'HALT' POINT, BUT THIS IS NOT RECOMMENDED AS ALL FOLLOWING TESTS WILL EXHIBIT THE SAME SYMPTOMS AND GIVE MISLEADING ERROR PRINTOUTS.

7.0 RESTRICTIONS

BEFORE STARTING THE PROGRAM THE OPERATOR MUST HAVE THE DRIVE PORT SWITCH LOCKED EITHER ON PORT A OR PORT B BUT MUST NEVER LEAVE IT IN THE PROGRAMMABLE STATE.

SWITCH 12 MUST BE SET WHEN RUNNING ON AN RH70 CONTROLLER AND IT MUST NOT BE SET WHEN RUNNING ON AN RH11 CONTROLLER. BECAUSE OF THE REQUIREMENT FOR IT TO BE SET WHEN USING AN RH70, THE PROGRAM CANNOT BE RUN IN CHAIN MODE WHEN USING THE SOFTWARE REGISTER FEATURE WHILE RUNNING ON AN RH70. THIS IS BECAUSE THE ROUTINE WHICH GETS SOFTWARE SWITCH SETTINGS IS NOT OPERABLE WHEN IN CHAIN MODE.

8. MISCELLANEOUS

8.1 EXECUTION TIME

THE FIRST PASS OF THE PROGRAM WILL TAKE APPROXIMATELY 20 SECONDS. SUBSEQUENT PASSES WILL TAKE 60 SECONDS .

8.2 STACK POINTER

THE STACK IS INITIALLY SET TO 1000

8.3 OPERATOR SELECTABLE SCOPE LOOPS

HERE IS A DETAILED EXPLAINATION OF HOW THE LOOP ON ERROR WORKS. FOR INSTRUCTIONS REGARDING THE USAGE OF THIS TECHNIQUE, HIT ↑C ANY TIME WHILE THE PROGRAM IS RUNNING. ON HITTING AN ERROR IF THE LOOP ON ERROR SWITCH IS SET, THE PROGRAM GOES BACK - USUALLY BACK TO THE BEGINNING OF THE TEST.

WHEN THIS OPERATOR SELECTABLE SCOPE LOOP IS USED THEN THE POINT THE PROGRAM GOES BACK TO CAN BE CHANGED.
THE RESTRICTIONS TO THE POINT WHERE THE PROGRAM CAN GO ARE: -
1. IT MUST BE WITHIN THE TEST UNDER CONSIDERATION
2. LOOP ON ERROR SWITCH MUST BE SET
3. THE ERROR MUST OCCUR WITHIN THE TEST UNDER CONSIDERATION
IF THE ERROR DOES NOT OCCUR WITHIN THE TEST UNDER CONSIDERATION

THE PROGRAM WILL REVERT TO NORMAL OPERATION. HOWEVER, IF LOOP ON TEST SWITCH IS SET AND THIS OPERATOR SELECTABLE SCOPE LOOP IS USED THEN THE PROGRAM WILL LOOP BACK TO THE SELECTED POINT WHEN IT COMES TO THE END OF THE TEST UNDER CONSIDERATION.

AFTER LOOPING FOR SOME TIME IF THE LOOP SWITCH IS PUT DOWN THEN NORMAL OPERATION WILL CONTINUE.

8.4 PROGRAM REVISION HISTORY

9.0 PROGRAM DESCRIPTION

9.1 LOGIC DIVISION IN HARDWARE MODULES

REGISTER BOARD (RG) - ERROR REGISTER 1 STATUS REGISTERS MUX FOR REGISTERS GO HANDLING REGISTER DECODE COMMAND DECODE EXECUTION OF MECH. COMMANDS

SYNC. DATA BOARD (SN) - DATA CONTROL PARALLEL TO SERIAL SYNC. BYTE DETECT.

SEEK AND SEARCH (SS) - SEEK LOGIC SEARCH LOGIC HEADER HANDLING.

ERROR CORRECTION (EC) - ECC LOGIC ERROR REGISTER 2 & 3 MUX FOR ERROR REG. 2 & 3 LOOK AHEAD REG. SECTOR COUNTER DATA FORMATION RING COUNTER.

DUAL PORT (DP) - DUAL PORT ARBITRATION ATTENTION LOGIC SERIAL NO REGISTER MASS BUS REGISTER STORAGE

9.2 DISK SURFACE USAGE

SYMBOLS USED
C = CYLINDER
T = TRACK
S = SECTOR
W = WRITE
R = READ
TT = TEST NUMBER

C0, T0, S0
TT22-W,R, TT23-R, TT24-W,R, TT25-W,R, TT26-W,R, TT35-W,R, TT37-W, TT50-W, TT51-W,R, TT52-W,R, TT55-W,R

C0, T0, S1
TT27-W,R, TT37-W,R, TT40-R, TT41-W,R, TT42-W,R, TT43-W,R

C0, T18, S21
TT30-W, TT31-W,R

C1, T0, S0
TT30-W,R, TT31-W,R, TT53-W,R, TT54-W,R

C1, T18, S21
TT31-W

```
        C2, T0, S0
        TT31-W,R

        C2, T18, S21
        TT31-W

        C3, T0, S0
        TT31-W,R

        C3, T18, S21
        TT31-W

        C4, T0, S0
        TT31-W,R

        C4, T18, S21
        TT31-W

        C5, T0, S0
        TT31-W,R

        C5, T7, S4
        TT33-W,R, TT34-W,R

        C5, T18, S21
        TT31-W

        C6, T0, S0
        TT31-W,R

        C6, T18, S21
        TT31-W

        C7, T0, S0
        TT31-W,R

        C7, T18, S18
        TT31-W

        C8, T0, S0
        TT31-W,R

        C8, T18, S21
        TT31-W

        C9, T0, S0
        TT31-W

        C9, T18, S21
        TT31-W, TT32-R

        C10, T0, S0
        TT31-W,R

        C410, T18, S21
        TT36-W,R, TT50-W,R

9.3     THE FOLLOWING SECTION DESCRIBES EACH TEST AND SUBROUTINES
        IN DETAIL AND CAN BE USED AS AN INDEX TO THE LISTING.
```

THE LEFT MOST COLUMN IS THE LINE NUMBER WITHIN THE LISTING
WHERE THAT ITEM WILL BE FOUND.

DOCUMENT
****
MNDEC-11-DZRJJ-A, RP04/5/6 FUNCT. CONT. TST-PT 2
****

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****

CO2

TABLE OF CONTENTS
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          3       COPYRIGHT (C) 1976
                  DIGITAL EQUIPMENT CORP.
                  MAYNARD, MASS. 01754

                  PROGRAM BY PETE BLACKSTONE

                  THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                  PACKAGE (MAINDEC-11-DZQAC-C0),MAR 21, 1976.

          33      INTERNAL PROGRAM MACROS BEGIN HERE
                  ***********************************

          39
                  NOTE:   ALL MACRO CALLS BEGINNING WITH ".$" ARE SUPPLIED FROM AN
                          EXTERNAL SYSMAC.SML PACKAGE WHICH MUST BE MADE AVAILABLE
                          TO THE SOURCE PROGRAM AT ASSEMBLY TIME.

          *****************************************************************
  46      OPERATIONAL SWITCH SETTINGS
          *****************************************************************

          47
                          SWITCH              USE
                          ------        --------------------
                            15          HALT ON ERROR
                            14          LOOP ON TEST
                            13          INHIBIT ERROR TYPEOUTS
                            12          RH70 CONTROLLER SELECT
                            11          INHIBIT ITERATIONS

          55                10          BELL ON ERROR
                             9          LOOP ON ERROR
                             8          LOOP ON TEST IN SWR<7:0>
                             7          STOP FURTHER COMPARES IF SW08 IS LOW
                             6          TYPE ALL REG. WITH ERROR IF SW8 LOW

          *****************************************************************
  61      BASIC DEFINITIONS
          *****************************************************************

          63      INITIAL ADDRESS OF THE STACK POINTER *** 1000 ***

          68      MISCELLANEOUS DEFINITIONS

          80      GENERAL PURPOSE REGISTER DEFINITIONS

          92      PRIORITY LEVEL DEFINITIONS
```

```
             102     "SWITCH REGISTER" SWITCH DEFINITIONS

             130     DATA BIT DEFINITIONS (BIT00 TO BIT15)

             158     BASIC "CPU" TRAP VECTOR ADDRESSES

             ****************************************************************
       172   TRAP CATCHER
             ****************************************************************

             175     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

             ****************************************************************
       182   ACT11 HOOKS
             ****************************************************************

             ****************************************************************
       193   STARTING ADDRESS
             ****************************************************************

             202     STARTING ADDRESS 200 FOR NORMAL STARTS
                     THIS WILL TEST ALL RP04'S ON THE SYSTEM A SINGLE DRIVE AT A TIME

                     STARTING ADDRESS 210 WILL TEST ONLY ONE SPECIFIED DRIVE

                     STARTING ADDRESS 220 WILL JUMP OVER THE TESTS REQUIRING AN OPERATOR
                     AT THE DRIVE

             ****************************************************************
       210   MEMORY MANAGEMENT DEFINITIONS
             ****************************************************************

             212     KT11 VECTOR ADDRESS

             216     KT11 STATUS REGISTER ADDRESSES

             223     KERNEL "I" PAGE DESCRIPTOR REGISTERS

             234     KERNEL "I" PAGE ADDRESS REGISTERS
```

```
            ****************************************************************
     247    COMMON TAGS
            ****************************************************************

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

            ****************************************************************
     305    ERROR POINTER TABLE
            ****************************************************************

            307     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:

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

            ****************************************************************
     1239   REGISTER ADDRESSES
            ****************************************************************

            1319    TABLE OF FUNCTIONS FOR RHCS1 THEN "GO" BIT HAS TO BE SET

            1342    DATA BUFFER FOR READ WRITE

            ****************************************************************
     1412
            ****************************************************************

            ****************************************************************
     1413   *** DIAGNOSTIC CODE ***
            ****************************************************************

            ****************************************************************
     1414
            ****************************************************************
```

```
         **************************************************************
 1417    SETUP TESTS
         **************************************************************

         **************************************************************
 1432    INITIALIZE THE COMMON TAGS
         **************************************************************

         **************************************************************
 1518    GET VALUE FOR SOFTWARE SWITCH REGISTER
         **************************************************************

         1533    IS THERE A P-CLOCK (KW11-P) ON THE SYSTEM ?
                 IF SO MAKE 'WAT" TRAPS GO TO 'WAIT.P'
                 IF SO MAKE RP04 INTERRUPTS GO TO 'TIME 1'
                 IF NOT MAKE 'WAT' TRAPS GO TO 'WAIT.T'
                 IF NOT MAKE RP04 INTERRUPTS GO TO 'TIME 2'

         1539    THE NEXT LINE IS TO BE ADDED LATER
                 AND THE JUMP AND NOP REMOVED
                 FOR NOW NO CLOCK WILL BE USED

         1543    MOV     @#1$,@#ERRVEC   ;SET TIME-OUT VECTOR

         1579    TEST 1  REFERENCE EACH REGISTER

         1581                    REFERENCE EACH REGISTER BY A MOVE INSTRUCTION

         1627    TEST 2  PARTIAL TEST OF RHAS FOR UNIT NUMBERS PRESENT

         1629            CHECK THAT RHAS CAN BE CLEARED BY MOVING ALL ONES

         1650    TEST 3  TEST FOR DRIVES PRESENT USING RHAS AND RHCS2

         1652            THE NUMBER OF RP04/RP06 DRIVES PRESENT IS FOUND
                         BY MOVING ALL ONES INTO RHER1 WITH UNIT NUMBER
                         IN RHCS2 INCREMENTED FROM ZERO TO SEVEN.

         1656            THE SET BITS IN RHAS WILL GIVE DRIVES PRESENT.

         1658            THE DRIVE TYPE IS CHECKED TO BE RP04 OR RP06 AND
                         UNITS PRESENT ARE STORED IN A TABLE CALLED 'UNITS'

         1719    SET UP THE UNITS TABLE

         1795    TEST 4  TYPE SERIAL NUMBER AND DRIVE TYPE

         1797            SET APPROPRIATE ATTTENTION BIT OF UNIT UNDER TEST IN 'ATTENT'
                         TYPE UNIT UNDER TEST
```

```
1800                READ SERIAL NUMBER AND DRIVE TYPE REGISTERS
                    TYPE THEM OUT AND PROCEED

1803                TO LOOP HERE SET SWITCH 8, AND THIS TEST NUMBER ON
                    SWITCHES 0 THRU 7 AND RESTART

1829        INCREMENT THE UNITS TABLE TO NEXT DRIVE (IF ANY)
            & DECREMENT "NOUNITS" PRESENT TO BE TESTED

1893        TYPE OUT THE DRIVE TYPE IN ASCII

1940        TEST 5  CHECK MOL TO BE HIGH

1942                MAKE SURE THAT DRIVE IS ON LINE BEFORE STARTING PROGRAM
                    IF DRIVE IS OFF LINE THEN AFTER TYPE OUT THE PROGRAM WILL
                    HANG FOR EVER WAITING FOR DRIVE TO GO ON LINE

1982        TEST 6  PROGRAM INTERRUPT

1984                PROGRAM INTERRUPT IS TESTED BY SETTING RDY AND IE
                    IN RHCS1 AT THE SAME TIME
                    THIS SHOULD INTERRUPT THROUGH LOCATION 254
                    THE PROCESSOR PRIORITY IS SET TO 4

2029        TEST 7  INTERRUPT AT PROCESSOR AND DISK PRIORITY SAME

2031                PROCESSOR PRIORITY IS SET AT 5 (SAME AS THE DISK)
                    IE AND RDY IS SET. THIS SHOULD NOT INTERRUPT

2072        TEST 10 SET VV BIT #6 IN RHDS1

2074                THIS TEST SETS VV IN RHDS1
                    THERE IS A RESET AT THE BEGINING OF THE TEST
                    FOR ERROR RECOVERY ONLY.

2081        IN CASE THERE IS ANY DRIVE ERRORS DURING POWER UP
            OR POWER DOWN OR ANY PARITY ERRORS A RESET IS GIVEN

2102        NOW SAVE REGISTERS FOR COMPARISON AFTER PACK ACKNOWLEDGE

2137        COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
            R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

2168        NOW COMPARE REGISTERS BEFORE PACK ACKNOWLEDGE
            WITH AFTER PACK ACKNOWLEDGE
```

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            *************************************************************
     2199   DATA TRANSFER RELATED ERRORS (USING MEDIA)
            *************************************************************

            2203   TEST 11 LAST BLOCK TRANSFERED-RHDS1 LBT

            2205           WRITE ONE WORD OF 55125 ON CYLINDER 410./814., TRACK 18
                           SECTOR 21, BY A WRITE HEADER AND DATA COMMAND
                           THEN CHECK ALL REGISTERS (LAST BLOCK TRANSFERED
                           SHOULD BE SET)

            2210           THEN READ ABOVE USING READ DATA (256 WORDS)
                           CHECK ALL REGISTERS AND DATA
                           (AGAIN 'LBT' SHOULD BE SET)

            2224   CHECK THE DRIVE TYPE AND THEN FILL THE
                   WRITE FROM BUFFER WITH APPROPRIATE HEADER

            2255   FILL READ INTO BUFFER WITH ALL ONES

            2265   DRIVE TYPE IS CHECKED AND THEN THE APPROPRIATE
                   WRITE HEADER AND DATA COMMAND IS LOADED

            2313   NOW SAVE REGISTERS FOR COMPARISON AFTER WRITE

            2340   TIME IS NOT CRITICAL HERE

            2349   NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE

            2380   COMPARE ALL REGISTERS

            2402   NOW A READ DATA WILL BE DONE ON SAME CYLINDER, SECTOR & TRACK

            2404   CLEAR ANY PREVIOUS ERRORS

            2412   FILL WRITE FROM BUFFER WITH EXPECTED DATA

            2425   FIRST THE DRIVE TYPE IS CHECKED AND THEN THE APPROPRIATE
                   READ COMMAND IS LOADED

            2470   SAVE REGISTERS FOR COMPARISON AFTER READ DATA

            2495   TIME IS NOT CRITICAL HERE

            2504   NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE

            2536   COMPARE ALL REGISTERS

            2556   READ DATA WILL BE COMPARED
```

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2576    TEST 12 SEARCH COMMAND

2578            THE SEARCH COMMAND WILL BE DONE ON CYLINDER 0
                THAT IS STARTING WITH A RECALIBRATE
                THEN HEADER AND DATA WILL BE WRITTEN FOR SECTOR 0 AND 1
                ALL REGISTERS WILL BE CHECKED
                A SEARCH COMMAND WILL BE GIVEN FOR SECTOR 0
                ON INTERRUPT SECTOR 1 HEADER AND DATA WILL BE READ
                TIME WILL BE CRITICAL AS THE TIME TAKEN TO DO THE
                READ IS THE ONLY INDICATOR THAT THE HEADS WERE ON
                SECTOR 0 AT INTERRUPT TIME.  TIME ALLOWED IS MAXIMUM
                OF 1500 MICRO SECONDS
                THEN ALL REGISTERS ARE CHECKED AND DATA READ
                IS  CHECKED

2600    GET HEADS TO CYLINDER 0

2634    FILL WRITE FROM BUFFER WITH HEADER

2644    FILL WRITE FROM BUFFER WITH DATA

2652    FILL WRITE FROM BUFFER WITH NEXT SECTOR HEADER

2662    FILL WRITE FROM BUFFER WITH NEXT SECTOR DATA

2670    CLEAR READ INTO BUFFER WITH DATA OTHER THAN EXPECTED DATA

2678    THE WRITE HEADER AND DATA WILL BE LOADED

2697    SAVE REGISTERS FOR COMPARISON AFTER WRITE HEADER AND DATA

2727    ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR = 760 MICRO SEC

2736    CC'PARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
        R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

2760    NOW CHANGE SAVE REGISTERS TO EXPECTED VALUES

2777    NOW COMPARE REGISTERS BEFORE WRITE HEADER AND DATA
        WITH REGISTERS AFTER COMMAND

2797    NOW A SEARCH COMMAND WILL BE GIVEN
        BUT BEFORE THAT ALL POSSIBLE REGISTERS
        WILL BE FILLED FOR THE READ HEADER AND DATA SECTOR 1
        AS THERE WILL NOT BE MUCH TIME BETWEEN THE
        COMPLETION OF THE SEARCH AND THE SECTOR 1 COMING.

2803    FILL FOR THE READ HEADER AND DATA COMMAND WHICH WILL NOT
        BE EXECUTED TILL AFTER THE SEARCH
        THE SEARCH WILL ONLY LEAVE RHCS1 AND RHDST
        CHANGED ALL THE REST WILL BE UNCHANGED
```

```
2831    SAVE REGISTERS FOR COMPARISON NOT AFTER THE
        SEARCH COMMAND BUT AFTER THE READ HEADER AND DATA

2840    NOW SAVE VALUES FOR RHCS1 AND RHDST WHICH
        WILL CHANGE AFTER THE SEARCH

2848    THE INTERRUPT VECTOR WILL BE SET TO GO TO 2$
        AFTER THE SEARCH

2863    TIME IS NOT CRITICAL THIS ONLY WAITS FOR SEARCH COMPLETION

2889    TIME ALLOWED HERE IS CRITICAL ANY TIME ERROR
        INDICATES WRONG SEARCH IN THE SEARCH COMMAND

2899    WRITE FROM BUFFER WILL BE FILLED WITH EXPECTED DATA

2915    CHANGE SAVED REGISTERS TO EXPECTED VALUES

2937    COMPARE REGISTER BEFORE READ HEADER AND DATA
        WITH REGISTERS AFTER COMMAND

2956    NOW READ INTO BUFFER WILL BE CHECKED TO SEE
        THE READ WAS GOOD

2975    TEST 13 SEARCH COMMAND

2977            THE ONLY THING NEW IN THIS TEST IS AN IMPLIED SEEK
                IN A SEARCH COMMAND
                THE HEADS START FROM CYLINDER 10 BY A SEEK
                COMMAND THEN A SEARCH SECTOR 0 TRACK 0 CYLINDER 0
                IS GIVEN
                THEN A READ COMMAND IS GIVEN FOR
                CYLINDER 0, TRACK 0, SECTOR 1
                TIME FOR THE READ IS THE ONLY INDICATOR
                OF CORRECT SEARCH

2997    GET THE HEADS TO CYLINDER 10

3027    FILL REGISTERS FOR READ HEADER AND DATA TO BE DONE AFTER SEARCH

3050    SAVE REGISTERS FOR COMPARISON AFTER SEARCH
        AND READ HEADER AND DATA

3059    NOW GIVE THE SEARCH COMMAND

3111    THIS IS ONLY A WAIT LOOP

3135    TIME ALLOWED HERE IS CRITICAL ANY TIME ERROR
        INDICATES WRONG SEARCH IN THE SEARCH COMMAND
```

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3145    WRITE FROM BUFFER WILL BE FILLED WITH EXPECTED DATA

3161    CHANGE SAVED REGISTERS TO EXPECTED VALUES

3188    COMPARE REGISTER BEFORE READ HEADER AND DATA

3189    WITH REGISTERS AFTER COMMAND

3208    NOW READ INTO BUFFER WILL BE CHECKED TO SEE
        THE READ WAS GOOD

3230            THE NEXT TEST REMOVES SECTOR 1 ON CYLINDER 0
                TRACK0 AND PUTS SECTOR 0 THERE.
                HENCE THE PACK IS UNFORMATTED FROM
                THIS POINT ON TO THE TEST WHEN SECTOR
                1 IS REPLACED.  IF TESTING IS STOPPED WITH
                AN ERROR IN THE SECTION OF THE PROGRAM BETWEEN
                THIS AND WHEN SECTOR 1 IS REPLACED THEN THE
                DISK BEING USED MAY HAVE BEEN UNFORMATTED
                IF THE LAST PASS OF THIS PROGRAM GIVES
                NO ERRORS IN THIS SECTION THEN THE DISK
                MAY NOT HAVE BEEN UNFORMATTED. HOWEVER IT
                IS RECOMMENDED THAT AFTER A PASS OF THIS
                PROGRAM THE DISK BE REFORMATTED.

3251    TEST 14 HEADER COMPARE ERROR - RHER1 BIT #7 (HCE)

3253            WRITE HEADER AND DATA IS USED TO REMOVE SECTOR 1
                AND PUT SECTOR 0 THERE ON CYLINDER 0
                THEN A READ DATA IS GIVEN FOR SECTOR1
                HCE- BIT #7 IN RHER1 SHOULD SET.
                ALL REGISTERS ARE CHECKED
                ANY DATA READ IS CHECKED

3270    FILL WRITE FROM BUFFER WITH HEADER

3281    FILL READ INTO BUFFER WITH ALL ONES

3290    WRITE HEADER AND DATA IS LOADED

3309    NOW SAVE REGISTERS FOR COMPARISON AFTER WRITE

3338    TIME IS NOT CRITICAL

3347    NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE

3364    COMPARE ALL REGISTERS

3384    NOW A READ DATA WILL BE DONE ON CYLINDER=0, SECTOR=1,
        TRACK=0
        FILL WRITE FROM BUFFER WITH EXPECTED DATA
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3401    READ COMMAND IS LOADED

3419    SAVE REGISTERS FOR COMPARISON AFTER READ DATA

3447    TIME IS NOT CRITICAL

3456    NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE

3492    COMPARE ALL REGISTERS

3510    READ DATA WILL BE COMPARED

3526    TEST 15 HEADER COMPARE ERROR - RHER1 BIT #7 (HCE)

3528            WRITE HEADER AND DATA IS USED TO REMOVE SECTOR 1
                AND PUT SECTOR 0 ON CYLINDER 0
                THEN A WRITE DATA IS GIVEN FOR SECTOR 1, TRACK 0, CYLINDER 0
                FOR 70. WORDS
                HCE - BIT 7 IN RHER1 SHOULD SET
                ALL REGISTERS ARE CHECKED
                THEN A READ HEADER AND DATA SECTOR 1, TRACK 0, CYLINDER 0
                IS GIVEN, HCE - BIT 7 SHOULD SET AND ALL
                HEADER AND DATA SHOULD BE READ

3548    FILL WRITE FROM BUFFER WITH HEADER AND DATA

3560    FILL READ INTO BUFFER WITH ALL ONES

3568    WRITE HEADER AND DATA IS LOADED

3587    NOW SAVE REGISTERS FOR COMPARISON AFTER
        WRITE HEADER AND DATA

3617    TIME IS NOT CRITICAL

3626    NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE

3643    COMPARE ALL REGISTERS

3661    NOW A WRITE DATA WILL BE DONE ON SAME CYLINDER, SECTOR
        TRACK

3665    FILL WRITE FROM BUFFER WITH DATA

3673    WRITE DATA COMMAND IS LOADED

3691    SAVE REGISTERS FOR COMPARISON AFTER WRITE DATA

3719    TIME IS NOT CRITICAL
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3728    NOW CHANGE REGISTERS TO EXPECTED VALUE

3809    COMPARE ALL REGISTERS

3828    READ HEADER AND DATA SECTOR 1, TRACK 0, CYLINDER 0
        WILL BE ATTEMPTED

3837    FILL WRITE FROM BUFFER WITH EXPECTED DATA

3861    FILL READ INTO BUFFER WITH ALL ONES

3868    FILL REGISTERS WITH READ HEADER AND DATA COMMAND

3887    SAVE REGISTERS FOR COMPARISON AFTER READ
        HEADER AND DATA

3916    TIME IS NOT CRITICAL

3925    CHANGE SAVED REGISTERS TO EXPECTED VALUE

3969    COMPARE REGISTERS BEFORE READ HEADER AND DATA
        WITH AFTER

3989    NOW COMPARE READ DATA
        THE COMMAND READ ONLY 204 WORDS, 4 HEADER WORDS
        AND 200 DATA WORDS

4020    TEST 16 HEADER COMPARE ERROR - RHER1 HCE

4022            WITH THE HEADS ON CYLINDER 0 A SEARCH COMMAND IS GIVEN
                FOR CYLINDER 0 TRACK 0 SECTOR 1, ALTHOUGH THE HEADER
                FOR THIS SECTOR IS CHANGED TO SECTOR 0 HCE-BIT #7
                IN RHER1 SHOULD NOT SET
                BECAUSE SEARCH DOES NOT READ HEADER BUT ONLY USES SECTOR COUNTER

4038    GET HEADS TO CYLINDER 0

4075    FILL REGISTERS FOR SEARCH

4083    SAVE REGISTERS FOR COMPARISON AFTER SEARCH

4121    COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
        R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

4145    CHANGE SAVED REGISTERS TO EXPECTED VALUE

4165    COMPARE REGISTERS BEFORE SEARCH WITH AFTER SEARCH

4188    TEST 17 RESTORE SECTOR 1 CYLINDER 1 TRACK 1
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4190            THIS REPLACES REMOVED SECTOR


                WRITE HEADER AND DATA CYLINDER 0, FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 1, KEYS=0, NUMBER OF WORDS 256 WORDS
                OF 0
                THEN READ HEADER AND DATA FOR ABOVE.
                WRITE FROM BUFFER AND READ INTO BUFFER ARE FILLED WITH
                10000,1,0,0, AND 256 OF 0
                THE WRITE COMMAND IS THEN LOADED INTO THE REGISTERS EXCEPT
                THE GO BIT, AND ALL THE REGISTERS ARE SAVED
                THEN GO IS GIVEN FOR WRITE HEADER AND DATA

                THEN ALL REGISTERS ARE COMPARED TO CHECK FOR IMPROPER CHANGED
                THEN WRITE FROM BUFFER IS CHECKED TO SEE THAT NOTHING CHANGED


                NOW FOR THE READ COMMAND READ INTO BUFFER IS FILLED
                WITH ALL ONES, COMMAND IS LOADED INTO REGISTERS EXCEPT
                GO BIT AND ALL REGISTERS ARE SAVED
                GO IS GIVEN FOR THE READ COMMAND

4216            ALL REGISTERS ARE CHECKED FOR IMPROPER CHANGE
                THEN THE READ DATA IS COMPARED.

4229      FILL WRITE FROM BUFFER WITH HEADER

4239      FILL WRITE FROM BUFFER WITH DATA

4247      NOW READ INTO BUFFER WILL BE FILLED WITH SAME DATA
          AS WRITE FROM BUFFER SO THAT AFTER A WRITE COMPARISONS
          CAN BE MADE TO MAKE SURE THAT WRITE DID NOT
          CHANGE WRITE FROM BUFFER

4267      NOW THE WRITE HEADER AND DATA COMMAND WILL BE FILLED

4286      NOW SAVE REGISTERS FOR COMPARISON AFTER WRITE HEADER AND DATA

4315      ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR = 760 MICRO SEC

4324      COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
          R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

4348      NOW CHANGE SAVED REGISTERS TO EXPECTED VALUES

4365      NOW COMPARE REGISTERS BEFORE WRITE HEADER AND DATA
          WITH REGISTERS AFTER COMMAND
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4396    NOW WRITE FROM BUFFER WILL BE CHECKED TO SEE THAT
        NOTHER GOT CHANGED

4401    NOW A READ HEADER AND DATA COMMAND WILL BE GIVEN
        READ INTO BUFFER IS FILLED WITH ONES

4416    NOW FILL COMMAND

4435    NOW SAVE REGISTERS FOR COMPARISON AFTER READ HEADER AND DATA

4473    COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
        R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

4497    CHEANGE SAVED REGISTERS TO EXPECTED VALUES

4514    COMPARE REGISTER BEFORE READ HEADER AND DATA
        WITH REGISTERS AFTER COMMAND

4534    NOW READ INTO BUFFER WILL BE CHECKED TO SEE
        THE READ WAS GOOD

4557    TEST 20 INVALID ADDRESS ERROR - RHER1 - 'IAE'

4559            A WRITE HEADER AND DATA WILL BE ATTEMPTED TO CYLINDER 411./815.
                TRACK 0, SECTOR 0

4562            INVALID ADDRESS ERROR (IAE) BIT #10 IN RHER1 SHOULD SET

4575    CHECK THE DRIVE TYPE AND THEN FILL THE
        WRITE FROM BUFFER WITH APPROPRIATE HEADER

4604    FILL WRITE FROM BUFFER WITH DATA

4613    THE DRIVE TYPE IS CHECKED AND THE APPROPRIATE
        WRITE HEADER AND DATA COMMAND IS LOADED

4663    NOW SAVE REGISTERS FOR COMPARISON AFTER
        WRITE HEADER AND DATA

4703    CHANGE  THE SAVED REGISTERS TO EXPECTED VALUES

4705    AS EXCEPTION IS ASSERTED BEFORE RUN IS LATCHED,
        RHWC,RHBA,RHCS1 & RHCS2 CANNOT BE PREDETERMINED -
        THEY WILL VARY DEPENDING ON GATE DELAYS FOR DIFFERENT UNITS

4741    COMPARE REGISTERS BEFORE ATTEMPTED WRITE WITH
        CONTENTS AFTER ATTEMPTED WRITE WITH AN 'IAE' ERROR

4766    TEST 21 INVALID ADDRESS ERROR - RHER1 (BIT #10)IAE
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4768            A WRITE DATA IS ATTEMPTED TO CYLINDER 0, TRACK 19,
                SECTOR 0
                INVALID ADDRESS ERROR IAE BIT #10 IN RHER1
                SHOULD SET

4783    FILL WRITE FROM BUFFER WITH DATA

4791    WRITE DATA COMMAND WILL BE FILLED

4809    SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED WRITE DATA

4845    CHANGE  SAVED REGISTERS TO EXPECTED VALUES

4849    AS EXCEPTION IS ASSERTED BEFORE RUN IS LATCHED
        RHWC,RHBA,RHCS1,RHCS2,  CANNOT BE PEREDETERMINED
        THEY WILL VARY DEPENDING ON GATE DELAYS ON DIFFRENT UNITS

4884    COMPARE REGISTERS BEFORE ATTEMPTED WRITE DATA
        WITH AFTER ATTEMPT, IAE SHOULD BE SET

4907    TEST 22 INVALID ADDRESS ERROR RHER1 -BIT #10

4909            A READ HEADER AND DATA IS ATTEMPTED TO CYLINDER 0
                TRACK 0, SECTOR 22
                INVALID ADDRESS ERROR IAE BIT #10 IN RHER1
                SHOULD SET
                THIS WILL START WITH THE HEADS ON CYLINDER 10
                TO PROVE THAT IAE SETS EVEN BEFORE THE IMPLIED
                SEEK

4927    GET THE HEADS TO CYLINDER 10

4968    FILL READ INTO BUFFER WITH 125252

4976    THE READ HEADER AND DATA COMMAND IS FILLED

4995    SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED READ

5030    CHANGE SAVED REGISTERS TO EXPECTED VALUES

5034    AS EXCEPTION IS ASSERTED BEFORE RUN IS LATCHED
        RHWC,RHBA,RHCS1,RHCS2,  CANNOT BE PEREDETERMINED
        THEY WILL VARY DEPENDING ON GATE DELAYS ON DIFFRENT UNITS

5069    COMPARE REGISTERS BEFORE ATTEMPTED READ HEADER
        AND DATA WITH AFTER ATTEMPTED READ

5095    TEST 23 INVALID ADDRESS ERROR - RHER1  (BIT #10)IAE
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5097            A READ DATA IS ATTEMPTED TO CYLINDER 0, TRACK 0
                SECTOR 20 - FORMAT 18 BITS PER WORD
                INVALID ADDRESS ERROR IAE BIT #10 IN RHER1
                SHOULD SET

5112    FILL READ INTO BUFFER WITH 125252

5120    THE READ HEADER AND DATA COMMAND IS FILLED

5138    SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED READ

5174    CHANGE SAVED REGISTERS TO EXPECTED VALUES

5206    COMPARE REGISTERS BEFORE ATTEMTED READ
        DATA WITH AFTER ATTEMTED READ DATA

5232    TEST 24 ADDRESS OVERFLOW ERROR - RHER1 (BIT#9) AOE

5234            A WRITE HEADER AND DATA COMMAND IS GIVEN FOR CYLINDER 0,TRACK 0
                SECTOR 0, 256 WORDS OF 0
                NO CHECK IS DONE AFTER THIS WRITE

                A WRITE HEADER AND DATA COMMAND IS GIVEN FOR
                CYLINDER 410./814., TRACK 18, SECTOR 21, 261 WORDS

                ADDRESS OVERFLOW ERROR - RHER1 BIT#9 (AOE) SHOULD SET
                AFTER SECTOR 21 IS WRITTEN
                ALL REGISTERS ARE CHECKED

                A READ HEADER AND DATA CYLINDER 410./814., TRACK 18, SECTOR 21,
                260+66+4=330  WORDS IS ISSUED

                SECTOR 21 SHOULD BE READ CORRECTLY BUT NO MORE
                READS SHOULD HAPPEN, AGAIN THE 'AOE' BIT SHOULD SET

                CYLINDER 0, TRACK 0, SECTOR 0 IS READ AND THERE
                SHOULD BE NO CHANGE IN DATA IN THIS SECTOR FROM
                THE LAST WRITE HEADER AND DATA COMMAND

5265    FILL WRITE FROM BUFFER WITH HEADER

5275    FILL WRITE FROM BUFFER WITH DATA

5284    THE FIRST WRITE OPERATION IS DONE
        FILL WRITE HEADER AND DATA COMMAND

5339    CHECK THE DRIVE TYPE AND DO THE
        APPROPRIATE SECOND WRITE OPERATION
```

5342 FILL WRITE FROM BUFFER WITH HEADER

5374 FILL WRITE FROM BUFFER WITH DATA - 65125

5383 CHECK THE DRIVE TYPE AND
FILL WRITE FROM BUFFER WITH APPROPRIATE NEXT HEADER

5386 THIS IS A NON EXISTANT HEADER AND SHOULD NOT BE WRITTEN
SINCE 'AOE' SHOULD INHIBIT THE WRITE OPERATION

5417 FILL WRITE FROM BUFFER WITH DATA FOR NEXT SECTOR

5426 CHECK THE DRIVE TYPE AND DO THE APPROPRIATE
FILL WRITE HEADER AND DATA COMMAND

5474 SAVE REGISTERS FOR COMPARISON AFTER WIRTE HEADER AND DATA

5510 CHANGE SAVED REGISTERS TO EXPECTED VALUES

5560 CHECK DEVICE TYPE BEFORE SETTING UP 'RHCA' & 'RHCC'

5596 COMPARE REGISTERS BEFORE WRITE HEADER AND DATA WITH AFTER

5618 NOW PREPARE TO DO A READ HEADER AND DATA
(THE FIRST READ OPERATION)

5621 CHECK THE DRIVE TYPE AND FILL
WRITE FROM BUFFER WITH APPROPRIATE EXPECTED HEADER

5661 FILL WRITE FROM BUFFER WITH EXPECTED DATA

5669 FILL WRITE FROM BUFFER WITH 377 FROM WORDS 261 TO 266

5677 CLEAR READ INTO BUFFER

5692 CHECK THE DRIVE TYPE AND DO THE APPROPRIATE
FILL READ HEADER AND DATA COMMAND

5739 SAVE REGISTERS FOR COMPARISON AFTER
READ HEADER AND DATA

5776 CHANGE SAVED REGISTERS TO EXPECTED VALUES

5813 CHECK DRIVE TYPE BEFORE SETTING UP 'RHCA'

5841 COMPARE REGISTERS BEFORE READ HEADER AND DATA WITH
REGISTERS AFTER COMMAND

5862 NOW COMPARE THE DATA READ

5888 NOW PREPARE TO READ CYLINDER 0, SECTOR 0, TRACK 0
TO SEE THAT NOTHING GOT WRITTEN ON THERE
WITH THE ADDRESS OVER FLOW BIT SET (AOE)

5893 FILL WRITE FROM BUFFER WITH EXPECTED HEADER

5909 FILL READ INTO BUFFER WITH 377

5923 FILL COMMAND FOR READ HEADER AND DATA

5942 SAVE REGISTERS FOR COMPARISON AFTER READ

5977 CHANGE REGISTERS TO EXPECTED VALUE

6024 COMPARE DATA/READ

6049 TEST 25 FORMAT ERROR - RHER1 (BIT #4)FMT

6051 AN ATTEMPT WILL BE MADE TO WRITE DATA ON CYLINDER 0
SECTOR 0 TRACK 0 WITH 18 BITS PER WORD WHEN THE
HEADER HAS 16 BITS PER WORD SET

THIS SHOULD GIVE FORMAT ERROR PER BIT #4 IN RHER1

THEN THIS SECTOR WILL BE READ IN THE CORRECT FORMAT
16 BITS PER WORD TO CHECK THAT NOTHING GOT WRITTEN

6069 FIRST WRITE HEADER AND DATA CYLINDER 0, TRACK 0, SECTOR 0
FILL WRITE FROM BUFFER WITH HEADER

6080 FILL WRITE FROM BUFFER WITH DATA

6088 FILL COMMAND

6142 NOW PREPARE TO WRITE WITH WRONG FORMAT

6144 FILL WRITE FROM BUFFER

6152 FILL WRITE DATA COMMAND

6170 SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED WRITE DATA
WITH WRONG FORMAT

6207 CHANGE SAVED REGISTERS TO EXPECTED VALUE

6286 COMPARE REGISTERS BEFORE WRITE DATA WITH AFTER ATTEMPT

6305 NOW PREPARE TO READ WITH CORRECT FORMAT TO CHECK
THAT NOTHING GOT WRITTEN

6313 FILL WRITE FROM BUFFER WITH EXPECTED DATA

6321 FILL READ INTO BUFFER WITH 125252

6329 FILL COMMAND TO READ DATA

6347 SAVE REGISTERS FOR COMPARISON AFTER NORMAL READ

6383 CHANGE SAVED REGISTERS TO EXPECTED VALUE

6407 COMPARE REGISTERS BEFORE READ WITH AFTER

6427 COMPARE DATA READ AFTER ATTEMPTED WRITE WITH
WRONG FORMAT BIT

6446 TEST 26 FORMAT ERROR - RHER1 (BIT #4)FMT

6448 AN ATTEMPT IS MADE TO READ DATA WITH WRONG
FORMAT BIT

FORMAT ERROR BIT #4 IN RHER1 SHOULD SET
NO DATA SHOULD BE READ

6464 FILL WRITE FROM BUFFER WITH 107070

6472 FILL READ INTO BUFFER WITH 107070

6480 FILL COMMAND TO READ WITH WRONG FORMAT

6498 SAVE REGISTERS FOR COMPARAISON AFTER READ

6534 CHANGE SAVED REGISTERS TO EXPECTED VALUE

6577 COMPARE REGISTERS BEFORE WRITE DATA WITH AFTER ATTEMPT

6596 COMPARE READ INTO BUFFER TO CHECK THAT NOTHING WAS READ

6619 TEST 27 REGISTER MODIFICATION REFUSED - RHER1(BIT #2),RMR

6621 CYLINDER1 TRACK 0, SECTOR 0 WILL BE WRITTEN WITH
200 WORDS OF 2000 BY A WRITE HEADER AND DATA COMMAND

THE HEADS WILL BE BROUGHT TO CYLINDER 0 BY A SEEK

A READ DATA COMMAND WILL BE GIVEN TO CYLINDER 1 TRACK 0
SECTOR 0 150. WORDS. THIS WILL TAKE AT
LEAST 7 MILI SECONDS. IMMEDIATELY AFTER GO AT
IMPLIED SEEK TIME, WRITE INTO A REGISTER WILL BE ATTMEPTED
THEN READY WILL BE WAITED ON TO COMPLETE THE READ DATA
THEN ALL REGISTERS WILL BE COMPARED AND THE DATA READ
SHOULD BE GOOD
THIS WILL BE REPEATED FOR RHCS1, RHER1, RHDST, RHER2
RHOF, RHCA, RHER3

```
6648    PREPARE TO WRITE HEADER AND DAT[illegible]LINDER 1, TRACK 0, SECTOR 0
        FILL WRITE FROM BUFFER WITH HEAD[illegible]

6665    FILL WRITE FROM BUFFER WITH DATA

6673    FILL COMMAND

6712    TIME IS NOT IMPORTANT

6721    NOW BRING THE HEADS TO CYLINDER 0

6756    PREPARE FOR A READ DATA

6758    FILL WRITE FROM BUFFER WITH EXPECTED DATA FROM READ

6772    FILL READ INTO BUFFER WITH DATA OTHER THAN WHAT IS EXPECTED

6779    FILL READ DATA COMMAND

6797    SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED WRITE
        INTO A REGISTER WHILE THE READ IS GOING ON

6831    NOW RMR IS SET BUT THE COMPLETION OF READ MUST BE
        WAITED ON

6842    CHANGE SAVED REGISTERS TO EXPECTED VALUE

6893    COMPARE REGISTERS BEFORE READ DATA WITH REGISTERS
        AFTER READ AND ATTEMPTED MODIFICATION OF REGISTER

6917    COMPARE DATA READ

6937    TEST 30 REGISTER MODIFICATION REFUSED - RHER1 (BIT #2),'RMR'

6939            A WRITE HEADER AND DATA COMMAND WILL BE GIVEN TO
                CYLINDER 1 SECTOR 0 TRACK 0 DATA WORDS
                OF 070707

                A WRITE DATA COMMAND WILL BE GIVEN TO CYLINDER 1

6945            SECTOR 0, TRACK 0, 256 WORDS OF 2000
                AND 4 WORDS OF 2001. IMMEDIATELY AFTER GO
                AN ATTEMPT WILL BE MADE TO MODIFY A REGISTER
                RMR BIT #2 IN RHER1 SHOULD SET

                AFTER THE WRITE IS COMPLETE ALL REGISTERS WILL
                BE CHECKED.

                THE DATA WRITTEN WILL BE READ BACK AND CHECKED

                THIS WILL BE REPEATED FOR RHCS1, RHER1, RHDST,
                RHER2, RHOF, RHCA, RHER3
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6971    PREPARE TO WRITE HEADER AND DATA

6981    FILL WRITE FROM BUFFER WITH HEADER

6991    FILL WRITE FROM BUFFER WITH DATA

6999    FILL WRITE FROM BUFFER WITH NEXT SECTOR HEADER

7009    FILL WRITE FROM BUFFER WITH WITH NEXT SECTOR DATA

7017    NOW THE WRITE HEADER AND DATA COMMAND WILL BE FILLED

7056    ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR=760 MICRO SEC

7065    NOW PREPARE FOR THE WRITE DATA COMMAND

7067    FILL WRITE FROM BUFFER WITH 256 OF 2000 AND 4 OF 2001

7081    FILL WRITE DATA COMMAND

7099    SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED
        REGISTER MODIFICATION DURING A WRITE DATA

7133    NOW RMR MUST BE SET BUT THE COMPLETION OF
        WRITE DATA MUST BE WAITED ON

7144    CHANGE SAVED REGISTERS TO EXPECTED VALUE

7195    COMPARE REGISTERS BEFORE WRITE DATA WITH REGISTERS
        AFTER WRITE AND ATTEMPTED MODIFICATION OF REGISTER

7219    CLEAR ALL ERROR FLAGS

7227    FILL WRITE FROM BUFFER WITH EXPECTED DATA

7241    NOW THE READ DATA COMMAND WILL BE FILLED

7259    NOW SAVE REGISTERS FOR COMPARISON AFTER READ DATA COMMAND

7297    COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
        R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

7321    NOW CHANGE SAVED REGISTERS TO EXPECTED VALUES

7339    NOW COMPARE REGISTERS BEFORE READ DATA WITH
        AFTER COMMAND

7355    NOW READ INTO BUFFER WILL BE CHECKED TO SEE THAT READ
        WAS GOOD
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7370    IF ALL 7 REGISTERS NOT COMPLETE THEN REPEAT

7378    TEST 31 REGISTER MODIFICATION REFUSED - RHER1  (BIT #2)RMR

7380            A READ DATA COMMAND IS GIVEN TO CYLINDER 0, SECTOR 0
                TRACK 0. IMMEDIATELY AFTER GO RHAS IS WRITTEN INTO
                WITH ALL ONES RMR BIT #2 IN RHER SHOULS NOT SET

7394    FILL WRITE FROM BUFFER WITH EXPECTED DATA

7401    FILL READ INTM BUFFER WITH ALL ONES

7408    NOW THE READ DATA COMMAND WILL BE FILLED

7425    NOW SAVE REGISTERS FOR COMPARISON AFTER READ DATA COMMAND

7459    TIME IS NOT IMPORTANT

7468    COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
        R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

7492    NOW CHANGE SAVED REGISTERS TO EXPECTED VALUES

7514    NOW COMPARE REGISTERS BEFORE READ DATA WITH
        AFTER COMMAND

7530    NOW READ INTO BUFFER WILL BE CHECKED TO SEE THAT READ
        WAS GOOD

7548    TEST 32 ILLEGAL FUNCTION RHER1 - (BIT #0,ILF)

7550            THIS WILL CALCULATE EVERY ILLEGAL FUNCTION
                BETWEEN 0 AND 77. EACH TIME AN ILLEGAL FUNCTION
                IS FORMED IT WILL BE STORED IN ILLEGAL THEN
                EXECUTION OF ILLEGAL
                WILL BE ATTEMPTED AND RESULTS CHECKED

7571    GENERATE ILLEGAL FUNCTION

7589    ILLEGAL FUNCTION HAS BEEN FOUND
        IT IS IN 'ILLEGL'

7593    SAVE REGISTERS FOR COMPARISON AFTER GO

7662    CHANGE SAVED REGISTERS TO EXPECTED VALUE

7684    RHCS1 WILL HAVE SC AND TRE ADDED IF FUNCTION IS GREATER THAN 50

7695    RHCS2 WILL HAVE NOTHING ADDED IF FUNCTION IS LESS THAN 50
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7719    NOW COMPARE REGISTERS AFTER GIVING AN ILLEGAL COMMAND

7747    TEST 33 OPERATION INCOMPLETE - RHER1(BIT #13)OPI
                A WRITE HEADER AND DATA COMMAND IS GIVEN
                CYLINDER 0 SECTOR 1 TRACK 0 KEYS 0 DATA 177777
                WORDCOUNT 260

                AFTER GO IS GIVEN THEN THREE INDEX PULSES ARE
                GIVEN. THIS SHOULD BRING OPI HIGH

7764    THESE ARE REGULAR SETUPS

7776    SETUP DATA, WRITE HEADER & DATA, AND FORMAT OF THE WRITE

7791    SAVE REGISTERS FOR COMPARISON AFTER READ

7799    GO TO WRITE HEADER AND DATA
        BUT BEFORE GO, ONE INDEX PULSE IS GIVEN
        TO CLEAR OUT THE SECTOR CLOCK COUNTER IN THE RH11
        SO THAT NO SECTOR PULSES COME DURING THIS TEST

7817    ISSUE THE FIRST DIAGNOSTIC INDEX PULSE

7821    SECOND INDEX PULSE

7825    THIRD INDEX PULSE

7830    CHANGE SAVED REGISTERS TO EXPECTED VALUE

7874    RHWC,RHBA AND OR AND IR BITS OF RHCS2 WILL NOT BE CHECKED

7883    COMPARE REGISTERS BEFORE WRITE WITH RESULTS AFTER WRITE

7904    TEST 34 CONSECUTIVE SECTOR FORMATTING

7906            46 CONSECUTIVE SECTORS WILL BE FORMATTED
                STARTING FROM CYLINDER 0 TRACK 0 SECTOR 21.
                FORMATTING WILL BE DONE BY A WRITE HEADER AND
                DATA COMMAND FOR 4 WORDS, ONE SECTOR
                AT A TIME.

                AFTER EACH SECTOR IS WRITTEN, 'SC' WILL BE CHECKED
                TO INSURE THAT THERE WERE NO ERRORS

7928    FILL WRITE FROM BUFFER WITH THE HEADER

7939    NOW THE WRITE HEADER AND DATA COMMAND WILL BE SETUP

7981    ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR=760 MICRO SEC
```

```
7990    NOW ONE MORE SECTOR HAS BEEN WRITTEN
        'SC' WILL BE CHECKED TO MAKE SURE
        NO ERRORS OCCURED

8001    A SECTOR HAS BEEN FORMATTED NOW,
        THE HARDWARE WILL BE CLEARED AND
        CHANGES WILL BE MADE TO FORMAT NEXT SECTOR.

8031    TEST 35 OPERATION INCOMPLETE - RHER1 (BIT #13)OPI

8033            THIS WILL TEST THAT OPI DOES NOT SET WHEN THREE NORMAL
                INDEX PULSES ARE ENCOUNTERED IN A READ COMMAND

8036            FIRST 46 CONSECUTIVE SECTORS WILL BE FORMATTED
                STARTING FROM CYLINDER 0 TRACK 0 SECTOR 21.
                FORMATTING WILL BE DONE BY A WRITE HEADER AND
                DATA COMMAND FOR 4 WORDS, ONE SECTOR
                AT A TIME

                THEN A READ HEADER AND DATA WILL BE DONE
                FOR CYLINDER 0 TRACK 0 SECTOR 21 FOR
                11960 WORDS (260.X22X2+260+260) WITH BUS
                ADDRESS INHIBIT SET.

                AT THE END ALL REGISTERS WILL BE CHECKED.

8062    FILL WRITE FROM BUFFER WITH HEADER

8073    NOW THE WRITE HEADER AND DATA COMMAND WILL BE FILLED

8115    ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR=760 MICRO SEC

8124    NOW ONE MORE SECTOR HAS BEEN WRITTEN
        'SC' WILL BE CHECKED TO MAKE SURE
        NO ERRORS OCCURED

8138    ONE SECTOR HAS BEEN FORMATTED NOW,
        THE HARDWARE WILL BE CLEARED AND
        CHANGES WILL BE MADE TO FORMAT NEXT SECTOR.

8165    NOW 46 SECTORS HAVE BEEN FORMATTED

8167    READ HEADER AND DATA FOR 46 SECTORS=11960 WORDS
        WITH BUS ADDRESS INHIBITED

8176    FILL READ HEADER AND DATA COMMAND

8215    TIME IS NOT IMPORTANT
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```
8225    NOW THAT ALL 11960 WORDS HAVE BEEN READ
        'OPI' WILL BE CHECKED TO BE NOT SET

8236    'SC' WILL BE CHECKED

8250    TEST 36 HEAD SELECTION TEST ERR & TRE
                THIS TESTS HEAD SELECTION LOGIC ONLY. A WRITE HEADER AND
                DATA COMMAND IS GIVEN TO EACH TRACK FROM 0 TO 18 ON
                CYLINDER 0, SECTOR 0.
                THE DATA ON EACH SECTOR IS UNIQUE. THE LEAST SIGNIFICANT
                5 BITS GIVE SECTOR THE NEXT LEAST SIGNIFICANT 5 BITS
                GIVE TRACK THE NEXT 6 BITS GIVE CYLINDER

                THEN READ HEADER AND DATA IS DONE FOR THE ABOVE AND DATA
                CHECKED

                BETWEEN THE WRITE AND READ ONLY "ERR" AND "TRE" ARE CHECKED


                ON AN ERROR IN THE READ HEADER AND DATA LOOPING WILL BE
                ONLY ON THE ERROR SECTOR READ

8277    THE FOLLOWING CLEARS ARE TO INITIALIZE TEST FROM CYLINDER 0

8284    THIS GETS THE HEADS TO CYLINDER 0

8321    FILL WRITE FROM BUFFER WITH HEADER

8332    FILL WRITE FROM BUFFER WITH DATA

8341    THE WRITE HEADER AND DATA COMMAND WILL BE FILLED

8381    ONE REVOLUTION = 16670 MICRO SEC., ONE SECTOR = 760
        MICRO SEC. MAX TIME ALLOWED = ONE REVOLUTION + HEAD
        SWITCH + 2 SECTORS, MIN TIME ALLOWED = SECTOR (FIRST CASE)
        IF THERE IS A FAILURE HERE HALT PROGRAM AFTER ERROR WITH
        SWITCH 15 AND SEE CURRENT CYLINDER REGISTER TO DETERMINE
        WHAT CYLINDER IS FAILING

8396    NOW SECTOR 0 OF ONE TRACK HAS BEEN WRITTEN CHECK COMPOSIT
        ERROR BIT TO BE SURE NO ERRORS HAPPENED

8399    SAVE REGISTERS IN SAVE TABLE

8411    THE FOLLOWING 3 ADDS SETS UP FOR NEXT TRACK WRITING

8420    THE FOLLOWING CLEARS SETS UP FOR READ HEADER AND DATA

8431    SET UP FOR READ HEADER AND DATA
```

```
8434    FILL READ INTO BUFFER WITH ALL ONES

8444    FILL WRITE FROM BUFFER WITH EXPECTED HEADER

8455    FILL WRITE FROM BUFFER WITH EXPECTED DATA

8464    FILL COMMAND FOR READ HEADER AND DATA

8512    NOW SECTOR 0 OF ONE TRACK HAS BEEN READ CHECK COMPOSIT
        ERROR BIT TO BE SURE NO ERROR HAPPENED

8515    SAVE REGISTERS IN SAVE TABLE

8527    NOW THE READ DATA WILL BE COMPARED DATA IN EACH SECTOR
        IS UNIQUE IF PROGRAM IS HALTED ON ERROR THEN LOOK AT
        RHDST TO GET WHAT TRACK IS IN ERROR. LOOKING AT THE DATA
        BITS NO 4,5,6,7,8 IN GOOD DATA ALSO GIVES TRACK NUMBER
        IN GOOD DATA ALSO GIVES TRACK NUMBER

8554    NOW INCREMENT TO READ NEXT TRACK

8568    TEST 37 DIFFERENCE LINES

8570            A WRITE HEADER AND DATA WILL BE DONE ON ALL CYLINDERS
                UP TO 256./512. ON SECTOR ZERO, TRACK ZERO. THE DATA WILL
                BE THE CYLINDER NUMBER

                THEN A RECALIBRATE AND READ HEADER AND DATA WILL BE DONE
                ON CYLINDERS 0,1,2,4,8,16,32,64,128,256 & 512.

                DATA WILL BE CHECKED.
                ON AN ERROR, LOOPING WILL BE DONE ON THE
                READ ONLY

8596    SET UP TO INITIALIZE TEST FROM CYLINDER 0, TRACK 0,
        SECTOR 0

8602    THIS IS TO GET THE HEADS TO CYLINDER ZERO

8626    THE DRIVE TYPE IS CHECKED AND THE APPROPRIATE MAX.
        CYLINDER DIFFERENCE IS SET UP

8647    FILL WRITE FROM BUFFER WITH HEADER

8658    FILL WRITE FROM BUFFER WITH DATA

8667    THE WRITE HEADER AND DATA COMMAND WILL BE LOADED
```

```
8707    ONE REVOLUTION = 16670 MICRO SECONDS. ONE SECTOR = 760
        MICRO SECONDS, ONE SEEK = 7000 MICRO SECONDS.
        MAX TIME = 1 REVOLUTION + 1 SEEK + 2 SECTORS
        MIN TIME = 1 SECTOR

8720    NOW ONE SECTOR WRITE IS COMPLETE.  CHANGES WILL BE MADE
        FOR THE NEXT SECTOR, THEN THE ABOVE WILL BE REPEATED
        UNTIL CYLINDER 256./512. IS REACHED

8729    NOW ALL 256./512. CYLINDERS HAVE CYLINDER NUMBER WRITTEN
        AS DATA ON SECTOR 0, TRACK 0. NOW A RECALIBRATE, FOLLOWED
        BY READ HEADER AND DATA, THEN A CHECK WILL BE DONE ON
        CYLINDER 0,1,2,4,8,16,32,64,128,256,512, AND 0

8737    INITIALIZE, RECALIBRATE, AND READ CYLINDERS

8740    SETUP FOR CYLINDER 0

8774    CLEAR READ INTO BUFFER WITH ALL ONES

8782    FILL WRITE FROM BUFFER WITH EXPECTED HEADER

8800    FILL READ HEADER AND DATA COMMAND

8832    ONE SECTOR = 760 MICRO SECONDS, ONE REVOLUTION =
        16670 MICRO SECONDS, MAX SEEK = 52000 MICRO SECONDS
        MAX TIME = ONE REV + 1 SEEK + 1 SECTOR
        MIN TIME = 1 SECTOR

8853    CHECK READ WORDS AS ALL READ COMMANDS HAVE BEEN CHECKED

8855    (DATA ERRORS MAY IMPLY "IMPLIED SEEK" ERRORS)

8870    NOW ONE CYLINDER HAS BEEN CHECKED.  CHANGES WILL BE MADE
        TO READ THE NEXT CYLINDER AND THE ABOVE SECTOR READ WILL BE
        REPEATED

8922    TEST 40 END OF DRIVE

8924            THIS IS THE END OF TEST FOR ONE DRIVE
                IF THERE ARE MORE DRIVES, THEN THE PROGRAM
                JUMPS TO TEST 5 FOR NEXT DRIVE TEST

8928            END OF PASS IS REACHED ONLY AFTER ALL DRIVES ARE COMPLETE
```

```
        ****************************************************************
 8971
        ****************************************************************

        ****************************************************************
 8972   ***SUBROUTINES***
        ****************************************************************

        ****************************************************************
 8973
        ****************************************************************

        ****************************************************************
 8978   END OF PASS ROUTINE
        ****************************************************************

        8981    INCREMENT THE PASS NUMBER ($PASS)
                TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
                IF THERES A MONITOR GO TO IT
                IF THERE ISN'T JUMP TO TST1

        9037    NOW FILL DATA

        9192    THIS IS A SUBROUTINE TO SAVE REGISTERS
                IN THE REGISTER TABLE TO ANY LOCATION
                THE CALL IS
                JSR     R0,@#SAVER
                        F       ;FROM
                        T       ;TO
                        N       ;NUMBER OF WORDS SAVED
                F MUST ALWAYS BE RHCS1
                T MUST ALWAYS BE SAVRE

        9278    THIS SECTION WAITS FOR BIT, THROUGH TWO COUNT DOWNS

        9301    NOW TIME AND TOLERANCE WILL BE CHECKED

        9363    THIS HAS THE TWO COUNT DOWNS FROM 177777

        9389    BIT DID SET SO CHECK IF INTERRUPT OCCURRED

        9391    THE AMOUNT OF TIME ALLOWED CAN BE CHANGED BY ALTERING LOCATION
                "RPTCTR" ABOVE

        9462    NOW DATA WILL BE FILLED

        9501    NOW SAVE REGISTERS

        9505    NOW COMPARES WILL MADE
```

```
        9601    THIS SAVES THE CONTENTS OF ALL HARDWARE REGISTERS
                IN MEMORY LOCATIONS TAGED FROM "WC" TO "EC2"
                THIS IS DONE SO THAT COMPARES ARE DONE WITH SAVED LOCATIONS
                AND NOT THE REGISTERS THEMSELVES.   THIS WILL MAKE
                ERROR PRINTOUTS FOR GOOD AND BAD DATA ALWAYS DIFFRENT

        9703            THIS ROUTINE WILL ALLOW THE CHANGE OF THE BASE
                        ADDRESS FROM 176700 TO ANY TYPED VALUE

        ************************************************************
9775    SYSMAC LIBRARY ROUTINES
        ************************************************************

        ************************************************************
9778    SCOPE HANDLER ROUTINE
        ************************************************************

        9781    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
                SW08=1  LOOP ON TEST IN SWR<7:0>
                CALL
                        SCOPE           ;;SCOPE=IOT

        ************************************************************
9841    CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
        ************************************************************

        9844    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
```

```
        ****************************************************************
 9908   TYPE ROUTINE
        ****************************************************************

        9911    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

        ****************************************************************
 9978   TTY INPUT ROUTINE
        ****************************************************************

        9989    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

        10006   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 (OPERSEL)

        10058   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.

        10073   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.

        10144   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
```

```
        10168   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

        ****************************************************************
10206   READ AN OCTAL NUMBER FROM THE TTY
        ****************************************************************

        10209   THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                CHANGE IT TO BINARY.
                THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
                OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
                FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
                THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
                CALL:
                        RDOCT                   ;;READ AN OCTAL NUMBER
                        RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                                ;;HIGH ORDER BITS ARE IN $HIOCT

        ****************************************************************
10259   ERROR HANDLER ROUTINE
        ****************************************************************

        10262   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 $ERRTYP 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

        ****************************************************************
10310   ERROR MESSAGE TYPEOUT ROUTINE
        ****************************************************************

        10312   THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
                ERROR IS TO BE REPORTED.  IT THEN OBTAINS, FROM THE "ERROR TABLE" ($ERRTB),
                AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.
                IT IS A COPY OF THE $ERRTYP SUBROUTINE FROM SYSMAC.
                WITH ONLY MINOR CHANGES
                FIRST IF SWITCH 6 IS SET AND SWITCH 8 RESET THEN
                ALL REGISTER CONTENTS WILL BE TYPED BEFOR REPORTING THE ERROR
                SECOND IF THE CURRENT ERROR HAS THE SAME ITEM NUMBER
                AS THE PREVIOUS ERROR THEN ONLY THE DATA WILL BE TYPED
                AND NOT THE ERROR MESSAGE AND HEADER.
```

```
        ***************************************************************
10541   BINARY TO OCTAL (ASCII) AND TYPE
        ***************************************************************

        10544   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

        ***************************************************************
10618   TRAP DECODER
        ***************************************************************

        10621   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.

        ***************************************************************
10634   TRAP TABLE
        ***************************************************************

        10636   THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                BY THE "TRAP" INSTRUCTION.
```

```
        *************************************************************
10655   POWER DOWN AND UP ROUTINES
        *************************************************************

        10702   *************************************************************
                *************************************************************

        *************************************************************
           46      61     172     182     193     210     247     305    1239    1412    1413    1414    1417    1432    151
        *************************************************************
```

```
                    .TITLE  MNDEC-11-DZRJJ-A, RP04/5/6 FUNCT. CONT. TST-PT 2
                    ;*COPYRIGHT (C) 1976
                    ;*DIGITAL EQUIPMENT CORP.
                    ;*MAYNARD, MASS. 01754
                    ;*
                    ;*PROGRAM BY PETE BLACKSTONE
                    ;*
                    ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                    ;*PACKAGE (MAINDEC-11-DZQAC-C0),MAR 21, 1976.
                    ;*


;/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:
;/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:
;/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:

;DRIVE MUST BE LOCKED ON PORT A OR PORT B

;/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*
;/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*
;/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*



                        ;*INTERNAL PROGRAM MACROS BEGIN HERE
                        ;***********************************


                    ;;*****************************************************
                    ;*
                    ;*NOTE: ALL MACRO CALLS BEGINNING WITH ".$" ARE SUPPLIED FROM AN
                    ;*      EXTERNAL SYSMAC.SML PACKAGE WHICH MUST BE MADE AVAILABLE
                    ;*      TO THE SOURCE PROGRAM AT ASSEMBLY TIME.
                    ;*
                    ;;*****************************************************

                    .SBTTL  OPERATIONAL SWITCH SETTINGS
                    ;*
                    ;*      SWITCH              USE
                    ;*      ------              --------------------
                    ;*        15                HALT ON ERROR
                    ;*        14                LOOP ON TEST
                    ;*        13                INHIBIT ERROR TYPEOUTS
                    ;*        12                RH70 CONTROLLER SELECT
                    ;*        11                INHIBIT ITERATIONS
```

```
                        ;*      10      BELL ON ERROR
                        ;*       9      LOOP ON ERROR
                        ;*       8      LOOP ON TEST IN SWR<7:0>
                        ;*       7      STOP FURTHER COMPARES IF SW08 IS LOW
                        ;*       6      TYPE ALL REG. WITH ERROR IF SW8 LOW
```

```
                        .SBTTL  BASIC DEFINITIONS

                        ;*INITIAL ADDRESS OF THE STACK POINTER *** 1000 ***
        001000          STACK=  1000
                        .EQUIV  EMT,ERROR               ;;BASIC DEFINITION OF ERROR CALL
                        .EQUIV  IOT,SCOPE               ;;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
                        .EQUIV  PS,PSW
        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
                        .EQUIV  R6,SP                   ;;STACK POINTER
                        .EQUIV  R7,PC                   ;;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
                                .EQUIV  SW09,SW9
                                .EQUIV  SW08,SW8
                                .EQUIV  SW07,SW7
                                .EQUIV  SW06,SW6
                                .EQUIV  SW05,SW5
                                .EQUIV  SW04,SW4
                                .EQUIV  SW03,SW3
                                .EQUIV  SW02,SW2
                                .EQUIV  SW01,SW1
                                .EQUIV  SW00,SW0

                                ;*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
                                .EQUIV  BIT09,BIT9
                                .EQUIV  BIT08,BIT8
                                .EQUIV  BIT07,BIT7
                                .EQUIV  BIT06,BIT6
                                .EQUIV  BIT05,BIT5
                                .EQUIV  BIT04,BIT4
                                .EQUIV  BIT03,BIT3
                                .EQUIV  BIT02,BIT2
                                .EQUIV  BIT01,BIT1
                                .EQUIV  BIT00,BIT0

                                ;*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  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  ACT11 HOOKS

                                        ;;*************************************************************
                                        ;HOOKS REQUIRED BY ACT11
         000200                                 $SVPC=.                         ;SAVE PC
         000046                                 .=46
000046   032574                                 $ENDAD                          ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
         000052                                 .=52
000052   020000                                 .WORD   20000                   ;;2)SET LOC.52 TO 20000
         000200                                 .=$SVPC                         ;; RESTORE PC

                                        .SBTTL  STARTING ADDRESS

         000200                                 .=200
000200   000137   004710                        JMP     @#BEGIN                 ;NORMAL START
         000210                                 .=210
000210   000137   004674                        JMP     @#BEGIN2                ;JUMP TO SELECT DRIVE START
         000220                                 .=220
000220   000137   004660                        JMP     @#BEGIN1                ;JUMP TO NO OPERATOR TESTS START

                                        ;*STARTING ADDRESS 200 FOR NORMAL STARTS
                                        ;*THIS WILL TEST ALL RP04'S ON THE SYSTEM A SINGLE DRIVE AT A TIME
                                        ;*
                                        ;*STARTING ADDRESS 210 WILL TEST ONLY ONE SPECIFIED DRIVE
                                        ;*
                                        ;*STARTING ADDRESS 220 WILL JUMP OVER THE TESTS REQUIRING AN OPERATOR
                                        ;*AT THE DRIVE
```

```
                                .SBTTL  MEMORY MANAGEMENT DEFINITIONS

                                ;*KT11 VECTOR ADDRESS

        000250                  MMVEC=  250

                                ;*KT11 STATUS REGISTER ADDRESSES

        177572                  SR0=    177572
        177574                  SR1=    177574
        177576                  SR2=    177576
        172516                  SR3=    172516

                                ;*KERNEL "I" PAGE DESCRIPTOR REGISTERS

        172300                  KIPDR0= 172300
        172302                  KIPDR1= 172302
        172304                  KIPDR2= 172304
        172306                  KIPDR3= 172306
        172310                  KIPDR4= 172310
        172312                  KIPDR5= 172312
        172314                  KIPDR6= 172314
        172316                  KIPDR7= 172316

                                ;*KERNEL "I" PAGE ADDRESS REGISTERS

        172340                  KIPAR0= 172340
        172342                  KIPAR1= 172342
        172344                  KIPAR2= 172344
        172346                  KIPAR3= 172346
        172350                  KIPAR4= 172350
        172352                  KIPAR5= 172352
        172354                  KIPAR6= 172354
        172356                  KIPAR7= 172356

        001110                          .=1110                  ; ?
```

```
                                 .SBTTL  COMMON TAGS

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

          001100                         .=1100
001100                           $CMTAG:                                    ;;START OF COMMON TAGS
001100    000000                 $PASS:   .WORD   0                         ;;CONTAINS PASS COUNT
001102       000                 $TSTNM:  .BYTE   0                         ;;CONTAINS THE TEST NUMBER
001103       000                 $ERFLG:  .BYTE   0                         ;;CONTAINS ERROR FLAG
001104    000000                 $ICNT:   .WORD   0                         ;;CONTAINS SUBTEST ITERATION COUNT
001106    000000                 $LPADR:  .WORD   0                         ;;CONTAINS SCOPE LOOP ADDRESS
001110    000000                 $LPERR:  .WORD   0                         ;;CONTAINS SCOPE RETURN FOR ERRORS
001112    000000                 $ERTTL:  .WORD   0                         ;;CONTAINS TOTAL ERRORS DETECTED
001114       000                 $ITEMB:  .BYTE   0                         ;;CONTAINS ITEM CONTROL BYTE
001115       001                 $ERMAX:  .BYTE   1                         ;;CONTAINS MAX. ERRORS PER TEST
001116    000000                 $ERRPC:  .WORD   0                         ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120    000000                 $GDADR:  .WORD   0                         ;;CONTAINS ADDRESS OF 'GOOD' DATA
001122    000000                 $BDADR:  .WORD   0                         ;;CONTAINS ADDRESS OF 'BAD' DATA
001124    000000                 $GDDAT:  .WORD   0                         ;;CONTAINS 'GOOD' DATA
001126    000000                 $BDDAT:  .WORD   0                         ;;CONTAINS 'BAD' DATA
001130    000000                          .WORD   0                         ;;RESERVED--NOT TO BE USED
001132    000000                          .WORD   0
001134       000                 $AUTOB:  .BYTE   0                         ;;AUTOMATIC MODE INDICATOR
001135       000                 $INTAG:  .BYTE   0                         ;;INTERRUPT MODE INDICATOR
001136    000000                          .WORD   0
001140    177570                 SWR:     .WORD   DSWR                      ;;ADDRESS OF SWITCH REGISTER
001142    177570                 DISPLAY: .WORD   DDISP                     ;;ADDRESS OF DISPLAY REGISTER
001144    177560                 $TKS:    177560                            ;;TTY KBD STATUS
001146    177562                 $TKB:    177562                            ;;TTY KBD BUFFER
001150    177564                 $TPS:    177564                            ;;TTY PRINTER STATUS REG. ADDRESS
001152    177566                 $TPB:    177566                            ;;TTY PRINTER BUFFER REG. ADDRESS
001154       000                 $NULL:   .BYTE   0                         ;;CONTAINS NULL CHARACTER FOR FILLS
001155       002                 $FILLS:  .BYTE   2                         ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001156       012                 $FILLC:  .BYTE   12                        ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001157       000                 $TPFLG:  .BYTE   0                         ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001160    000000                 $REGAD:  .WORD   0                         ;;CONTAINS THE ADDRESS FROM
                                                                            ;;WHICH  ($REG0) WAS OBTAINED
001162    000000                 $REG0:   .WORD   0                         ;;CONTAINS (($REGAD)+0)
001164    000000                 $REG1:   .WORD   0                         ;;CONTAINS (($REGAD)+2)
001166    000000                 $REG2:   .WORD   0                         ;;CONTAINS (($REGAD)+4)
001170    000000                 $REG3:   .WORD   0                         ;;CONTAINS (($REGAD)+6)
001172    000000                 $REG4:   .WORD   0                         ;;CONTAINS (($REGAD)+10)
001174    000000                 $REG5:   .WORD   0                         ;;CONTAINS (($REGAD)+12)
001176    000000                 $TMP0:   .WORD   0                         ;;USER DEFINED
001200    000000                 $TMP1:   .WORD   0                         ;;USER DEFINED
001202    000000                 $TMP2:   .WORD   0                         ;;USER DEFINED
001204    000000                 $TMP3:   .WORD   0                         ;;USER DEFINED
001206    000000                 $TMP4:   .WORD   0                         ;;USER DEFINED
001210    000000                 $TMP5:   .WORD   0                         ;;USER DEFINED
001212    000000                 $TIMES:  0                                 ;;MAX. NUMBER OF ITERATIONS
001214    000000                 $ESCAPE:0                                  ;;ESCAPE ON ERROR ADDRESS
001216    177607  000377         $BELL:   .ASCIZ  <207><377><377>           ;;CODE FOR BELL
```

```
301 001222    077          $QUES:  .ASCII  /?/             ;;QUESTION MARK
302 001223    015          $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
303 001224 000012          $LF:    .ASCIZ  <12>            ;;LINE FEED
304                        ;;*************************************************************
```

```
                                .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


 001226                         $ERRTB:



                                ;ITEM1
 001226  042244                         EM1                     ;RP04 DID NOT INTERRUPT
                                                                ;WAITED ON BIT DID NOT OCCUR
 001230  057134                         DH1                     ;PC
                                                                ;WAT PC
                                                                ;BIT WAITED
                                                                ;REG ADDRESS
                                                                ;REG CONTENTS
                                                                ;RHCS1 CONTENTS
 001232  061404                         DT1                     ;$ERRPC,WAITPC,WAITBT,WAITRE,$BDDAT,CS1
 001234  061724                         DF1                     ;0,0,0,0,0,0

                                ;ITEM2
 001236  042273                         EM2                     ;INTERRUPT ENABLE BIT DOWN BUT
                                                                ;WAITED ON BIT DID NOT OCCUR
 001240  057134                         DH1                     ;PC
                                                                ;WAT PC
                                                                ;BIT WAITED
                                                                ;REG ADDRESS
                                                                ;REG CONTENTS
                                                                ;RHCS1 CONTENTS
 001242  061404                         DT1                     ;$ERRPC,WAITPC,WAITBT,WAITRE,$BDDAT,CS1
 001244  061724                         DF1                     ;0,0,0,0,0,0

                                ;ITEM3
 001246  042362                         EM3                     ;RP04 DID NOT INTERRUPT WHEN
                                                                ;WAITED ON BIT DID SET
 001250  057134                         DH1                     ;PC
                                                                ;WAT PC
                                                                ;BIT WAITED
                                                                ;REG ADDRESS
                                                                ;RHCS1 CONTENTS
 001252  061404                         DT1                     ;$ERRPC,WAITPC,WAITBT,WAITRE,$BDDAT,CS1
 001254  061724                         DF1                     ;0,0,0,0,0,0

                                ;ITEM4
```

```
001256  042443                    EM4                 ;WAITED ON BIT DID SET BUT
                                                      ;TIME IS IN ERROR
                                                      ;TIME IS GIVEN IN 10 MICRO SEC.
                                                      ;(DECIMAL)
001260  057314                    DH4                 ;PC
                                                      ;WAT PC
                                                      ;BIT WAITED
                                                      ;REG ADDRESS
                                                      ;TIME IN 10 MSEC
001262  061424                    DT4                 ;$ERRPC,WAITPC,WAITBT,WAITRE,$BDDAT,WAITIM
001264  061733                    DF4                 ;0,0,0,0,0,1

                          ;ITEM5
001266  042554                    EM5                 ;RHAS DOES NOT CLEAR BY
                                                      ;MOVING IN ALL ONES
001270  057455                    DH5                 ;PC
                                                      ;REG. ADDR.
                                                      ;GOOD DATA
                                                      ;RECEIVED DATA
001272  061446                    DT5                 ;$ERRPC,REGADR,$GDDAT,$BDDAT
001274  061742                    DF5                 ;0,0,0,0

                          ;ITEM6
001276  042626                    EM6                 ;LOADING RHER1 FOR ALL
                                                      ;UNITS DID NOT SET ANY BITS
                                                      ;IN RHAS-NO UNITS PRESENT
001300  057574                    DH6                 ;PC
                                                      ;REG ADDR
                                                      ;RECEIVED DATA
001302  061462                    DT6                 ;$ERRPC,REGADR,$BDDAT
001304  061747                    DF6                 ;0,0,0

                          ;ITEM7
001306  042714                    EM7                 ;SPECIFIED REGISTER NONEXISTANT
                                                      ;SO ABORT PROGRAM
001310  057673                    DH7                 ;PC
                                                      ;ADDR. OF REG.
001312  061474                    DT7                 ;$ERRPC,TEMP1
001314  061753                    DF7                 ;0,0

                          ;ITEM10
001316  042776                    EM10                ;STOPED DRIVE HAS MOL BIT
                                                      ;IN RHDS1 = 1
001320  057733                    DH10                ;PC
                                                      ;TEST NO
                                                      ;FAILING REG ADDR
                                                      ;CONTENTS OF RHCS1
                                                      ;CONTENTS OF RHCS2
                                                      ;CONTENTS OF RHDS1
                                                      ;CONTENTS OF RHER1
001322  061504                    DT10                ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001324  061756                    DF10                ;0,0,0,0,0,0,0

                          ;ITEM11
```

```
001326  043045                  EM11            ;WITH SPINDLE POWERED DOWN
                                                ;RHCS2 SHOULD HAVE ONLY
                                                ;UNIT NUMBER AND IR HIGH
001330  057733                  DH10            ;PC
                                                ;TEST NO
                                                ;FAILING REG. ADR
                                                ;CONTENTS OF RHCS1
                                                ;CONTENTS OF RHCS2
                                                ;CONTENTS OF RHDS1
                                                ;CONTENTS OF RHER1
001332  061504                  DT10            ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001334  061756                  DF10            ;0,0,0,0,0,0,0

                        ;ITEM12
001336  043152                  EM12            ;AFTER A POWER UP WITH
                                                ;NO PACK ACKNOWLEDGE COMMAND
                                                ;RHDS1 SHOULD HAVE MOL=1, VV=0
001340  057733                  DH10            ;PC
                                                ;TEST NO
                                                ;FAILING REGISTER ADDR.
                                                ;CONTENTS OF RHCS1
                                                ;CONTENTS OF RHCS2
                                                ;CONTETNS OF RHDS1
                                                ;CONTENTS OF RHER1
001342  061504                  DT10            ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001344  061756                  DF10            ;0,0,0,0,0,0,0

                        ;ITEM13
001346  043260                  EM13            ;AFTER A POWER UP WITHOUT
                                                ;ANY INIT RHCS1 SHOULD
                                                ;HAVE GO=0, DVA=1, RDY=1
                                                ;IE=0, DISREGARD
                                                ;ALL OTHER BITS
001350  057733                  DH10            ;PC
                                                ;TEST NO
                                                ;FAILING REGISTER ADDR.
                                                ;CONTENTS OF RHCS1
                                                ;CONTENTS OF RHCS2
                                                ;CONTENTS OF RHDS1
                                                ;CONTENTS OF RHER1
001352  061504                  DT10            ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001354  061756                  DF10            ;0,0,0,0,0,0,0

                        ;ITEM14
001356  043377                  EM14            ;AFTER POWER UP RHCC
                                                ;SHOULD BE=0
001360  057455                  DH5             ;PC
                                                ;REG. ADDR.
                                                ;GOOD DATA
                                                ;RECEIVED DATA
001362  061446                  DT5             ;$ERRPC,REGADR,$GDDAT,$BDDAT
001364  061742                  DF5             ;0,0,0,0
```

```
                                ;ITEM15
001366  043451                          EM15            ;PACK ACKNOWLEDGE CAUSED
                                                        ;AN ERROR
                                                        ;GOOD DATA IS BEFORE COMMAND
                                                        ;RECEIVED DATA IS AFTER COMMAND
001370  057455                          DH5             ;PC
                                                        ;REG. ADDR.
                                                        ;GOOD DATA
                                                        ;RECEIVED DATA
001372  061446                          DT5             ;$ERRPC,REGADR,$GDDAT,$BDDAT
001374  061742                          DF5             ;0,0,0,0

                                ;ITEM16
001376  043612                          EM16            ;GIVING A NO-OP COMMAND CAUSED
                                                        ;AN ERROR
                                                        ;GOOD DATA GIVES REGISTER
                                                        ;CONTENTS BEFORE COMMAND
                                                        ;RECEIVED DATA GIVES REGISTER
                                                        ;CONTENTS AFTER COMMAND
001400  057455                          DH5             ;PC
                                                        ;REG. ADDR.
                                                        ;GOOD DATA
                                                        ;RECEIVED DATA
001402  061446                          DT5             ;$ERRPC,REGADR,$GDDAT,$BDDAT
001404  061742                          DF5             ;0,0,0,0

                                ;ITEM17
001406  043740                          EM17            ;DRIVE CLEAR COMMAND
                                                        ;CAUSED AN ERROR
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;THERE AFTER COMMAND
001410  057455                          DH5             ;PC
                                                        ;REG. ADDR.
                                                        ;GOOD DATA
                                                        ;RECEIVED DATA
001412  061446                          DT5             ;$ERRPC,REGADR,$GDDAT,$BDDAT
001414  061742                          DF5             ;0,0,0,0

                                ;ITEM20
001416  044075                          EM20            ;READ-IN COMMAND GAVE AN ERROR
                                                        ;GOOD DATA HAS WHAT SHOULD BE THERE
                                                        ;RECEIVED DATA HAS WHAT WAS
                                                        ;AFTER COMMAND
001420  057455                          DH5             ;PC
                                                        ;REG. ADDR.
                                                        ;GOOD DATA
                                                        ;RECEIVED DATA
001422  061446                          DT5             ;$ERRPC,REGADR,$GDDAT,$BDDAT
001424  061742                          DF5             ;0,0,0,0


                                ;ITEM 21
```

```
      001426  044244                    EM21                        ;RHCS1 CONTENTS DURING
                                                                    ;COMMAND WAS IN ERROR
      001430  057455                    DH5
      001432  061446                    DT5
      001434  061742                    DF5

                              ;ITEM 22
      001436  044317                    EM22                        ;RHDS1 CONTENTS DURING
                                                                    ;COMM ANS WAS IN ERROR
      001440  057455                    DH5
      001442  061446                    DT5
      001444  061742                    DF5

                              ;ITEM 23
      001446  044372                    EM23                        ;UNLOAD COMMAND GAVE AN ERROR
                                                                    ;GOOD DATA GIVES WHAT SHOULD
                                                                    ;BE THERE
                                                                    ;RECEIVED DATA GIVES WHAT WAS
                                                                    ;THERE AFTER COMMAND
      001450  057455                    DH5
      001452  061446                    DT5
      001454  061742                    DF5

                              ;ITEM 24
      001456  044541                    EM24                        ;OFFSET COMMAND CAUSED AN ERROR
                                                                    ;GOOD DATA IS WHAT SHOULD BE THERE
                                                                    ;RECEIVED DATA GIVES WHAT WAS THERE
                                                                    ;AFTER AN OFFSET COMMAND
      001460  057455                    DH5
      001462  061446                    DT5
      001464  061742                    DF5

                              ;ITEM 25
      001466  044704                    EM25                        ;RETURN TO CENTER LINE COMMAND
                                                                    ;CAUSED AN ERROR
                                                                    ;GOOD DATA GIVES WHAT SHOULD BE
                                                                    ;THERE
                                                                    ;RECEIVED DATA GIVES WHAT WAS
                                                                    ;THERE AFTER COMMAND
      001470  057455                    DH5
      001472  061446                    DT5
      001474  061742                    DF5

                              ;ITEM 26
      001476  045066                    EM26                        ;500 OFFSETS CAUSED AN ERROR
      001500  060112                    DH26                        ;PC
                                                                    ;CONT. OF RHCS1
                                                                    ;CONT. OF RHCS2
                                                                    ;CONT. OF RHDS1
                                                                    ;CONT. OF RHER1
                                                                    ;CONT. OF RHER2
                                                                    ;CONT. OF RHER3
      001502  061524                    DT26                        ;$ERRPC,CS1,CS2,DS1,ER1,ER2,ER3
      001504  061765                    DF26                        ;0,0,0,0,0,0,0
```

```

                                        ;ITEM 27
001506  045156                                  EM27            ;WRITE HEADER AND DATA
                                                                ;CAUSED IMPROPER REGISTER CHANGE
                                                                ;GOOD DATA GIVES WHAT
                                                                ;SHOULD BE THERE
                                                                ;RECEIVED DATA GIVES WHAT
                                                                ;WAS THERE AFTER COMMAND
001510  057455                                  DH5
001512  061446                                  DT5
001514  061742                                  DF5

                                        ;ITEM 30
001516  045374                                  EM30            ;WRITE HEADER AND DATA
                                                                ;CHANGED WRITE FROM BUFFER
001520  060312                                  DH30            ;PC
                                                                ;WORD NO
                                                                ;GOOD DATA
                                                                ;BAD DATA
001522  061546                                  DT30            ;$ERRPC,ERWORD,$GDDAT,$BDDAT
001524  061775                                  DF30            ;0,0,0,0

                                        ;ITEM 31
001526  045454                                  EM31            ;READ HEADER AND DATA CAUSED
                                                                ;IMPROPER REGISTER CHANGE
                                                                ;GOOD DATA HAS WHAT SHOULD
                                                                ;BE THERE
                                                                ;RECEIVED DATA GIVES WHAT
                                                                ;WAS THERE AFTER COMMAND
001530  057455                                  DH5
001532  061446                                  DT5
001534  061742                                  DF5

                                        ;ITEM 32
001536  045671                                  EM32            ;WRITE HEADER AND DATA FOLLOWED
                                                                ;BY A READ HEADER AND DATA
                                                                ;CAUSED A READ/WRITE ERROR
001540  060312                                  DH30
001542  061546                                  DT30
001544  061775                                  DF30

                                        ;ITEM 33
001546  045776                                  EM33            ;READ DATA CAUSED IMPROPER REGISTER
                                                                ;CHANGE
                                                                ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                                                ;RECEIVED DATA GIVES WHAT WAS THERE AFTER
                                                                ;COMMAND
001550  057455                                  DH5
001552  061446                                  DT5
001554  061742                                  DF5

                                        ;ITEM 34
001556  046200                                  EM34            ;READ DATA INCORRECT
001560  060312                                  DH30
```

```
001562  061546                        DT30
001564  061775                        DF30

                              ;ITEM 35
001566  046224                        EM35                 ;WRITE DATA COMMAND CAUSED
                                                           ;IMPROPER REGISTER CHANGE
                                                           ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                                           ;RECEIVED DATA GIVES REGISTER
                                                           ;CONTENTS AFTER WRITE DATA
001570  057455                        DH5
001572  061446                        DT5
001574  061742                        DF5

                              ;ITEM 36
001576  046442                        EM36                 ;WRITE DATA COMMAND CHANGED
                                                           ;WRITE FROM BUFFER
001600  060312                        DH30
001602  061546                        DT30
001604  061775                        DF30

                              ;ITEM 37
001606  046517                        EM37                 ;SEEK COMMAND CAUSED AN
                                                           ;ERROR
                                                           ;GOOD DATA GIVES WHAT SHOULD
                                                           ;BE THERE
                                                           ;RECEIVED DATA GIVES WHAT
                                                           ;WAS THERE AFTER SEEK COMMAND
001610  057455                        DH5                  ;
001612  061446                        DT5                  ;
001614  061742                        DF5                  ;

                              ;ITEM 40
001616  046734                        EM40                 ;WRITE CHECK CAUSED AN
                                                           ;IMPROPER REGISTER CHANGE
                                                           ;GOOD DATA GIVES WHAT SHOULD
                                                           ;BE THERE
                                                           ;RECEIVED DATA GIVES WHAT WAS
                                                           ;THERE AFTER COMMAND
001620  057455                        DH5
001622  061446                        DT5
001624  061742                        DF5

                              ;ITEM 41
001626  047143                        EM41                 ;LOCKING OUT WRITES BY WRITE
                                                           ;LOCK BUTTON CAUSED IMPROPER
                                                           ;REGISTER CHANGE
                                                           ;GOOD DATA GIVES WHAT SHOULD
                                                           ;BE THERE
                                                           ;RECEIVED DATA GIVES WHAT
                                                           ;WAS THERE AFTER WRITES
                                                           ;WERE LOCKED OUT BY
                                                           ;BUTTON
001630  057455                        DH5
001632  061446                        DT5
```

```
001634  061742                      DF5

                              ;ITEM 42
001636  047424                      EM42                ;ATTEMPTING TO WRITE WITH WRITE
                                                        ;LOCKED OUT CAUSED IMPROPER
                                                        ;REGISTER CHANGE
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;THERE AFTER ATTEMPT
001640  057455                      DH5
001642  061446                      DT5
001644  061742                      DF5

                              ;ITEM 43
001646  047702                      EM43                ;WRITING WITH WRITE LOCKED
                                                        ;OUT CHANGED DISK DATA
                                                        ;GOOD DATA GIVES WHAT WAS
                                                        ;ON DISK BEFORE WRITE WITH
                                                        ;WRITE LOCK WAS ATTEMPTED
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;READ BACK AFTER WRITE WITH
                                                        ;WRITE LOCK WAS ATTEMPTED
001650  060312                      DH30
001652  061546                      DT30
001654  061775                      DF30

                              ;ITEM 44
001656  050240                      EM44                ;ENABLING WRITES BY WRITE LOCK
                                                        ;BUTTON CAUSED AN ERROR
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;THERE AFTER WRITE LOCK
                                                        ;BUTTON ENABLED WRITES
001660  057455                      DH5                 ;
001662  061446                      DT5                 ;
001664  061742                      DF5                 ;

                              ;ITEM 45
001666  050532                      EM45                ;TRANSFERRING ON LAST BLOCK IE. CYLINDER
                                                        ;410, SECTOR 21, TRACK 18
                                                        ;CAUSED IMPROPER REGISTER
                                                        ;CHANGE
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;THERE AFTER TRANSFER
001670  057455                      DH5
001672  061446                      DT5
001674  061742                      DF5

                              ;ITEM 46
001676  051040                      EM46                ;DATA READ FROM LAST
```

```
                                                        ;BLOCK IE. CYLINDER 410
                                                        ;SECTOR 21, TRACK 18 IS IN
                                                        ;ERROR
001700  060312                          DH30
001702  061546                          DT30
001704  061775                          DF30

                                ;ITEM 47
001706  051164                          EM47            ;TRANSFERRING FROM NONEXISTANT
                                                        ;SECTOR CAUSED IMPROPER
                                                        ;REGISTER CHANGE
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;THERE AFTER ATTEMPTED
                                                        ;TRANSFER
001710  057455                          DH5
001712  061446                          DT5
001714  061742                          DF5

                                ;ITEM 50
001716  051446                          EM50            ;TRANSFERRING FROM NONEXISTANT
                                                        ;SECTOR CAUSED DATA ERROR
                                                        ;GOOD DATA GIVES WHAT
                                                        ;SHOULD BE IN BUFFER
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;IN BUFFER AFTER TRANSFER
001720  060312                          DH30
001722  061546                          DT30
001724  061775                          DF30

                                ;ITEM 51
001726  051665                          EM51            ;GIVING ILLEGAL FUNCTION CAUSED
                                                        ;IMPROPER REGISTER CHANGE
                                                        ;GOOD DATA GIVES WHAT SHOULD BE
                                                        ;THERE
                                                        ;RECEIVED DATA GIVES REGISTER
                                                        ;CONTENTS AFTER ILLEGAL FUNCTION
001730  060424                          DH51            ;PC
                                                        ;REG. ADDR.
                                                        ;GOOD DATA
                                                        ;RECEIVED DATA
                                                        ;ILLEGAL FUNCTION
001732  061562                          DT51            ;$ERRPC,REGADR,$GDDAT,$BDDAT,ILLEGL
001734  062002                          DF51            ;0,0,0,0,0


                                ;ITEM 52
001736  052132                          EM52            ;WRITE DATA ON NONEXISTANT
                                                        ;SECTOR CAUSED IMPROPER
                                                        ;REGISTER CHANGE
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT
```

```
                                                    ;WAS THERE AFTER ATTEMPTED
                                                    ;WRITE DATA
 001740  057455                       DH5
 001742  061446                       DT5
 001744  061742                       DF5

                                ;ITEM 53
 001746  052403                       EM53          ;READ HEADER AND DATA AFTER
                                                    ;A SEARCH CAUSED AN ERROR
 001750  060312                       DH30
 001752  061546                       DT30
 001754  061775                       DF30

                                ;ITEM 54
 001756  052471                       EM54          ;ATTEMPTED OPERATION WITH
                                                    ;INVALID ADDRESS CAUSED
                                                    ;IMPROPER REGISTER CHANGE
                                                    ;GOOD DATA GIVES WHAT SHOULD
                                                    ;BE THERE
                                                    ;RECEIVED DATA GIVES WHAT WAS
                                                    ;THERE AFTER OPERATION
 001760  057455                       DH5
 001762  061446                       DT5
 001764  061742                       DF5

                                ;ITEM 55
 001766  052736                       EM55          ;WRITING/READING WITH EXPECTED
                                                    ;ADDRESS OVERFLOW ERROR CAUSED
                                                    ;IMPROPER REGISTER CHANGE
                                                    ;GOOD DATA GIVES WHAT SHOULD
                                                    ;BE THERE
                                                    ;RECEIVED DATA GIVES WHAT
                                                    ;WAS THERE AFTER OPERATION
 001770  057455                       DH5
 001772  061446                       DT5
 001774  061742                       DF5

                                ;ITEM 56
 001776  053224                       EM56          ;DATA READ WITH AN EXPECTED
                                                    ;ADDRESS OVERFLOW ERROR IS
                                                    ;INCORRECT
                                                    ;WORD NO 1 TO 260 SHOULD
                                                    ;BE READ
                                                    ;WORD NOS 261 TO 266 SHOULD
                                                    ;NOT CHANGE DUE TO READ
 002000  060312                       DH30
 002002  061546                       DT30
 002004  061775                       DF30

                                ;ITEM 57
 002006  053434                       EM57          ;ATTEMPTING DATA COMMAND
                                                    ;WITH WRONG FORMAT BIT CAUSED
                                                    ;IMPROPER REGISTER CHANGE
                                                    ;GOOD DATA GIVES WHAT SHOULD BE
```

```
                                                        ;THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;THERE AFTER ATTEMPTED DATA
                                                        ;TRANSFER
002010  057455                          DH5
002012  061446                          DT5
002014  061742                          DF5

                              ;ITEM 60
002016  053726                          EM60            ;ATTEMPTING TO MODIFY REGISTER
                                                        ;DURING AN OPERATION CAUSED
                                                        ;IMPROPER REGISTER CHANGE
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;THERE AFTER OPERATION
                                                        ;WAS COMPLETE
002020  060563                          DH60            ;PC
                                                        ;REG. ADDR.
                                                        ;GOOD DATA
                                                        ;RECEIVED DATA
                                                        ;MODFING REGISTER
002022  061600                          DT60            ;$ERRPC,REGADR,$GDDAT,$BDDAT,$BDADR
002024  062010                          DF60            ;0,0,0,0,0

                              ;ITEM 61
002026  054335                          EM61            ;DEVICE NOT AVAIBLE BEFOR COMMAND WAS TO BE GIVEN
002030  060720                          DH61            ;PC
                                                        ;PC OF JSR
                                                        ;RHDS1
002032  061616                          DT61            ;$ERRPC,PCJSR,$BDADR
002034  062016                          DF61            ;0,0,0

                              ;ITEM 62
002036  054335                          EM61            ;DEVICE NOT AVAIBLE BEFOR COMMAND WAS TO BE GIVEN
002040  061012                          DH62            ;PC
                                                        ;PC OF JSR
                                                        ;RHCS1 WAS
002042  061630                          DT62            ;$ERRPC,PCJSR,$BDADR
002044  062022                          DF62            ;0,0,0


                              ;ITEM 63
002046  054421                          EM63            ;RHDS1 CONTENTS DURING
                                                        ;COMMAND WAS IN ERROR
002050  057455                          DH5
002052  061446                          DT5
002054  061742                          DF5


                              ;ITEM 64
002056  054474                          EM64            ;RECALIBRATE COMMAND CAUSED
                                                        ;IMPROPER REGISTER CHANGE.
                                                        ;GOOD DATA GIVES WHAT SHOULD BE
```

```
                                                            ;THERE.
                                                            ;RECEIVED DATA GIVES WHAT WAS THERE
                                                            ;AFTER COMMAND
002060  057455                      DH5
002062  061446                      DT5
002064  061742                      DF5


                            ;ITEM65

002066  054713                      EM65                    ;INTERRUPT FAILING
002070  061065                      DH65                    ;PC
                                                            ;TEST NO
                                                            ;CONTENTS OF RHCS1
                                                            ;CONTENTS OF RHAS
                                                            ;CONTENTS OF RHDS1
002072  061642                      DT65                    ;$ERRPC,TSTNM,CS1,AS,DS1
002074  062026                      DF65                    ;0,0,0,0,0


                            ;ITEM66
002076  054735                      EM66                    ;HEADER AND DATA COMMAND
                                                            ;FOR HEAD SELECTION TEST
                                                            ;CAUSED AN ERROR
                                                            ;RHDST GIVES WHAT TRACK
                                                            ;WAS BEING WRITTEN ON CYLINDER 0
                                                            ;SECTOR 0
002100  061201                      DH66                    ;PC
                                                            ;RHDST
                                                            ;RHER1
                                                            ;RHER2
                                                            ;RHER3
                                                            ;RHCS1
                                                            ;RHCS2
002102  061656                      DT66                    ;$ERRPC,DST,ER1,ER2,ER3,CS1,CS2
002104  062033                      DF66                    ;0,0,0,0,0,0,0
                            ;ITEM67
002106  055146                      EM67                    ;READ HEADER AND DATA ERROR
                                                            ;IN HEAD SELECTION TEST
                                                            ;FIRST FOUR WORDS GIVE HEADER
                                                            ;NEXT WORDS ARE DATA
                                                            ;GOOD DATA WORDS GIVE
                                                            ;THE TRACK NUMBER IN
                                                            ;BITS 4,5,6,7,8
002110  060312                      DH30
002112  061546                      DT30
002114  061775                      DF30
                            ;ITEM70
002116  055422                      EM70                    ;READ HEADER AND DATA ERROR
                                                            ;IN DIFFERENCE LINE TEST
                                                            ;WORD NOS. 1-4 GIVE
                                                            ;HEADER
                                                            ;WORD NOS. 5-260 GIVE DATA
                                                            ;WHICH IS THE CYLINDER
```

```
                                                      ;ADDRESS
002120  060312                      DH30
002122  061546                      DT30
002124  061775                      DF30

                        ;ITEM 71
002126  055630                      EM71              ;FORCING OPI CAUSED IMPROPER REGISTER
                                                      ; CHANGE
                                                      ;GOOD DATA GIVES WHAT SHOULD
                                                      ;BE THERE
                                                      ;RECEIVED DATA GIVES WHAT WAS
                                                      ;THERE AFTER 3 INDEX PULSES
002130  057455                      DH5               ;PC
                                                      ;REG. ADDR.
                                                      ;GOOD DATA
                                                      ;RECEIVED DATA
002132  061446                      DT5               ;$ERRPC,REGADR,$GDDAT,$BDDAT
002134  061742                      DF5               ;0,0,0,0

                        ;ITEM72
002136  056071                      EM72              ;THERE WAS AN ERROR
                                                      ;AFTER A WRITE HEADER
                                                      ;AND DATA COMMAND

002140  061277                      DH72              ;PC
                                                      ;RHCS1
                                                      ;RHCS2
                                                      ;RHDS1
                                                      ;RHDST
                                                      ;RHCA
                                                      ;RHER1
                                                      ;RHWC
002142  061700                      DT72              ;$ERRPC,CS1,CS2,DS1,DST,CA,ER1,WC
002144  062044                      DF72              ;0,0,0,0.0,0,0,0

                        ;ITEM73
002146  056337                      EM73              ;READING OVER 3 INDEX
                                                      ;PULSES CAUSED SC
002150  061277                      DH72
002152  061700                      DT72
002154  062044                      DF72

                        ;ITEM74
002156  056507                      EM74              ;READING OVER 3 INDEX
                                                      ;PULSES CAUSED OPI
002160  061277                      DH72
002162  061700                      DT72
002164  062044                      DF72
```

```
                                       ;;***************************************************************
                                       ;RH11 REGISTER BITS
                                       ;;***************************************************************

        002166  000254                 RPVEC:  254                             ;RP04 VECTOR ADDRESS



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



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



                                       ;CONTROL AND STATUS REGISTER 2 (RHCS2)

                000001                 [illegible]     1                       ;UNIT SELECT (BIT #0)
                000002                 [illegible]     2                       ;UNIT SELECT (BIT #1)
                000004                 US4=    4                               ;UNIT SELECT (BIT #2)
                000010                 BAI=    10                              ;BUS ADDRESS INCREMENT INHIBIT (BIT #3)
                000020                 UNIB=   20                              ;UNIBUS B DC LO (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 EXISTANT MEMORY (BIT #11)
                010000                 NED=    10000                           ;NON EXISTANT 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 (RHDB)
                                       ;EACH BIT IS CALLED BY BIT NUMBER
```

```
                          ;;*************************************************************
                          ;RP04 REGISTER BITS
                          ;;*************************************************************



                          ;CONTROL AND STATUS 1 REGISTER. (#00)

        000001            GO=      1                  ;GO (BIT #0)
        000100            IE=      100                ;INTERRUPT ENABLE (BIT #6)
        000200            RDY=     200                ;READY (BIT #7)
        000400            A16=     400                ;HIGH ORDER UNIBUS BITS (BIT #8)
        001000            A17=     1000               ;HIGH ORDER UNIBUS BITS (BIT #9)
        002000            PSEL=    2000               ;PORT SELECT (BIT #10)
        004000            DVA=     4000               ;DEVICE AVAILABLE (BIT #11)
        020000            MCPE=    20000              ;MASSBUSS PARITY ERROR (BIT #13)
        040000            TRE=     40000              ;TRANSFER ERROR (BIT #14)
        100000            SC=      100000             ;SPECIAL CONDITION (BIT #15)

                          ;STATUS REGISTER (RHDS1) (#01)

        000001            DFF5=    1                  ;DRIVE FORWARD 5"/SEC.  (BIT #0)
        000002            DFF20=   2                  ;DRIVE FORWARD 20"/SEC.  (BIT #1)
        000004            DIGB=    4                  ;DRIVE TO INNER GAVRD BAND (BIT #2)
        000010            GRV=     10                 ;GO REVERSE (BIT #3)
        000020            DL64=    20                 ;DIFFERENCE LESS THAN 64 (BIT #4)
        000040            DE1=     40                 ;DIFFERENCE EQUALS 1 (BIT #5)
        000100            VV=      100                ;VOLUME VALID (BIT #6)
        000200            DRY=     200                ;DRIVE READY (BIT #7)
        000400            DPR=     400                ;DRIVE PRESENT (BIT #8)
        001000            PROG=    1000               ;PROGRAMABLE (BIT #9)
        002000            LBT=     2000               ;LAST SECTOR TRANSFERRED (BIT #10)
        004000            WRL=     4000               ;WRITE LOCK (BIT #11)
        010000            MOL=     10000              ;MEDIUM ON-LINE (BIT #12)
        020000            PIP=     20000              ;POSITIONING OPERATION IN PROGRESS (BIT #13)
        040000            ERR=     40000              ;COMPOSIT ERROR. (BIT #14)
        100000            ATA=     100000             ;ATTENTION ACTIVE (BIT #15)

                          ;ERROR REGISTER #01 (RHER1) (#02)
        000001            ILF=     1                  ;ILLEGAL FUNCTION (BIT #0)
        000002            ILR=     2                  ;ILLEGAL REGISTER (BIT #1)
        000004            RMR=     4                  ;REGISTER MODIFICATION REFUSED (BIT #2)
        000010            PAR=     10                 ;PARITY ERROR (BIT #3)
        000020            FER=     20                 ;FORMAT ERROR (BIT #4)
        000040            WCF=     40                 ;WRITE CLOCK FAIL (BIT #5)
        000100            ECH=     100                ;ECC HARD ERROR (BIT #6)
        000200            HCE=     200                ;HEADER COMPARE ERROR (BIT #7)
        000400            HCRC=    400                ;HEADER CRC ERROR (BIT #8)
        001000            AOE=     1000               ;ADDRESS OVERFLOW ERROR (BIT #9)
        002000            IAE=     2000               ;INVALID ADDRESS ERROR (BIT #10)
        004000            WLE=     4000               ;WRITE LOCK ERROR (BIT #11)
        010000            DTE=     10000              ;DRIVE TIMING ERROR (BIT #12)
        020000            OPI=     20000              ;OPERATION INCOMPLETE (BIT #13)
        040000            UNS=     40000              ;DRIVE UNSAFE (BIT #14)
```

```
        100000          DCK=    100000                  ;DATA CHECK ERROR (BIT 15)

                        ;MAINTAINABILITY REGISTER (RHMR)(#03)

        000001          DMD=    1                       ;DIAGINOSTIC MODE (BIT #0)
        000002          MCLK=   2                       ;MAINTAINABILITY CLOCK (BIT #1)
        000004          MINX=   4                       ;MAINTAINABILITY INDEX (BIT #2)
        000010          MSTCK=  10                      ;MAINTAINABILITY SECTOR CLOCK (BIT #3)
        000020          MRD=    20                      ;MAINTAINABILITY READ (BIT #4)
        000040          MWR=    40                      ;MAINTAINABILITY WRITE (BIT #5)
        001000          DTSY=   1000                    ;MAINTAINABILITY SYNC DETECTED (BIT #9)

                        ;ATTENTION SUMMARY PSEUDO-REGISTER (RHAS) (#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 (RHDST) (#1)
                        ;EACH BIT IS CALLED BY BIT NUMBER

                        ;DRIVE TYPE REGISTER (RHDT) (#06)
                        ;EACH BIT IS CALLED BY BIT NUMBER

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

        000001          EXT1=   1                       ;EXTENSION 1 (BIT #0)
        000002          EXT2=   2                       ;EXTENSION 2 (BIT #1)
        000004          EXT4=   4                       ;EXTENSION 3 (BIT #2)
        000010          EXT10=  10                      ;EXTENSION 4 (BIT #3)
        000020          EXT20=  20                      ;EXTENSION 5 (BIT #4)
        000040          EXT40=  40                      ;EXTENSION 6 (BIT #5)
        000100          SC1=    100                     ;SECTOR COUNT FIELD 0 (BIT #6)
        000200          SC2=    200                     ;SECTOR COUNT FIELD 1 (BIT #7)
        000400          SC4=    400                     ;SECTOR COUNT FIELD 2 (BIT #8)
        001000          SC10=   1000                    ;SECTOR COUNT FIELD 3 (BIT #9)
```

```
002000          SC20=   2000            ;SECTOR COUNT FIELD 4 (BIT #10)
004000          TRK1=   4000            ;TRACK FIELD 1 (BIT #11)
010000          TRK2=   10000           ;TRACK FIELD 2 (BIT #12)
020000          TRK4=   20000           ;TRACK FIELD 3 (BIT #13)
040000          TRK10=  40000           ;TRACK FIELD 4 (BIT #14)
100000          TRK20=  100000          ;TRACK FIELD 5 (BIT #15)

                ;ERROR REGISTER #2 (RHER2) (#10)

000001          WCU=    1               ;WRITE CURRENT UNSAFE (BIT #0)
000002          CSF=    2               ;CURRENT SINK FAILURE (BIT #1)
000004          WSU=    4               ;WRITE SELECT UNSAFE (BIT #2)
000010          CSU=    10              ;CURRENT SWITCH UNSAFE (BIT #3)
000020          MSE=    20              ;MOTOR SEQUENCE ERROR (BIT #4)
000040          TDF=    40              ;TRANSITIONS DETECTOR FAILURE (BIT #5)
000100          TUF=    100             ;TRANSITIONS UNSAFE (BIT #6)
000200          FEN=    200             ;FAILSAFE ENABLED (BIT #7)
000400          WRU=    400             ;WRITE READY UNSAFE (BIT #8)
001000          MHS=    1000            ;MULTIPLE HEAD SELECT (BIT #9)
002000          NHS=    2000            ;NO HEAD SELECTION (BIT #10)
004000          IXE=    4000            ;INDEX ERROR (BIT #11)
010000          VU30=   10000           ;30VOLT UNSAFE (BIT #12)
020000          PLU=    20000           ;PLO UNSAFE (BIT #13)
100000          ACU=    100000          ;ACUNSAFE (BIT #15)

                ;OFFSET REGISTER (RHOF) (#11)

000001          OF25=   1               ;OFFSET 25 MICRO INCHES (BIT #0)
000002          OF50=   2               ;OFFSET 50 MICRO INCHES (BIT #1)
000004          OF100=  4               ;OFFSET 100 MICRO INCHES (BIT #2)
000010          OF200=  10              ;OFFSET 200 MICRO INCHES (BIT #3)
000020          OF400=  20              ;OFFSET 400 MICRO INCHES (BIT #4)
000040          OF800=  40              ;OFFSET 800 MICRO INCHES (BIT #5)

000200          OFREV=  200             ;OFFSET NEGATIVE (REVERSE) (BIT #5)
002000          HCI=    2000            ;HEADER COMPARE INHIBIT (BIT #10)
004000          ECI=    4000            ;ERROR CORRECTION CODE INHIBIT (BIT #11)
010000          FMT22=  10000           ;FORMAT BIT (BIT #12

                ;DESIRED CYLINDER ADDRESS (RHCA) (#12)
                ;EACH BIT IS CALLED BY BIT NUMBER.




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




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

```



                                        ;ERROR REGISTER #03 (RHER3) (#15)

        000001                          PSU=    1                               ;PACK SPEED UNSAFE (BIT #0)
        000002                          VUF=    2                               ;VELOCITY UNSAFE (BIT #1)
        000010                          UWR=    10                              ;ANY UNSAFE EXCEPT READ/WRITE (BIT #3)
        000020                          PRE=    20                              ;DISK PACK ROTATION ERROR (BIT #4)
        000040                          ACL=    40                              ;AC LOW (BIT #5)
        000100                          DCL=    100                             ;DC LOW (BIT #6)
        040000                          SKI=    40000                           ;SEEK INCOMPLETE (BIT #14)
        100000                          OCYL=   100000                          ;OFF CYLINDER (BIT #15)



                                        ;ECC POSITION REGISTER (RHEC1) (#16)
                                        ;EACH BIT IS CALLED BY BIT NUMBER




                                        ;ECC PATTERN REGISTER (RHEC2) (#17)
                                        ;EACH BIT IS CALLED BY BIT NUMBER

```

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                                .SBTTL  REGISTER ADDRESSES




                                ;RP04/5/6 DISK I/O REGISTERS LOCATED IN THE RH11 CONTROLLER

        002170  176722          RHDB:   176722                  ;DATA BUFFER
        002172  176702          RHWC:   176702                  ;WORD COUNT
        002174  176704          RHBA:   176704                  ;BUS ADDRESS
        002176  176710          RHCS2:  176710                  ;CONTROL AND STATUS 2

                                ;RP04/5/6 DISK I/O REGISTERS LOCATED IN THE DEVICE CONTROL LOGIC (DCL)

        002200  176700          RHCS1:  176700                  ;CONTROL AND STATUS 1
        002202  176714          RHER1:  176714                  ;ERROR #1
        002204  176706          RHDST:  176706                  ;DESIRED SECTOR/TRACK ADDRESS
        002206  176740          RHER2:  176740                  ;ERROR #2
        002210  176732          RHOF:   176732                  ;OFFSET
        002212  176734          RHCA:   176734                  ;DESIRED CYLINDER ADDRESS
        002214  176742          RHER3:  176742                  ;ERROR #3
        002216  176716          RHAS:   176716                  ;ATTENTION SUMMARY
        002220  176724          RHMR:   176724                  ;MAINTAINABILITY
        002222  176712          RHDS1:  176712                  ;DRIVE STATUS
        002224  176726          RHDT:   176726                  ;DRIVE TYPE
        002226  176730          RHSN:   176730                  ;SERIAL NUMBER
        002230  176744          RHEC1:  176744                  ;ECC POSITION
        002232  176746          RHEC2:  176746                  ;ECC PATTERN
        002234  176736          RHCC:   176736                  ;CURRENT CYLINDER ADDRESS
        002236  176720          RHLA:   176720                  ;LOOK-AHEAD

                                ;ADDITIONAL REGISTERS LOCATED IN THE RH70 CONTROLLER LOGIC

        002240  176750          RHBAE:  176750                  ;BUS ADDRESS EXTENSION REGISTER
        002242  176752          RHCS3:  176752                  ;CONTROL AND STATUS REGISTER #3


                                ;P-CLOCK (KW11-P) I/O REGISTERS

        002244  172540          PCLCSR: 172540                  ;CONTROL AND STATUS REGISTERS
        002246  172542          PCLBUF: 172542                  ;COUNT SET BUFFER
        002250  172544          PCLCTR: 172544                  ;COUNTER
```

```
                                ;THE FOLLOWING LOCATIONS ARE RESERVED FOR REGISTER SAVES
                                ;ANY TIME THERE IS AN ERROR ALL THESE WILL BE FILLED
                                ;ONLY SOME MAY BE PRINTED BUT ALL WILL BE FILLED TRUE
                                ;FOR THE TIME JUST AFTER THE "ERROR" ERROR COMMAND

002252  000000                  DB:     0                       ;DATA BUFFER
002254  000000                  WC:     0                       ;WORD COUNT
002256  000000                  BA:     0                       ;BUS ADDRESS
002260  000000                  CS2:    0                       ;CONTROL AND STATUS 2


002262  000000                  CS1:    0                       ;CONTROL AND STATUS 1
002264  000000                  ER1:    0                       ;ERROR #1
002266  000000                  DST:    0                       ;DESIRED SECTOR/TRACK ADDRESS
002270  000000                  ER2:    0                       ;ERROR #2
002272  000000                  OF:     0                       ;OFFSET
002274  000000                  CA:     0                       ;DESIRED CYLINDER ADDRESS
002276  000000                  ER3:    0                       ;ERROR #3
002300  000000                  AS:     0                       ;ATTENTION SUMMARY
002302  000000                  MR:     0                       ;MAINTAINABILITY
002304  000000                  DS1:    0                       ;DRIVE STATUS
002306  000000                  DT:     0                       ;DRIVE TYPE
002310  000000                  SN:     0                       ;SERIAL NUMBER
002312  000000                  EC1:    0                       ;ECC POSITION
002314  000000                  EC2:    0                       ;ECC PATTERN
002316  000000                  CC:     0                       ;CURRENT CYLINDER ADDRESS
002320  000000                  LA:     0                       ;LOOK-AHEAD
```

```
                                ;FUNCTION EQUATES

                                        ;*TABLE OF FUNCTIONS FOR RHCS1 THEN "GO" BIT HAS TO BE SET
002322                          FUTABL:
002322  000000                  NOPERA: 0                        ;NO OPERATION
002324  000002                  UNLOAD: 2                        ;UNLOAD (STAND BY)
002326  000006                  RECALI: 6                        ;RECALIBRATE
002330  000010                  DCLEAR: 10                       ;DRIVE CLEAR
002332  000012                  RELEAS: 12                       ;RELEASE (DUAL-PORT OPERATION)
002334  000030                  SERCH:  30                       ;SEARCH COMMAND
002336  000050                  WRCHEK: 50                       ;WRITE CHECK DATA
002340  000052                  WRCHDT: 52                       ;WRITE CHECK HEADER AND DATA
002342  000060                  WRIDAT: 60                       ;WRITE DATA
002344  000062                  WRIFOR: 62                       ;WRITE HEADER AND DATA (FORMAT)
002346  000070                  READAT: 70                       ;READ DATA
002350  000072                  REFOR:  72                       ;READ HEADER AND DATA
002352  000004                  SEECOM: 4                        ;SEEK COMMAND
002354  000014                  OFSETC: 14                       ;OFFSET COMMAND
002356  000016                  RETCL:  16                       ;RETURNTO CENTERLINE
002360  000022                  PKACK:  22                       ;PACK ACKNOWLEDGE
002362  000020                  READIN: 20                       ;READ IN
002364  000000                  ILLEGL: .WORD   0                ;COMPUTED ILLEGAL FUNCTION


                                        ;*DATA BUFFER FOR READ WRITE

002370  000422                  WRFROM: .BLKW   274.             ;WRITE FROM THIS BUFFER
003434  000422                  REINTO: .BLKW   274.             ;READ INTO THIS BUFFER
```

```


                                     ;RESERVED LOCATIONS FOR FLAGS AND INTERNAL PROGRAM CONTROL WORDS

004500  000000                       REGADR: 0                   ;SAVE REGISTER ADDRESS HERE
004502  000000                       ERWORD: 0                   ;SAVE ERROR WORD NUMBER HERE
004504  000000                       TSTNM:  0                   ;TEST NUMBER
004506  000000                       RP4VEC: 0                   ;CONTAINS ADDRESS OF LOCATION
                                                                 ;WHERE AN RP04 INTERRUPT IS TO VECTOR TO
                                                                 ;THIS MUST BE MOVED INTO 'RPVEC' TO BE
                                                                 ;EFFECTIVE.

004510  000000                       OFSTVL: 0                   ;OFFSET VALUE USED IN OFFSET TEST


004512  000024                       SAVERE: .BLKW   20.         ;BLOCK TO SAVE REGISTERS
004562  000000                       FINALA: 0                   ;SAVE LOOK AHEAD REGISTER AT END OF OPERATION
004564  000000                       FINACC: 0                   ;SAVE CURRENT CYLINDER REGISTER AT END OF OPERATION


                                     ;TABLE FOR ATTENTION BITS
                                     ;ATTENTION TABLE

004566     001      002      004     ATABLE: .BYTE   1,2,4,10,20,40,100,200
004571     010      020      040
004574     100      200



                                     ;RESERVED LOCATIONS FOR UNIT SELECT

004576  000010                       UNITS:  .BLKW   8.          ;THIS IS FILLED WITH -1
004616  000000                       UNIT:   .WORD   0           ;UNIT UNDER TEST
004620  000000                       NOUNIT: .WORD   0           ;NUMBER OF UNITS PRESENT
                                                                 ;USED TO KEEP TRACK OF UNIT UNDER TEST
004622  000000                       NUNIT:  .WORD   0           ;USED TO DETERMIN IF THERE ARE MORE
                                                                 ;THAN ONE UNIT
004624  000000                       NOPUSH: 0                   ;ALL ONES INDICATE NONE OF THE OPERATOR
                                                                 ;INTERVENTION TESTE WILL BE PERFORMED
004626  000000                       SELECT: .WORD   0           ;ALL ONES INDICATE UNIT TO BE SELECTED
004630  000000                       UNITSL: .WORD   0           ;UNIT NO. SELECTED



004632  000000                       ERFLG$: 0                   ;ERROR FLAG

004634  000000                       FIRST:  0                   ;IF ZERO WILL TYPE HEADER
                                                                 ;IF ONES WILL NOT TYPE HEADER

004636  000000                       RP06:   0                   ;DEVICE TYPE FLAG

004640  000000                       RH70:   0                   ;IF 1, PROGRAM IS RUNNING ON AN RH70
                                                                 ;IF 0, PROGRAM IS ON AN RH11

```

```
004642  000000          RUNCTR: .WORD   0               ;'RUN' LINE DELAY COUNTER TO BE USED
                                                        ;WHILE THE SILO IS FILLING

004644  000000          ATTENT: 0                       ;ATTENTION BIT FOR PRESENT UNIT
004646  000000          TOTALAT:        0               ;TOTAL ATTENTION BITS

004650  000000          TMP0:   .WORD   0               ;TEMP STORAGE
004652  000000          TMP1:   .WORD   0
004654  000000          TMP4:   .WORD   0               ;TEMP STORAGE
004656  000000          TMP5:   .WORD   0               ;TEMP STORAGE
```

```
DZRJJA.P11      ORD     0                       ;TEMP STORAGE

                                                .SBTTL
                                                .SBTTL  *** DIAGNOSTIC CODE ***
                                                .SBTTL


                                                .SBTTL  SETUP TESTS


004660  012737  177777  004624  BEGIN1: MOV     #-1,@#NOPUSH    ;JUMP OVER OPERATOR REQUIRED TESTS
004666  005037  004626                  CLR     @#SELECT        ;DO NOT SELECT UNIT
004672  000412                          BR      START
004674  012737  177777  004626  BEGIN2: MOV     #-1,@#SELECT    ;SELECT UNIT
004702  005037  004624                  CLR     @#NOPUSH        ;DO NOT JUMP OVER ANY TEST
004706  000404                          BR      START
004710  005037  004626          BEGIN:  CLR     @#SELECT        ;DO NOT SELECT UNIT
004714  005037  004624                  CLR     @#NOPUSH        ;DO NOT JUMP OVER ANY TEST
                                                                ;NORMAL RUN

004720                          START:
004720  000005                          RESET
                                .SBTTL  INITIALIZE THE COMMON TAGS
                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
004722  012706  001100                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
004726  005026                          CLR     (R6)+           ;;CLEAR MEMORY LOCATION
004730  022706  001140                  CMP     #SWR,R6 ;;DONE?
004734  001374                          BNE     .-6             ;;LOOP BACK IF NO
004736  012706  001000                  MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                ;;INITIALIZE A FEW VECTORS
004742  012737  036070  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
004750  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
004756  012737  040266  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
004764  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
004772  012737  042012  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
005000  012737  000340  000036          MOV     #340,@#TRAPVEC+2;;LEVEL 7
005006  012737  042062  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
005014  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
005022  005037  001212                  CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
005026  005037  001214                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
005032  112737  000001  001115          MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
005040  012737  005040  001106          MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
005046  012737  005046  001110          MOV     #.,$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.
005054  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
005060  012737  005114  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
005066  012737  177570  001140          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
005074  012737  177570  001142          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
005102  022777  177777  174030          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
005110  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                ;;AND  THE HARDWARE SWR IS NOT = -1
005112  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
005114  012716  005122          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
005120  000002                          RTI
005122  012737  000176  001140  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
```

```
005130  012737  000174  001142          MOV     #DISPREG,DISPLAY
005136  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR



005142  012737  000000  177776          MOV     #0,PS           ;SET PROCESSOR STATUS TO 0
005150  012737  000200  000036          MOV     #200,@#TRAPVEC+2 ;TRAP PRIORITY = 4
005156  013700  002166                  MOV     @#RPVEC,R0      ;GET RP VECTOR ADDRESS
005162  012720  036000                  MOV     #RPVECT,(R0)+   ;THIS IS FOR UNTIMELY INTERRUPTS
005166  012710  000340                  MOV     #340,(R0)       ;RP04 INTERRUPT SERVICE ROUTINE
                                                                ;PRIORITY = 7

005172  004737  037026                  JSR     PC,@#$TKINT     ;INITIALIZE THE TTY KEYBOARD
005176  005737  004634                  TST     @#FIRST         ;IS THIS FIRST TIME ROUND ?
005202  001001                          BNE     1$              ;DO NOT GIVE HEADER IF NOT
005204  000402                          BR      2$              ;GIVE HEADER IF SO
005206  000137  005774          1$:     JMP     @#SND1          ;SKIP OVERALL PROGRAM HEADER

005212                          2$:
005212  104400  005220                  TYPE    ,68$            ;;TYPE ASCIZ STRING
005216  000435                          BR      67$             ;;GET OVER THE ASCIZ
                                ;;68$:  .ASCIZ  <15><12>?RP04/5/6 FUNCTIONAL CONTROLLER TEST, PART II  - DZRJJ-A?
005312                          67$:
005312  104400  005320                  TYPE    ,70$            ;;TYPE ASCIZ STRING
005316  000414                          BR      69$             ;;GET OVER THE ASCIZ
                                ;;70$:  .ASCIZ  <15><12>/REVISION 21-MAR-76/<15><12>
005350                          69$:

005350  104400  005356                  TYPE    ,72$            ;;TYPE ASCIZ STRING
005354  000433                          BR      71$             ;;GET OVER THE ASCIZ
                                ;;72$:  .ASCIZ  <15><12>/ALL DCL'S UNDER TEST MUST BE LOCKED ON CORRECT PORT/
005444                          71$:
005444  104400  005452                  TYPE    ,74$            ;;TYPE ASCIZ STRING
005450  000433                          BR      73$             ;;GET OVER THE ASCIZ
                                ;;74$:  .ASCIZ  <15><12>/IF CHANGES ARE REQUIRED ON PORT SWITCH, A CYCLE UP/
005540                          73$:
005540  104400  005546                  TYPE    ,76$            ;;TYPE ASCIZ STRING
005544  000436                          BR      75$             ;;GET OVER THE ASCIZ
                                ;;76$:  .ASCIZ  <15><12>/SEQUENCE IS REQUIRED FOR STROBING THE PORT SELECT FLOP/<15><12>
005642                          75$:

005642  104400  005650                  TYPE    ,78$            ;;TYPE ASCIZ STRING
005646  000430                          BR      77$             ;;GET OVER THE ASCIZ
                                ;;78$:  .ASCIZ  <15><12>/ALL DCL'S NOT UNDER TEST MUST BE SWITCHED OFF/
005730                          77$:
005730  104400  005736                  TYPE    ,80$            ;;TYPE ASCIZ STRING
005734  000417                          BR      79$             ;;GET OVER THE ASCIZ
                                ;;80$:  .ASCIZ  <15><12>/OR LOCKED ON THE OTHER PORT/
005774                          79$:

005774  012737  177777  004634  SND1:   MOV     #-1,@#FIRST     ;NEXT TIME DO NOT GIVE HEADER

                                .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
006002  005737  000042                  TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
```

```
1520  006006  001006                          BNE     64$              ;;BRANCH IF YES
1521  006010  023727  001140  000176          CMP     SWR,#SWREG       ;;SOFTWARE SWITCH REG SELECTED?
1522  006016  001005                          BNE     65$              ;;BRANCH IF NO
1523  006020  104405                          GTSWR                    ;;GET SOFT-SWR SETTINGS
1524  006022  000403                          BR      65$
1525  006024  112737  000001  001134  64$:    MOVB    #1,$AUTOB        ;;SET AUTO-MODE INDICATOR
1526  006032                          65$:
1527
1528  006032  032777  010000  173100  RH70CK: BIT     #SW12,@SWR       ;LOOK TO SEE IF USING RH70
1529  006040  001403                          BEQ     3$               ;IF SW12 = 0, SKIP NEXT
1530  006042  012737  177777  004640          MOV     #-1,@#RH70       ;IF SW12 = 1, CU IS AN RH70
1531  006050                          3$:
```

```
                                                ;;*************************************************************
                                                          ;*IS THERE A P-CLOCK (KW11-P) ON THE SYSTEM ?
                                                          ;*IF SO MAKE 'WAT" TRAPS GO TO 'WAIT.P
                                                          ;*IF SO MAKE RP04 INTERRUPTS GO TO 'TIME 1'
                                                          ;*IF NOT MAKE 'WAT' TRAPS GO TO 'WAIT.T'
                                                          ;*IF NOT MAKE RP04 INTERRUPTS GO TO 'TIME 2'

                                                          ;*THE NEXT LINE IS TO BE ADDED LATER
                                                          ;*AND THE JUMP AND NOP REMOVED
                                                          ;*FOR NOW NO CLOCK WILL BE USED

                                                          ;*MOV    @#1$,@#ERRVEC    ;SET TIME-OUT VECTOR

                                                ;         JMP     @#1$             ;DO NOT USE CLOCK
                                                ;         NOP
                                                ;         TST     @#PCLCSR         ;REFERENCE P-CLOCK STATUS REGISTER
                                                ;                                  ;ADDRESS = 172540
                                                ;         MOV     #WAIT.P,@#$TRPAD+20 ;THERE IS A P-CLOCK
                                                ;         MOV     #TIME1,@#RP4VEC  ;THERE IS A P CLOCK SO
                                                ;                                  ;VECTOR TO TIME1
                                                ;         BR      2$
                                                ;1$:      MOV     #WAIT.T,@#$TRPAD+20 ;THERE IS NO P-CLOCK
                                                ;;*************************************************************


006050  012737  033216  004506                            MOV     #TIME2,@#RP4VEC  ;MAKE RP04/5/6 INTERRUPTS GO TO 'TIME 2'
006056  012737  177777  040434          2$:               MOV     #-1,@#PRITEM     ;CLEAR PREVIOUS ITEM NUMBER

006064  005737  004626                                    TST     @#SELECT         ;WAS IT A 200 START

006070  001442                                            BEQ     TST1             ;BRANCH IF STARTING FROM 200

006072  104400  006100                                    TYPE    ,65$             ;;TYPE ASCIZ STRING
006076  000424                                            BR      64$              ;;GET OVER THE ASCIZ
                                                ;;65$:    .ASCIZ  <15><12>/SELECT UNIT NUMBER TO BE TESTED ?  /<15><12>
006150                                          64$:
006150  104411                                            RDOCT
006152  042716  177770                                    BIC     #177770,(SP)     ;ONLY KEEP LAST 3 BITS
006156  011637  004616                                    MOV     (SP),@#UNIT      ;SAVE UNIT TO BE TESTED
006162  012637  004630                                    MOV     (SP)+,@#UNITSL   ;SAVE UNIT TO BE TESTED

006166  001403                                            BEQ     TST1             ;BRANCH IF STARTING FROM 200

006170  013737  004630  004616                            MOV     @#UNITSL,@#UNIT  ;SET UNIT NUMBER

```

```
                                         ;;*************************************************************
                                         ;*TEST 1          REFERENCE EACH REGISTER

                                         ;*                REFERENCE EACH REGISTER BY A MOVE INSTRUCTION

                                         ;;*************************************************************
 006176  000004                          TST1:   SCOPE
 006200  012737  000001  001212                  MOV     #1,$TIMES          ;;DO 1 ITERATION

 006206  012737  000001  004504                  MOV     #2-1,@#TSTNM       ;THIS SAVES TEST NUMBER

 006214  012706  001000                          MOV     #STACK, SP         ;SET UP STACK POINTER
 006220  012737  040276  000030                  MOV     #REGSA1,@#EMTVEC;ERROR VECTOR SO THAT
                                                                            ;NO REGISTERS ARE SAVED
 006226  012737  006254  000004                  MOV     #2$,@#ERRVEC       ;SET UP FOR BUS TIMEOUT

 006234  012700  000024                          MOV     #24,R0             ;THERE ARE 24 REG TO TEST
 006240  012701  002170                          MOV     #RHDB,R1           ;R1 NOW HAS ADDR OF ADDR OF FIRST REG.
 006244  013102                          1$:     MOV     @(R1)+, R2         ;READ HARDWARE REG.
 006246  005300                                  DEC     R0                 ;COUNT DOWN
 006250  001375                                  BNE     1$                 ;BRANCH IF 24 NOT DONE
 006252  000470                                  BR      3$                 ;BRANCH IF 24 DONE
 006254  012737  000006  000004  2$:     MOV     #ERRVEC+2,@#ERRVEC ;RESTORE TRAP CATCHER
 006262  022626                                  CMP     (SP)+,(SP)+        ;CLEAN STACK
 006264  016137  177776  001200                  MOV     -2(R1), $TMP1      ;STORE FAILING REG ADDR
 006272  104007                                  ERROR   7                  ;REGISTER NON EXISTANT
 006274  032777  020000  172636                  BIT     #SW13,@SWR         ;INHIBIT ERROR PRINTOUT ?
 006302  001052                                  BNE     4$                 ;BRANCH IF YES

 006304  104400  006312                          TYPE    ,65$               ;;TYPE ASCIZ STRING
 006310  000424                                  BR      64$                ;;GET OVER THE ASCIZ
                                         ;;65$:   .ASCIZ  <15><12>/IF BASE ADDRESS IS TO BE CHANGED HALT/
 006362                                  64$:
 006362  104400  006370                          TYPE    ,67$               ;;TYPE ASCIZ STRING
 006366  000415                                  BR      66$                ;;GET OVER THE ASCIZ
                                         ;;67$:   .ASCIZ  <15><12>/PROGRAM AND RESTART AT /
 006422                                  66$:

 006422  012746  035150                          MOV     #BASECH,-(SP)      ;GET READY TO TYPE STARTING ADDRESS
                                                                            ;OF "CHANGE OF BASE ADDRESS" ROUTINE
 006426  104401                                  TYPOC
 006430  000137  032506                  4$:     JMP     @#$EOP             ;GO TO END OF PROGRAM ----------->

 006434  012737  040266  000030  3$:     MOV     #$ERROR,@#EMTVEC;RESTORE ERROR VECTOR
                                                                            ;SO THAT REGISTERS ARE SAVED
 006442  012737  000006  000004                  MOV     #ERRVEC+2,@#ERRVEC ;RESTORE TRAP CATCHER
```

```

                                                ;;*******************************************************************
                                                ;*TEST 2         PARTIAL TEST OF RHAS FOR UNIT NUMBERS PRESENT

                                                ;*       CHECK THAT RHAS CAN BE CLEARED BY MOVING ALL ONES

                                                ;;*******************************************************************
006450  000004                                  TST2:   SCOPE
006452  012737  000001  001212                          MOV     #1,$TIMES               ;;DO 1 ITERATION
006460  012706  001000                                  MOV     #STACK,SP               ;SET STACK POINTER

006464  013701  002216                                  MOV     @#RHAS,R1               ;R1 HAS ADDRESS OF RHAS
006470  012711  177777                                  MOV     #-1,@R1                 ;WRITE ALL ONES INTO RHAS
006474  105711                                          TSTB    @R1                     ;TEST IT FOR ALL 0'S

006476  001407                                          BEQ     TST3                    ;BRANCH IF GOOD

006500  011137  001126                                  MOV     @R1,@#$BDDAT            ;BAD DATA
006504  005037  001124                                  CLR     @#$GDDAT                ;GOOD DATA
006510  010137  004500                                  MOV     R1,@#REGADR             ;FAILING REG. RHAS
006514  104005                                          ERROR   5                       ;RHAS DOES NOT CLEAR BY WRITING ALL
                                                                                        ;ONES INTO IT

```

```

                                        ;;************************************************************
                                        ;*TEST 3        TEST FOR DRIVES PRESENT USING RHAS AND RHCS2

                                        ;*      THE NUMBER OF RP04/RP06 DRIVES PRESENT IS FOUND
                                        ;*      BY MOVING ALL ONES INTO RHER1 WITH UNIT NUMBER
                                        ;*      IN RHCS2 INCREMENTED FROM ZERO TO SEVEN.

                                        ;*      THE SET BITS IN RHAS WILL GIVE DRIVES PRESENT.

                                        ;*      THE DRIVE TYPE IS CHECKED TO BE RP04 OR RP06 AND
                                        ;*      UNITS PRESENT ARE STORED IN A TABLE CALLED 'UNITS'

                                        ;;************************************************************
006516  000004                          TST3:   SCOPE
006520  012737  000001  001212                  MOV     #1,$TIMES               ;;DO 1 ITERATION


006526  012737  000003  004504                  MOV     #4-1,@#TSTNM            ;THIS SAVES TEST NUMBER

006534  000005                                  RESET                           ;START WITH AN INIT
006536  004737  037026                          JSR     PC,@#$TKINT             ;INITILIZE THE TTY KEYBOARD

006542  032777  020000  172370                  BIT     #SW13,@SWR              ;INHIBIT ERROR TYPEOUT?
006550  001026                                  BNE     4$                      ;BRANCH IF YES
006552  104400  006560                          TYPE    ,65$                    ;;TYPE ASCIZ STRING
006556  000423                                  BR      64$                     ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <15><12><15><12>/LOOKING AT RHAS - DRIVES PRESENT/
006626                                  64$:
006626  013701  002216                  4$:     MOV     @#RHAS,R1               ;R1 HAS ADDR. OF RHAS
006632  013702  002176                          MOV     @#RHCS2,R2              ;R2 HAS ADDR. OF RHCS2
006636  005012                                  CLR     @R2                     ;CLEAR RHCS2
006640  012700  000010                          MOV     #8.,R0                  ;COUNT
006644  013704  002202                          MOV     @#RHER1,R4              ;R4 HAS ADDR. OF RHER1
006650  012714  177777                  1$:     MOV     #-1,@R4                 ;MOVE ERRORS INTO RHER1
006654  005212                                  INC     @R2                     ;INCREMENT UNIT NO.
006656  005300                                  DEC     R0                      ;COUNT
006660  001373                                  BNE     1$                      ;BRANCH IF 8 NOT DONE
006662  111137  004646                          MOVB    @R1,@#TOTALAT           ;SAVE TOTAL ATTENTION
                                                                                ;USED IN DRIVE CLEAR TEST
006666  105037  004647                          CLRB    @#TOTALAT+1             ;CLEAR UPPER BYTE
006672  105711                                  TSTB    @R1                     ;TEST FOR ANY DRIVES PRESENT
006674  001402                                  BEQ     2$                      ;IF NONE THERE - SAY SO
006676  000137  007260                          JMP     XE2                     ;SOME THERE - LOAD TABLE

006702  032777  020000  172230          2$:     BIT     #SW13,@SWR              ;INHIBIT ERROR TYPE OUT?
006710  001402                                  BEQ     3$                      ;BRANCH IF NO
006712  000137  007616                          JMP     SELTST                  ;CHECK FOR SELECTED UNIT START AND LOAD
                                                                                ;"UNITS" TABLE WITH DESIRED DRIVE IF SO

006716                                  3$:
006716  104400  006724                          TYPE    ,67$                    ;;TYPE ASCIZ STRING
006722  000421                                  BR      66$                     ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  <15><12><15><12>/NO DRIVES PRESENT - RHAS = 0/
```

```
006766                          66$:
006766  104400  006774                  TYPE    ,69$            ;;TYPE ASCIZ STRING
006772  000430                          BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$:  .ASCIZ  <15><12>/WRITING ONES INTO RHER1 FOR ALL UNIT NUMBERS/
007054                          68$:
007054  104400  007062                  TYPE    ,71$            ;;TYPE ASCIZ STRING
007060  000430                          BR      70$             ;;GET OVER THE ASCIZ
                                ;;71$:  .ASCIZ  <15><12>/DOES NOT SET ANY BIT IN RHAS SO ABORT PROGRAM/
007142                          70$:
007142  104400  007150                  TYPE    ,73$            ;;TYPE ASCIZ STRING
007146  000442                          BR      72$             ;;GET OVER THE ASCIZ
                                ;;73$:  .ASCIZ  <15><12>/TO LOOP ON THIS TEST WO PRINTOUT SET SWITCHES 13,8,1 & 0<15><12
007254                          72$:

007254  000137  032506                  JMP     @#$EOP          ;GO OUT ------------------------>


                                        ;*SET UP THE UNITS TABLE

007260                          XE2:
007260  012700  000010          2$:     MOV     #8.,R0          ;COUNTER
007264  012703  004576                  MOV     #UNITS,R3       ;POINTER
007270  012723  177777          3$:     MOV     #-1,(R3)+       ;PRESET BLOCK TO ALL ONES
007274  005300                          DEC     R0              ;COUNT
007276  001374                          BNE     3$              ;BRANCH IF 8 NOT DONE
007300  012703  004576                  MOV     #UNITS,R3       ;POINTER
007304  005005                          CLR     R5
007306  005037  004620                  CLR     @#NOUNIT        ;NO. OF UNITS PRESENT
007312  012700  000010                  MOV     #8.,R0          ;COUNTER
007316  011137  001176                  MOV     @R1,@#$TMP0     ;TEMPORARY STORAGE
007322  006037  001176          4$:     ROR     @#$TMP0         ;SET CARRY IF ONE IN  0 BIT
007326  103120                          BCC     5$              ;CHECK NEXT UNIT IF ONE NOT IN BIT 0

007330  010577  172642                  MOV     R5,@RHCS2       ;INSERT UNIT NUMBER INTO UA BITS
007334  022777  024020  172662          CMP     #24020,@RHDT    ;IS THIS A DUAL PORT RP04 ?
007342  001503                          BEQ     6$              ;TYPE DRIVE NO. IF SO
007344  022777  020020  172652          CMP     #20020,@RHDT    ;IS THIS A SINGLE PORT RP04 ?
007352  001477                          BEQ     6$              ;TYPE NO. IF SO

                                ;;*************************************************************
007354  022777  024021  172642          CMP     #24021,@RHDT    ;IS THIS A DUAL PORT RP05 ?
007362  001473                          BEQ     6$              ;TYPE DRIVE NO. IF SO
007364  022777  020021  172632          CMP     #20021,@RHDT    ;IS THIS A SINGLE PORT RP05 ?
007372  001467                          BEQ     6$              ;TYPE THE NO. IF SO

007374  022777  024022  172622          CMP     #24022,@RHDT    ;IS THIS A DUAL PORT RP06 ?
007402  001463                          BEQ     6$              ;TYPE DRIVE NO. IF SO
007404  022777  020022  172612          CMP     #20022,@RHDT    ;IS THIS A SINGLE PORT RP06 ?
007412  001457                          BEQ     6$              ;TYPE DRIVE NO. IF SO
                                ;;*************************************************************


007414  104400  007422                  TYPE    ,65$            ;;TYPE ASCIZ STRING
007420  000410                          BR      64$             ;;GET OVER THE ASCIZ
```

```
                                        ;;65$:  .ASCIZ  <15><12>/UNIT NUMBER /
     007442                             64$:
     007442  010546                             MOV     R5,-(SP)        ;GET READY TO TYPE UNIT NUMBER
     007444  104404                             TYPDS
     007446  104400  007454                     TYPE    ,67$            ;;TYPE ASCIZ STRING
     007452  000406                             BR      66$             ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  /,  RHDT = /
     007470                             66$:
     007470  017746  172530                     MOV     @RHDT,-(SP)     ;GET READY TO TYPE RHDT
     007474  104401                             TYPOC
     007476  104400  007504                     TYPE    ,69$            ;;TYPE ASCIZ STRING
     007502  000422                             BR      68$             ;;GET OVER THE ASCIZ
                                        ;;69$:  .ASCIZ  ? - NOT AN RP04/RP05/RP06 DEVICE !!?
     007550                             68$:
     007550  000407                             BR      5$              ;NO RP04/RP05/RP06 FOUND SO INCR TABLE

     007552  010523                     6$:     MOV     R5,(R3)+
     007554  104400  001223                     TYPE    ,$CRLF
     007560  010546                             MOV     R5,-(SP)
     007562  104404                             TYPDS                   ;TYPE DRIVE NO.
     007564  005237  004620                     INC     @#NOUNIT        ;NUMBER OF DRIVES

     007570  005205                     5$:     INC     R5              ;INCR UNIT NUMBER
     007572  005300                             DEC     R0              ;DECR NO. OF UNITS LOOKED AT
     007574  001252                             BNE     4$              ;TEST THE NEXT UNIT

     007576  013737  004576  004616             MOV     @#UNITS,@#UNIT  ;SET UNIT NO. TO FIRST ONE FOUND/OR 0
     007604  013737  004620  004622             MOV     @#NOUNIT,@#NUNIT ;SAVE NO. OF UNITS
     007612  005337  004622                     DEC     @#NUNIT         ;IF NUNIT = 0 THEN ONLY ONE UNIT
                                                                        ;IF NUNIT > 0 THEN MORE THAN ONE UNIT

     007616  005737  004626             SELTST: TST     @#SELECT        ;STARTING ADDRESS 200 ?

     007622  001403                             BEQ     TST4            ;BRANCH IF STARTING FROM 200

     007624  013737  004630  004616             MOV     @#UNITSL,@#UNIT ;SET UNIT NUMBER
```

```


                                            ;;*************************************************************
                                            ;*TEST 4          TYPE SERIAL NUMBER AND DRIVE TYPE

                                            ;*       SET APPROPRIATE ATTTENTION BIT OF UNIT UNDER TEST IN 'ATTENT'
                                            ;*       TYPE UNIT UNDER TEST

                                            ;*       READ SERIAL NUMBER AND DRIVE TYPE REGISTERS
                                            ;*       TYPE THEM OUT AND PROCEED

                                            ;*       TO LOOP HERE SET SWITCH 8, AND THIS TEST NUMBER ON
                                            ;*       SWITCHES 0 THRU 7 AND RESTART

                                            ;;*************************************************************
007632  000004                              TST4:   SCOPE
007634  012737  000001  001212                      MOV     #1,$TIMES           ;;DO 1 ITERATION
007642  012737  010534  001106                      MOV     #1$,$LPADR          ;;SET SCOPE LOOP ADDRESS

007650  012706  001000                              MOV     #STACK,SP           ;RESET STACK
007654  012737  000004  004504                      MOV     #4,@#TSTNM          ;SAVE TEST NUMBER

007662  004737  033004                              JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                                ;R3-RHDS1, R4-RHER1
                                                                                ;GIVE RH-11 INITIALIZE
                                                                                ;SETUP UNIT NUMBER
007666  005037  004644                              CLR     @#ATTENT            ;CLEAR UNIT UNDER TEST ATTENTION

007672  005737  004616                              TST     @#UNIT              ;IS THE "UNIT" = 0 ?
007676  001107                                      BNE     20$                 ;IF NOT, SKIP NEXT MODS
007700  012700  000041                              MOV     #41,R0              ;IF SO, CHECK THE LOAD MEDIA LOCATION
007704  122710  000011                              CMPB    #11,(R0)            ;WAS IT AN RP04/5/6 ?
007710  001102                                      BNE     20$                 ;IF NOT, GO AHEAD AND TEST UNIT #0
007712  005737  004626                              TST     @#SELECT            ;WAS UNIT #0 SELECTED ?
                                                                                ;(IE. 210 START ?)
007716  001006                                      BNE     19$                 ;IF SO, CHANGE PACK

                                                    ;*INCREMENT THE UNITS TABLE TO NEXT DRIVE (IF ANY)
                                                    ;*& DECREMENT "NOUNITS" PRESENT TO BE TESTED

007720  012700  004576                              MOV     #UNITS,R0           ;IF NOT, LOAD THE UNITS TABLE POINTER
007724  005720                                      TST     (R0)+               ;SELECT THE NEXT UNIT IN TABLE
                                                                                ;(DOUBLE INCREMENT THE POINTER, R0)
007726  022710  177777                              CMP     #-1,(R0)            ;IS THERE ANOTHER TABLE ENTRY PRESENT ?
007732  001065                                      BNE     18$                 ;IF SO, USE NEXT DRIVE & DECR "NOUNITS"
                                                                                ;IF NOT, CHANGE PACK ON UNIT #0

007734                                      19$:
007734  104400  007742                              TYPE    ,65$                ;;TYPE ASCIZ STRING
007740  000434                                      BR      64$                 ;;GET OVER THE ASCIZ
                                            ;;65$:     .ASCIZ  <15><12><15><12>/DISMOUNT PACK FROM UNIT #0 AND MOUNT A SCRATCH PACK/
010032                                      64$:
010032  104400  010040                              TYPE    ,67$                ;;TYPE ASCIZ STRING
010036  000421                                      BR      66$                 ;;GET OVER THE ASCIZ
```

```
                                        ;;67$:  .ASCIZ  <15><12>/PRESS CONTINUE WHEN FINISHED/<15><12>
010102                                  66$:
010102  000000                                  HALT
010104  000404                                  BR      20$             ;CONTINUE, USING SCRATCH PACK ON UNIT #0

010106  011037  004616                  18$:    MOV     (R0),@#UNIT     ;SET UP NEW UNIT UNDER TEST
010112  005337  004620                          DEC     @#NOUNITS       ;DECR BECAUSE UNIT #0 WON'T BE TESTED

010116  013700  004616                  20$:    MOV     @#UNIT,R0       ;R0 NOW CONTAINS UNIT NO




                                        ;;*************************************************************
010122  005037  004636                          CLR     @#RP06          ;CLEAR RP06 DEVICE TYPE FLAG
010126  010077  172044                          MOV     R0,@RHCS2       ;SET UP UNIT ADDRESSING
010132  022777  024022  172064                  CMP     #24022,@RHDT    ;DUAL PORT RP06 ?
010140  001405                                  BEQ     2$              ;YES..SET FLAG
010142  022777  020022  172054                  CMP     #20022,@RHDT    ;SINGLE PORT RP06 ?
010150  001401                                  BEQ     2$              ;YES...SET FLAG
010152  000403                                  BR      3$              ;DON'T SET RP06 FLAG
010154  012737  177777  004636  2$:     MOV     #-1,@#RP06      ;SET THE FLAG

010162                                  3$:                             ;ASSUME THE NEXT UNIT IS AN RP04/RP05
                                        ;;*************************************************************


010162  116037  004566  004644                  MOVB    ATABLE(R0),@#ATTENT ;SET APPROPRIATE ATTENTION BIT
010170  104400  010176                          TYPE    ,69$            ;;TYPE ASCIZ STRING
010174  000414                                  BR      68$             ;;GET OVER THE ASCIZ
                                        ;;69$:  .ASCIZ  <15><12>/TESTING DRIVE NUMBER/
010226                                  68$:
010226  013746  004616                          MOV     @#UNIT,-(SP)    ;UNIT NO. TO STACK
010232  104404                                  TYPDS                   ;TYPE  DRIVE NO.
010234  104400  010242                          TYPE    ,71$            ;;TYPE ASCIZ STRING
010240  000410                                  BR      70$             ;;GET OVER THE ASCIZ
                                        ;;71$:  .ASCIZ  <15><12>/SERIAL NO. = /
010262                                  70$:
010262  017746  171740                          MOV     @RHSN,-(SP)     ;;SAVE @RHSN FOR TYPEOUT
010266  104401                                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
010270  104400  010276                          TYPE    ,73$            ;;TYPE ASCIZ STRING
010274  000410                                  BR      72$             ;;GET OVER THE ASCIZ
                                        ;;73$:  .ASCIZ  <15><12>/DRIVE TYPE = /
010316                                  72$:
010316  017746  171702                          MOV     @RHDT,-(SP)     ;;SAVE @RHDT FOR TYPEOUT
010322  104401                                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
```

```
                                                ;*TYPE OUT THE DRIVE TYPE IN ASCII

                                        ;;*********************************************************
 010324  022777  024020  171672                 CMP     #24020,@RHDT    ;DUAL PORT RP04 ?
 010332  001424                                 BEQ     4$              ;TYPE ASCII MESSAGE OUT
 010334  022777  020020  171662                 CMP     #20020,@RHDT    ;SINGLE PORT RP04 ?
 010342  001420                                 BEQ     4$              ;TYPE THE MESSAGE

 010344  022777  024021  171652                 CMP     #24021,@RHDT    ;DUAL PORT RP05 ?
 010352  001433                                 BEQ     5$              ;TYPE THE MESSAGE
 010354  022777  020021  171642                 CMP     #20021,@RHDT    ;SINGLE PORT RP05 ?
 010362  001427                                 BEQ     5$              ;TYPE THE MESSAGE

 010364  022777  024022  171632                 CMP     #24022,@RHDT    ;DUAL PORT RP06 ?
 010372  001442                                 BEQ     6$              ;TYPE THE MESSAGE
 010374  022777  020022  171622                 CMP     #20022,@RHDT    ;SINGLE PORT RP06 ?
 010402  001436                                 BEQ     6$              ;TYPE THE MESSAGE

 010404                                 4$:
 010404  104400  010412                         TYPE    ,75$            ;;TYPE ASCIZ STRING
 010410  000413                                 BR      74$             ;;GET OVER THE ASCIZ
                                        ;;75$:  .ASCIZ  <15><12>/DRIVE IS AN RP04/<15><12>
 010440                                 74$:
 010440  000435                                 BR      1$              ;SKIP NEXT ONES
 010442                                 5$:
 010442  104400  010450                         TYPE    ,77$            ;;TYPE ASCIZ STRING
 010446  000413                                 BR      76$             ;;GET OVER THE ASCIZ
                                        ;;77$:  .ASCIZ  <15><12>/DRIVE IS AN RP05/<15><12>
 010476                                 76$:
 010476  000416                                 BR      1$              ;SKIP NEXT
 010500                                 6$:
 010500  104400  010506                         TYPE    ,79$            ;;TYPE ASCIZ STRING
 010504  000413                                 BR      78$             ;;GET OVER THE ASCIZ
                                        ;;79$:  .ASCIZ  <15><12>/DRIVE IS AN RP06/<15><12>
 010534                                 78$:
                                        ;;*********************************************************




 010534  005777  171466                 1$:     TST     @RHSN           ;READ SERIAL NO. AND DRIVE TYPE
 010540  005777  171460                         TST     @RHDT           ;THESE TWO ARE TO HELP SCOPE LOOPS
 010544  017737  171456  002310                 MOV     @RHSN,@#SN      ;SAVE TO CHECK IF DRIVE CLEAR CLEARS ANY BITS
 010552  017737  171446  002306                 MOV     @RHDT,@#DT      ;SAVE TO CHECK IF DRIVE CLEAR CLEARS ANY BITS
```

```
                                        ;;**************************************************************
                                        ;*TEST 5        CHECK MOL TO BE HIGH

                                        ;*      MAKE SURE THAT DRIVE IS ON LINE BEFORE STARTING PROGRAM
                                        ;*      IF DRIVE IS OFF LINE THEN AFTER TYPE OUT THE PROGRAM WILL
                                        ;*      HANG FOR EVER WAITING FOR DRIVE TO GO ON LINE

                                        ;;**************************************************************
010560  000004                          TST5:   SCOPE

010562  012737  000005  004504                  MOV     #6-1,@#TSTNM    ;THIS SAVES TEST NUMBER




010570  004737  033004                          JSR     PC,@#CLDISK     ;GIVE INITILIZE
010574  032713  010000                          BIT     #MOL,@R3        ;CHECK MOL IN RHDS1

010600  001144                                  BNE     TST6            ;BRANCH IF MOL HIGH

010602  104400  010610                          TYPE    ,65$            ;;TYPE ASCIZ STRING
010606  000420                                  BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <15><12>/DRIVE IS OFFLINE - MOL IS LOW/
010650                                  64$:
010650  104400  010656                          TYPE    ,67$            ;;TYPE ASCIZ STRING
010654  000424                                  BR      66$             ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  <15><12>/HIT START ON DRIVE TO GET IT ON LINE/
010726                                  66$:
010726  104400  010734                          TYPE    ,69$            ;;TYPE ASCIZ STRING
010732  000431                                  BR      68$             ;;GET OVER THE ASCIZ
                                        ;;69$:  .ASCIZ  <15><12>/PROGRAM WILL HANG TESTING MOL TILL MOL IS HIGH/
011016                                  68$:
011016  032713  010000                  1$:     BIT     #MOL,@R3        ;CHECK MOL IN RHDS1
011022  001775                                  BEQ     1$              ;WAIT IF MOL IS STILL LOW
011024  104400  011032                          TYPE    ,71$            ;;TYPE ASCIZ STRING
011030  000430                                  BR      70$             ;;GET OVER THE ASCIZ
                                        ;;71$:  .ASCIZ  <15><12>/GOOD - MOL IS HIGH, PROGRAM WILL BE EXECUTED/
011112                                  70$:
```

```

                                        ;;*********************************************************************
                                        ;*TEST 6            PROGRAM INTERRUPT

                                        ;*          PROGRAM INTERRUPT IS TESTED BY SETTING RDY AND IE
                                        ;*          IN RHCS1 AT THE SAME TIME
                                        ;*          THIS SHOULD INTERRUPT THROUGH LOCATION 254
                                        ;*          THE PROCESSOR PRIORITY IS SET TO 4
                                        ;;*********************************************************************
     011112  000004                     TST6:   SCOPE


     011114  012737  000006  004504             MOV     #7-1,@#TSTNM      ;THIS SAVES TEST NUMBER

     011122  012706  001000                     MOV     #STACK,SP         ;RESET STACK

     011126  004737  033004                     JSR     PC,@#CLDISK       ;SET R1-RHCS1, R2-RHCS2
                                                                          ;R3-RHDS1, R4-RHER1
                                                                          ;GIVE RH-11 INITIALIZE
                                                                          ;SETUP UNIT NUMBER

     011132  013700  002166                     MOV     @#RPVEC,R0        ;GET RP VECTOR ADDRESS
     011136  012720  011204                     MOV     #RPTRP1,(R0)+     ;THIS IS FOR TIMELY INTERRUPTS
     011142  012710  000340                     MOV     #340,(R0)         ;RP04 INTERRUPT SERVICE ROUTINE
                                                                          ;PRIORITY = 7
     011146  012737  000200  177776             MOV     #200,PS           ;SET PROCESSOR PRIORITY @ 4
     011154  012711  000300                     MOV     #RDY!IE,@R1       ;RDY, IE IN RHSC1 SHOULD CAUSE INTERRUPT

     011160  013737  033502  001200             MOV     @#TIMCNT,@#$TMP1;COUNTER
     011166  005337  001200             1$:     DEC     @#$TMP1           ;WAIT FOR INTERRUPT
     011172  001375                             BNE     1$                ;BRANCH IF NOT ZERO
                                                                          ;BEFORE THIS IS ZERO INTERRUPT SHOULD OCCUR
     011174  104065                             ERROR   65                ;INTERRUPT DID NOT OCCUR
     011176  012712  000040                     MOV     #CLR,@R2          ;CLEAR CONTROLLER VIA CS2

     011202  000407                             BR      TST7              ;BRANCH TO NEXT TEST --------------)


     011204  022626                     RPTRP1: CMP     (SP)+,(SP)+       ;RESTORE STACK
     011206  022711  004200                     CMP     #DVA!RDY,@R1      ;IE SHOULD BE LOW

     011212  001403                             BEQ     TST7              ;CONTINUE IF GOOD --------------)

     011214  104065                             ERROR   65                ;INTERRUPT OCCURED BUT
                                                                          ;IE FAILED TO RESET
     011216  012712  000040                     MOV     #CLR,@R2          ;CLEAR CONTROLLER
```

```



                                    ;;*************************************************************
                                    ;*TEST 7          INTERRUPT AT PROCESSOR AND DISK PRIORITY SAME

                                    ;*       PROCESSOR PRIORITY IS SET AT 5 (SAME AS THE DISK)
                                    ;*       IE AND RDY IS SET. THIS SHOULD NOT INTERRUPT
                                    ;;*************************************************************
 011222  000004                     TST7:   SCOPE


 011224  012737  000007  004504             MOV     #10-1,@#TSTNM   ;THIS SAVES TEST NUMBER

 011232  012706  001000                     MOV     #STACK,SP       ;RESET STACK

 011236  004737  033004                     JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                    ;R3-RHDS1, R4-RHER1
                                                                    ;GIVE RH-11 INITIALIZE
                                                                    ;SETUP UNIT NUMBER

 011242  013700  002166                     MOV     @#RPVEC,R0      ;GET RP VECTOR ADDRESS
 011246  012720  011312                     MOV     #RPTRP2,(R0)+   ;THIS IS FOR UNTIMELY INTERRUPTS
 011252  012710  000340                     MOV     #340,(R0)       ;RP04 INTERRUPT SERVICE ROUTINE
                                                                    ;PRIORITY = 7
 011256  012737  000240  177776             MOV     #240,PS         ;SET PROCESSOR PRIORITY = 5
 011264  012711  000300                     MOV     #RDY!IE,@R1     ;RDY, IE IN RHSC1 WHOULD CAUSE INTERRUPT

 011270  013737  033502  001200             MOV     @#TIMCNT,@#$TMP1;COUNTER
 011276  005337  001200             1$:     DEC     @#$TMP1         ;WAIT FOR INTERPUPT
 011302  001375                             BNE     1$              ;BRANCH IF NOT ZERO
                                                                    ;BEFORE THIS IS ZERO INTERRUPT WHOULD OCCUR
 011304  012712  000040                     MOV     #CLR,@R2        ;CLEAR CONTROLLER

 011310  000404                             BR      TST10           ;NO INTERRUPT SO CONTINUE ---------------)


 011312  022626                     RPTRP2: CMP     (SP)+,(SP)+     ;RESTORE STACK
 011314  104065                             ERROR   65              ;INTERRUPT OCCURRED WITH
                                                                    ;PROCESSOR PRIORITY SAME AS DISK
 011316  012712  000040                     MOV     #CLR,@R2        ;CLEAR CONTROLLER
```

```
                                        ;;*****************************************************************
                                        ;*TEST 10        SET VV BIT #6 IN RHDS1

                                        ;*       THIS TEST SETS VV IN RHDS1
                                        ;*       THERE IS A RESET AT THE BEGINING OF THE TEST
                                        ;*       FOR ERROR RECOVERY ONLY.

                                        ;;*****************************************************************
011322  000004                          TST10:  SCOPE

                                                ;*IN CASE THERE IS ANY DRIVE ERRORS DURING POWER UP
                                                ;*OR POWER DOWN OR ANY PARITY ERRORS A RESET IS GIVEN
011324  000005                                  RESET
011326  004737  037026                          JSR     PC,@#$TKINT     ;INITILIZE TK
011332  012737  000000  177776                  MOV     #0,PS

011340  012706  001000                          MOV     #STACK,SP       ;RESET STACK
011344  012737  000010  004504                  MOV     #10,@#TSTNM     ;SAVE TEST NUMBER

011352  004737  033004                          JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                        ;R3-RHDS1, R4-RHER1
                                                                        ;GIVE RH-11 INITIALIZE
                                                                        ;SETUP UNIT NUMBER
011356  004737  033042                          JSR     PC,@#CHECK      ;CHECK THAT DVA,RDY,MOL,DPR,DRY = 1
011362  104400  056662                          TYPE    ,CPHALT         ;CANNOT CONTINUE TESTS IF THEY DON'T
011366  000000                                  HALT                    ;STOP TESTING

011370  013777  002360  170602                  MOV     @#PKACK,@RHCS1  ;GET READY FOR PKACK
                                                                        ;PACK ACKNOWLEGDE WITH 22 IN RHCS1


                                                ;*NOW SAVE REGISTERS FOR COMPARISON AFTER PACK ACKNOWLEDGE

011376  004037  033152                          JSR     R0,@#SAVER      ;SAVE REGISTERS
011402  002172                                  RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
011404  004512                                  SAVERE                  ;STARTING ADDRES OF WHERE
                                                                        ;THE REGISTERS ARE SAVED
011406  000022                                  18.                     ;NUMBER OF REGISTERS
                                                                        ;SAVED = 18.

011410  013777  004506  170550                  MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                        ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                        ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                        ;'TIME' WILL ONLY SAVE
                                                                        ;CURRENT CYLINDER ADDRESS
                                                                        ;AND LOOK AHEAD REGISTERS


011416  013746  002360                          MOV     @#PKACK,-(SP)   ;GET READY TO MOVE COMMAND
011422  052716  000001                          BIS     #GO,(SP)        ;GET READY TO SET GO
                                                                        ;WITHOUT INTERRUPT ENABLE
011426  012677  170546                          MOV     (SP)+,@RHCS1    ;GO WITH
                                                                        ;22 IN RHCS1 FOR PACK ACKNOWLEDGE
```

```
                                                               ;WITH INTERRUPT DISABLED

 011432  011100                        MOV     @R1,R0          ;SAVE RHCS1 DURING ABOVE OPERATION
 011434  011305                        MOV     @R3,R5          ;SAVE RHDS1 DURING ABOVE OPERATION


 011436  104412                        WAT                     ;WAIT FOR VV BIT TO SET
 011440  002222                        RHDS1                   ;WAIT FOR RHDS1 REGISTER
 011442  000100                        VV                      ;WAIT FOR VV BIT IN RHDS1 REGISTER
 011444  000001                        1.                      ;ALLOW 10 MICRO SECONDS
 011446  000001                        1.                      ;VV MUST SET BETWEEN
                                                               ;00 AND 20 MICRO SECONDS

                                       ;*COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
                                       ;*R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

 011450  013746  002360                MOV     @#PKACK,-(SP)   ;SAVE COMMAND
 011454  052716  004200                BIS     #DVA!RDY,(SP)   ;INCLUDE DVA!RDY
 011460  011637  001124                MOV     (SP),@#$GDDAT   ;SAVE FOR PRINTOUT
 011464  022600                        CMP     (SP)+,R0        ;DURING ABOVE OPERATION ONLY DVA!RDY
                                                               ;AND COMMAND SHOULD BE SET
 011466  001405                        BEQ     64$             ;BRANCH IF GOOD
 011470  010037  001126                MOV     R0,@#$BDDAT     ;BAD DATA
 011474  010137  004500                MOV     R1,@#REGADR     ;FAILING REGISTER RHCS1
 011500  104021                        ERROR   21              ;DURING ABOVE OPERATION ONLY
                                                               ;COMMAND AND DVA!RDY SHOULD BE SET
 011502  012746  010700        64$:    MOV     #MOL!DPR!DRY!VV,-(SP)   ;SAVE BITS SET DURING OPERATION IN RHDS1
 011506  011637  001124                MOV     (SP),@#$GDDAT   ;SAVE FOR PRINTOUT
 011512  022605                        CMP     (SP)+,R5        ;DURING ABOVE OPERATION ONLY MOL!DPR!DRY!VV
                                                               ;SHOULD BE SET
 011514  001405                        BEQ     66$             ;BRANCH IF GOOD
 011516  010537  001126                MOV     R5,@#$BDDAT     ;BAD DATA
 011522  010337  004500                MOV     R3,@#REGADR     ;FAILING REGISTER RHDS1
 011526  104063                        ERROR   63              ;DURING ABOVE OPERATION ONLY
                                                               ;MOL!DPR!DRY!VV SHOULD BE SET
 011530                        66$:

 011530  004037  033674                JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
 011534  002222                        RHDS1                   ;CHANGE RHDS1 REGISTER

 011536  000001                        1                       ;1 BIT/BITS TO BE CHANGED
 011540  000001                        1                       ;NEW VALUE OF VV IS 1
 011542  000100                        VV                      ;CHANGE VV BIT

                                       ;*NOW COMPARE REGISTERS BEFORE PACK ACKNOWLEDGE
                                       ;*WITH AFTER PACK ACKNOWLEDGE



 011544  004037  034002                JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                               ;PRESENT VALUE
 011550  004512                        SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
 011552  002254                        WC                      ;TEST DATA STARTING FROM 'RHWC'
 011554  000022                        18.                     ;18. REGISTERS TO BE COMPARED
```

```
011556 011562                  1$                      ;RETURN TO 1$ ON ERROR
011560 011566                  2$                      ;RETURN TO 2$ ON NO ERROR


011562 104015          1$:     ERROR   15              ;GIVING A PACK ACKNOWLEDGE
011564 000207                  RTS     PC              ;CAUSED AN ERROR
                                                       ;PACK ACKNOWLEDGE SHOULD
                                                       ;SET VV IN RHDS1
                                                       ;INTERRUPT SHOULD MAKE
                                                       ;IE = 0
                                                       ;NO OTHER REGISTERS SHOULD
                                                       ;CHANGE
                                                       ;GOOD DATA GIVES CONTENTS
                                                       ;OF REGISTER BEFORE COMMAND
                                                       ;RECEIVED DATA GIVES CONTENTS
                                                       ;OF REGISTER AFTER COMMAND
011566                 2$:
```

```
                                        .SBTTL  DATA TRANSFER RELATED ERRORS (USING MEDIA)


                                        ;;**************************************************************
                                        ;*TEST 11         LAST BLOCK TRANSFERED-RHDS1 LBT

                                        ;*       WRITE ONE WORD OF 65125 ON CYLINDER 410./814., TRACK 18
                                        ;*       SECTOR 21, BY A WRITE HEADER AND DATA COMMAND
                                        ;*       THEN CHECK ALL REGISTERS (LAST BLOCK TRANSFERED
                                        ;*       SHOULD BE SET)

                                        ;*       THEN READ ABOVE USING READ DATA (256 WORDS)
                                        ;*       CHECK ALL REGISTERS AND DATA
                                        ;*       (AGAIN 'LBT' SHOULD BE SET)

                                        ;;**************************************************************
011566  000004                          TST11:  SCOPE
011570  012706  001000                          MOV     #STACK,SP           ;RESET STACK
011574  012737  000011  004504                  MOV     #11,@#TSTNM         ;SAVE TEST NUMBER

011602  004737  032004                          JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                            ;R3-RHDS1, R4-RHER1
                                                                            ;GIVE RH-11 INITIALIZE
                                                                            ;SETUP UNIT NUMBER

                                                ;*CHECK THE DRIVE TYPE AND THEN FILL THE
                                                ;*WRITE FROM BUFFER WITH APPROPRIATE HEADER
                                        ;;**************************************************************
011606  005737  004636                          TST     @#RP06  ;TEST FOR RP06 DRIVE
011612  001412                                  BEQ     11$                 ;TREAT UNIT AS AN RP04
                                                                            ;TREAT UNIT AS AN RP06
                                        ;;**************************************************************


011614  004037  032630                          JSR     R0,@#FLHEAD         ;SAVE HEADER DATA IN WRFROM
011620  002370                                  WRFROM                      ;LOCATION WHERE SAVED
011622  000005                                  5                           ;NUMBER OF WORDS SAVED
011624  011456                                  11456                       ;FIRST DATA WORD
011626  011025                                  <18.*400>!<21.>                 ;SECOND DATA WORD
011630  000000                                  0                           ;THIRD DATA WORD
011632  000000                                  0                           ;FOURTH DATA WORD
011634  065125                                  <26.*2000>!<18.*40>!<21.>                       ;FIFTH DATA WORD
011636  000411                                  BR      12$                 ;CONTINUE WITH SET UP

011640                                  11$:

011640  004037  032630                          JSR     R0,@#FLHEAD         ;SAVE HEADER DATA IN WRFROM
011644  002370                                  WRFROM                      ;LOCATION WHERE SAVED
011646  000005                                  5                           ;NUMBER OF WORDS SAVED
011650  010632                                  10632                       ;FIRST DATA WORD
011652  011025                                  <18.*400>!<21.>                 ;SECOND DATA WORD
011654  000000                                  0                           ;THIRD DATA WORD
011656  000000                                  0                           ;FOURTH DATA WORD
011660  065125                                  <26.*2000>!<18.*40>!<21.>                       ;FIFTH DATA WORD
```

```
011662                         12$:

                                       ;*FILL READ INTO BUFFER WITH ALL ONES


011662  004037  032654                 JSR     R0,@#CLAREA      ;CLEAR 256 WORDS, FROM REINTO
011666  003434                         REINTO                   ;STARTING FROM REINTO
011670  000256                         256                      ;256 WORDS
011672  177777                         -1                       ;FILL WITH -1
```

```
                                        ;*DRIVE TYPE IS CHECKED AND THEN THE APPROPRIATE
                                        ;*WRITE HEADER AND DATA COMMAND IS LOADED

                                ;;*************************************************************
 011674  005737  004636                 TST     @#RP06  ;TEST FOR RP06 DRIVE
 011700  001412                         BEQ     7$              ;TREAT UNIT AS RP04
                                ;;*************************************************************

 011702  004037  034766                 JSR     R0,@#RUN                ;SETUP TO RUN FOR DATA COMMAND
 011706  001456                         814.                            ;CYLINDER 814.
 011710     025                         .BYTE   21.                     ;SECTOR 21.
 011711     022                         .BYTE   18.                     ;TRACK 18.
 011712  177773                         -1-4                            ;WORD COUNT (DATA) = 1 +
                                                                        ;4 HEADER WORDS
 011714  002370                         WRFROM                          ;BUS ADDRESS
                                                                        ;STARTING ADDRESS OF DATA
                                                                        ;BUFFER = WRFROM
 011716  000000                         0                               ;DO NOT INHIBIT BUS ADDRESS INCREMENT
 011720  010000                         FMT22                           ;16 BITS PER WORD FORMAT
                                                                        ;DO NOT INHIBIT ECC CORRECTION
                                                                        ;DO NOT INHIBIT HEADER COMPARE
 011722  002344                         WRIFOR                          ;GET READY TO DO A WRIFOR
                                                        ;WRITE HEADER AND DATA WITH 62 IN RHCS1

 011724  000411                         BR      8$                      ;CONTINUE WITH TEST

 011726                         7$:

 011726  004037  034766                 JSR     R0,@#RUN                ;SETUP TO RUN FOR DATA COMMAND
 011732  000632                         410.                            ;CYLINDER 410.
 011734     025                         .BYTE   21.                     ;SECTOR 21.
 011735     022                         .BYTE   18.                     ;TRACK 18.
 011736  177773                         -1-4                            ;WORD COUNT (DATA) = 1 +
                                                                        ;4 HEADER WORDS
 011740  002370                         WRFROM                          ;BUS ADDRESS
                                                                        ;STARTING ADDRESS OF DATA
                                                                        ;BUFFER = WRFROM
 011742  000000                         0                               ;DO NOT INHIBIT BUS ADDRESS INCREMENT
 011744  010000                         FMT22                           ;16 BITS PER WORD FORMAT
                                                                        ;DO NOT INHIBIT ECC CORRECTION
                                                                        ;DO NOT INHIBIT HEADER COMPARE
 011746  002344                         WRIFOR                          ;GET READY TO DO A WRIFOR
                                                        ;WRITE HEADER AND DATA WITH 62 IN RHCS1

 011750                         8$:


                                        ;*NOW SAVE REGISTERS FOR COMPARISON AFTER WRITE

 011750  004037  033152                 JSR     R0,@#SAVER              ;SAVE REGISTERS
 011754  002172                         RHWC                            ;RHWC IS THE FIRST REGISTER SAVED
 011756  004512                         SAVERE                          ;STARTING ADDRES OF WHERE
```

```
                                                          ;THE REGISTERS ARE SAVED
011760  000022                        18.                 ;NUMBER OF REGISTERS
                                                          ;SAVED = 18.

011762  004737  033064                JSR     PC,@#CHECKT ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                          ;AND THAT ALL STATUS BITS ARE = 0
011766  104400  056662                TYPE    ,CPHALT     ;CANNOT CONTINUE TESTING IF NOT
011772  000000                        HALT                ;STOP TEST
011774  013777  004506  170164        MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                          ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                          ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                          ;'TIME' WILL ONLY SAVE
                                                          ;CURRENT CYLINDER ADDRESS
                                                          ;AND LOOK AHEAD REGISTERS

012002  013746  002344                MOV     @#WRIFOR,-(SP) ;GET READY TO MOVE COMMAND
012006  052716  000101                BIS     #GO!IE,(SP) ;GET READY TO SET GO AND
                                                          ;ENABLE INTERRUPT
012012  012677  170162                MOV     (SP)+,@RHCS1 ;GO WITH
                                                          ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                          ;WITH INTERRUPT ENABLED

                                      ;*TIME IS NOT CRITICAL HERE

012016  104412                        WAT                 ;WAIT FOR LBT BIT TO SET
012020  002222                        RHDS1               ;WAIT FOR RHDS1 REGISTER
012022  002000                        LBT                 ;WAIT FOR LBT BIT IN RHDS1 REGISTER
012024  004704                        2500.               ;ALLOW 25000 MICRO SECONDS
012026  004704                        2500.               ;LBT MUST SET BETWEEN
                                                          ;00 AND 50000 MICRO SECONDS

                                      ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE

012030  004037  032706                JSR     R0,@#FILLRE ;MOV 0 INTO SAVED RHWC
012034  002172                        RHWC                ;SAVED REGISTER TO CHANGE
012036  000000                        0                   ;DATA


012040  004037  032706                JSR     R0,@#FILLRE ;MOV WRFROM+<5*2> INTO SAVED RHBA
012044  002174                        RHBA                ;SAVED REGISTER TO CHANGE
012046  002402                        WRFROM+<5*2>                ;DATA


012050  004037  033674                JSR     R0,@#CHREG  ;CHANGE BITS IN SAVED REGISTER
012054  002222                        RHDS1               ;CHANGE RHDS1 REGISTER

012056  000001                        1                   ;1 BIT/BITS TO BE CHANGED
012060  000001                        1                   ;NEW VALUE OF LBT IS 1
012062  002000                        LBT                 ;CHANGE LBT BIT

012064  004037  033674                JSR     R0,@#CHREG  ;CHANGE BITS IN SAVED REGISTER
012070  002212                        RHCA                ;CHANGE RHCA REGISTER

012072  000001                        1                   ;1 BIT/BITS TO BE CHANGED
```

```
012074  000001                      1                       ;NEW VALUE OF BITO IS 1
012076  000001                      BITO                    ;CHANGE BITO BIT

012100  004037  032706              JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHDST
012104  002204                      RHDST                   ;SAVED REGISTER TO CHANGE
012106  000000                      0                       ;DATA



                                    ;*COMPARE ALL REGISTERS

012110  004037  034002              JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                            ;PRESENT VALUE
012114  004512                      SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
012116  002254                      WC                      ;TEST DATA STARTING FROM 'RHWC'
012120  000021                      17.                     ;17. REGISTERS TO BE COMPARED
012122  012126                      1$                      ;RETURN TO 1$ ON ERROR
012124  012132                      2$                      ;RETURN TO 2$ ON NO ERROR


012126  104045              1$:     ERROR   45              ;WRITING ON THE LAST BLOCK
012130  000207                      RTS     PC              ;IE. CYLINDER 410./814., SECTOR 21
                                                            ;TRACK 18 CAUSED
                                                            ;IMPROPER REGISTER CHANGE
                                                            ;GOOD DATA GIVES WHAT
                                                            ;SHOULD BE THERE
                                                            ;RECEIVED DATA GIVES WHAT
                                                            ;WAS THERE AFTER WRITE
                                                            ;ON LAST BLOCK
```

```
                                           ;*NOW A READ DATA WILL BE DONE ON SAME CYLINDER, SECTOR & TRACK

                                           ;*CLEAR ANY PREVIOUS ERRORS
 012132                         2$:

 012132  004737  033004                    JSR     PC,@#CLDISK      ;SET R1-RHCS1, R2-RHCS2
                                                                    ;R3-RHDS1, R4-RHER1
                                                                    ;GIVE RH-11 INITIALIZE
                                                                    ;SETUP UNIT NUMBER

                                           ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA

 012136  004037  032630                    JSR     R0,@#FLHEAD      ;SAVE HEADER DATA IN WRFROM
 012142  002370                            WRFROM                   ;LOCATION WHERE SAVED
 012144  000001                            1                        ;NUMBER OF WORDS SAVED
 012146  065125                            <26.*2000>!<18.*40>!<21.>                  ;FIRST DATA WORD

 012150  004037  032654                    JSR     R0,@#CLAREA      ;CLEAR 256. WORDS. FROM WRFROM+2
 012154  002372                            WRFROM+2                         ;STARTING FROM WRFROM+2
 012156  000400                            256.                     ;256. WORDS
 012160  000000                            0                        ;FILL WITH 0

                                           ;*FIRST THE DRIVE TYPE IS CHECKED AND THEN THE APPROPRIATE
                                           ;*READ COMMAND IS LOADED

                                ;;*************************************************************
 012162  005737  004636                    TST     @#RP06   ;TEST FOR RP06 DRIVE
 012166  001412                            BEQ     9$               ;TREAT UNIT AS RP04
                                ;;*************************************************************

 012170  004037  034766                    JSR     R0,@#RUN         ;SETUP TO RUN FOR DATA COMMAND
 012174  001456                            814.                     ;CYLINDER 814.
 012176     025                            .BYTE   21.              ;SECTOR 21.
 012177     022                            .BYTE   18.              ;TRACK 18.
 012200  177400                            -256.                    ;WORD COUNT = 256.
 012202  003434                            REINTO                   ;BUS ADDRESS
                                                                    ;STARTING ADDRESS OF DATA
                                                                    ;BUFFER = REINTO
 012204  000000                            0                        ;DO NOT INHIBIT BUS ADDRESS INCREMENT
 012206  010000                            FMT22                    ;16 BITS PER WORD FORMAT
                                                                    ;DO NOT INHIBIT ECC CORRECTION
                                                                    ;DO NOT INHIBIT HEADER COMPARE
 012210  002346                            READAT                   ;GET READY TO DO A READAT
                                                         ;READ DATA WITH 70 IN RHCS1

 012212  000411                            BR      10$              ;CONTINUE WITH TEST

 012214                         9$:

 012214  004037  034766                    JSR     R0,@#RUN         ;SETUP TO RUN FOR DATA COMMAND
```

```
012220  000632                          410.                       ;CYLINDER 410.
012222     025                          .BYTE   21.                ;SECTOR 21.
012223     022                          .BYTE   18.                ;TRACK 18.
012224  177400                          -256.                      ;WORD COUNT = 256.
012226  003434                          REINTO                     ;BUS ADDRESS
                                                                   ;STARTING ADDRESS OF DATA
                                                                   ;BUFFER = REINTO
012230  000000                          0                          ;DO NOT INHIBIT BUS ADDRESS INCREMENT
012232  010000                          FMT22                      ;16 BITS PER WORD FORMAT
                                                                   ;DO NOT INHIBIT ECC CORRECTION
                                                                   ;DO NOT INHIBIT HEADER COMPARE
012234  002346                          READAT                     ;GET READY TO DO A READAT
                                                         ;READ DATA WITH 70 IN RHCS1

012236                          10$:

                                        ;*SAVE REGISTERS FOR COMPARISON AFTER READ DATA
012236  004037  033152                  JSR     R0,@#SAVER         ;SAVE REGISTERS
012242  002172                          RHWC                       ;RHWC IS THE FIRST REGISTER SAVED
012244  004512                          SAVERE                     ;STARTING ADDRES OF WHERE
                                                                   ;THE REGISTERS ARE SAVED
012246  000022                          18.                        ;NUMBER OF REGISTERS
                                                                   ;SAVED = 18.
012250  004737  033064                  JSR     PC,@#CHECKT        ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                   ;AND THAT ALL STATUS BITS ARE = 0
012254  104400  056662                  TYPE    ,CPHALT            ;CANNOT CONTINUE TESTING IF NOT
012260  000000                          HALT                       ;STOP TEST
012262  013777  004506  167676          MOV     @#RP4VEC,@RPVEC    ;SET RP04 VECTOR ADDRESS
                                                                   ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                   ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                   ;'TIME' WILL ONLY SAVE
                                                                   ;CURRENT CYLINDER ADDRESS
                                                                   ;AND LOOK AHEAD REGISTERS

012270  013746  002346                  MOV     @#READAT,-(SP)     ;GET READY TO MOVE COMMAND
012274  052716  000101                  BIS     #GO!IE,(SP)        ;GET READY TO SET GO AND
                                                                   ;ENABLE INTERRUPT
012300  012677  167674                  MOV     (SP)+,@RHCS1       ;GO WITH
                                                                   ;70 IN RHCS1 FOR READ DATA
                                                                   ;WITH INTERRUPT ENABLED

                                        ;*TIME IS NOT CRITICAL HERE

012304  104412                          WAT                        ;WAIT FOR RDY BIT TO SET
012306  002200                          RHCS1                      ;WAIT FOR RHCS1 REGISTER
012310  000200                          RDY                        ;WAIT FOR RDY BIT IN RHCS1 REGISTER
012312  001614                          908.                       ;ALLOW 9080 MICRO SECONDS
012314  001502                          834.                       ;RDY MUST SET BETWEEN
                                                                   ;740 AND 17420 MICRO SECONDS

                                        ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE

012316  004037  032706                  JSR     R0,@#FILLRE        ;MOV 0 INTO SAVED RHWC
```

D09


```
012322  002172                          RHWC                            ;SAVED REGISTER TO CHANGE
012324  000000                          0                               ;DATA


012326  004037  032706                  JSR     R0,@#FILLRE             ;MOV REINTO+<256.*2> INTO SAVED RHBA
012332  002174                          RHBA                            ;SAVED REGISTER TO CHANGE
012334  004434                          REINTO+<256.*2>                         ;DATA


012336  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
012342  002222                          RHDS1                           ;CHANGE RHDS1 REGISTER

012344  000001                          1                               ;1 BIT/BITS TO BE CHANGED
012346  000001                          1                               ;NEW VALUE OF LBT IS 1
012350  002000                          LBT                             ;CHANGE LBT BIT

012352  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
012356  002212                          RHCA                            ;CHANGE RHCA REGISTER

012360  000001                          1                               ;1 BIT/BITS TO BE CHANGED
012362  000001                          1                               ;NEW VALUE OF BIT0 IS 1
012364  000001                          BIT0                            ;CHANGE BIT0 BIT

012366  004037  032706                  JSR     R0,@#FILLRE             ;MOV 0 INTO SAVED RHDST
012372  002204                          RHDST                           ;SAVED REGISTER TO CHANGE
012374  000000                          0                               ;DATA


                                        ;*COMPARE ALL REGISTERS

012376  004037  034002                  JSR     R0,@#COMREG             ;COMPARE SAVED REGISTERS WITH
                                                                        ;PRESENT VALUE
012402  004512                          SAVERE                          ;GOOD DATA SAVED IN 'SAVERE'
012404  002254                          WC                              ;TEST DATA STARTING FROM 'RHWC'
012406  000022                          18.                             ;18. REGISTERS TO BE COMPARED
012410  012414                          3$                              ;RETURN TO 3$ ON ERROR
012412  012420                          4$                              ;RETURN TO 4$ ON NO ERROR


012414  104045                  3$:     ERROR   45                      ;READING ON LAST BLOCK IE.
012416  000207                          RTS     PC                      ;CYLINDER 410./814., SECTOR 21, TRACK 18
                                                                        ;CAUSED AN ERROR
                                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                                        ;BE THERE
                                                                        ;RECEIVED DATA GIVES WHAT
                                                                        ;WAS THERE AFTER READ
                                                                        ;FROM LAST BLOCK

                                        ;*READ DATA WILL BE COMPARED
        012420                  4$:

012420  004037  035032                  JSR     R0,@#COMPAR             ;COMPARE TWO BLOCKS OF MEMORY
012424  002370                          WRFROM                          ;GOOD DATA STARTS FROM WRFROM
012426  003434                          REINTO                          ;TEST DATA STARTS FROM REINTO
```

```
012430  000400                    256.                              ;256., WORDS TO BE COMPARED
012432  012436                    5$                                ;RETURN TO 5$ ON ERROR
012434  012442                    6$                                ;RETURN TO 6$ ON NO ERROR

012436  104046            5$:     ERROR     46                      ;DATA READ FROM
012440  000207                    RTS       PC                      ;LAST BLOCK IN ERROR

012442                    6$:
```

```
                                  ;;*******************************************************************
                                  ;*TEST 12          SEARCH COMMAND

                                  ;*        THE SEARCH COMMAND WILL BE DONE ON CYLINDER 0
                                  ;*        THAT IS STARTING WITH A RECALIBRATE
                                  ;*        THEN HEADER AND DATA WILL BE WRITTEN FOR SECTOR 0 AND 1
                                  ;*        ALL REGISTERS WILL BE CHECKED
                                  ;*        A SEARCH COMMAND WILL BE GIVEN FOR SECTOR 0
                                  ;*        ON INTERRUPT SECTOR 1 HEADER AND DATA WILL BE READ
                                  ;*        TIME WILL BE CRITICAL AS THE TIME TAKEN TO DO THE
                                  ;*        READ IS THE ONLY INDICATOR THAT THE HEADS WERE ON
                                  ;*        SECTOR 0 AT INTERRUPT TIME.  TIME ALLOWED IS MAXIMUM
                                  ;*        OF 1500 MICRO SECONDS
                                  ;*        THEN ALL REGISTERS ARE CHECKED AND DATA READ
                                  ;*        IS  CHECKED

                                  ;;*******************************************************************
012442  000004                    TST12:  SCOPE
012444  012706  001000                    MOV     #STACK,SP       ;RESET STACK
012450  012737  000012  004504            MOV     #12,@#TSTNM     ;SAVE TEST NUMBER

012456  004737  033004                    JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                  ;R3-RHDS1, R4-RHER1
                                                                  ;GIVE RH-11 INITIALIZE
                                                                  ;SETUP UNIT NUMBER
                                          ;*GET HEADS TO CYLINDER 0
012462  004737  033064                    JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                  ;AND THAT ALL STATUS BITS ARE = 0
012466  104400  056662                    TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
012472  000000                            HALT                    ;STOP TEST

012474  013777  004506  167464            MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                  ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                  ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                  ;'TIME' WILL ONLY SAVE
                                                                  ;CURRENT CYLINDER ADDRESS
                                                                  ;AND LOOK AHEAD REGISTERS


012502  013746  002326                    MOV     @#RECALI,-(SP)  ;GET READY TO MOVE COMMAND
012506  052716  000101                    BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                  ;ENABLE INTERRUPT
012512  012677  167462                    MOV     (SP)+,@RHCS1    ;GO WITH
                                                                  ; 6 IN RHCS1 FOR RECALIBRATE
                                                                  ;WITH INTERRUPT ENABLED

012516  104412                            WAT                     ;WAIT FOR RDY BIT TO SET
012520  002222                            RHDS1                   ;WAIT FOR RHDS1 REGISTER
012522  000200                            RDY                     ;WAIT FOR RDY BIT IN RHDS1 REGISTER
012524  012740                            5600.                   ;ALLOW 56000 MICRO SECONDS
012526  012737                            5599.                   ;RDY MUST SET BETWEEN
                                                                  ;10 AND 111990 MICRO SECONDS
```

```
012530  004737  033004          JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                        ;R3-RHDS1, R4-RHER1
                                                        ;GIVE RH-11 INITIALIZE
                                                        ;SETUP UNIT NUMBER

                                ;*FILL WRITE FROM BUFFER WITH HEADER

012534  004037  032630          JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
012540  002370                  WRFROM                  ;LOCATION WHERE SAVED
012542  000004                  4                       ;NUMBER OF WORDS SAVED
012544  010000                  10000                   ;FIRST DATA WORD
012546  000000                  0                       ;SECOND DATA WORD
012550  000000                  0                       ;THIRD DATA WORD
012552  000000                  0                       ;FOURTH DATA WORD

                                ;*FILL WRITE FROM BUFFER WITH DATA

012554  004037  032654          JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM+10
012560  002400                  WRFROM+10                       ;STARTING FROM WRFROM+10
012562  000400                  256.                    ;256. WORDS
012564  000000                  0                       ;FILL WITH 0


                                ;*FILL WRITE FROM BUFFER WITH NEXT SECTOR HEADER

012566  004037  032630          JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM+<260.*2>
012572  003400                  WRFROM+<260.*2>                 ;LOCATION WHERE SAVED
012574  000004                  4                       ;NUMBER OF WORDS SAVED
012576  010000                  10000                   ;FIRST DATA WORD
012600  000001                  1                       ;SECOND DATA WORD
012602  000000                  0                       ;THIRD DATA WORD
012604  000000                  0                       ;FOURTH DATA WORD

                                ;*FILL WRITE FROM BUFFER WITH NEXT SECTOR DATA

012606  004037  032654          JSR     R0,@#CLAREA     ;CLEAR 4 WORDS, FROM WRFROM+<264.*2>
012612  003410                  WRFROM+<264.*2>                 ;STARTING FROM WRFROM+<264.*2>
012614  000004                  4                       ;4 WORDS
012616  000001                  1                       ;FILL WITH 1


                                ;*CLEAR READ INTO BUFFER WITH DATA OTHER THAN EXPECTED DATA

012620  004037  032654          JSR     R0,@#CLAREA     ;CLEAR 260. WORDS, FROM REINTO
012624  003434                  REINTO                  ;STARTING FROM REINTO
012626  000404                  260.                    ;260. WORDS
012630  000377                  377                     ;FILL WITH 377


                                ;*THE WRITE HEADER AND DATA WILL BE LOADED

012632  004037  034766          JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
012636  000000                  0                       ;CYLINDER 0
```

```
012640  000                       .BYTE   0                 ;SECTOR 0
012641  000                       .BYTE   0                 ;TRACK 0
012642  177364                    -264.-4                   ;WORD COUNT (DATA) = 264. +
                                                            ;4 HEADER WORDS
012644  002370                    WRFROM                    ;BUS ADDRESS
                                                            ;STARTING ADDRESS OF DATA
                                                            ;BUFFER = WRFROM
012646  000000                    0                         ;DO NOT INHIBIT BUS ADDRESS INCREMENT
012650  010000                    FMT22                     ;16 BITS PER WORD FORMAT
                                                            ;DO NOT INHIBIT ECC CORRECTION
                                                            ;DO NOT INHIBIT HEADER COMPARE
012652  002344                    WRIFOR                    ;GET READY TO DO A WRIFOR
                                                  ;WRITE HEADER AND DATA WITH 62 IN RHCS1

                                  ;*SAVE REGISTERS FOR COMPARISON AFTER WRITE HEADER AND DATA
012654  004037  033152            JSR     R0,@#SAVER        ;SAVE REGISTERS
012660  002172                    RHWC                      ;RHWC IS THE FIRST REGISTER SAVED
012662  004512                    SAVERE                    ;STARTING ADDRES OF WHERE
                                                            ;THE REGISTERS ARE SAVED
012664  000022                    18.                       ;NUMBER OF REGISTERS
                                                            ;SAVED = 18.

012666  004737  033064            JSR     PC,@#CHECKT       ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                            ;AND THAT ALL STATUS BITS ARE = 0
012672  104400  056662            TYPE    ,CPHALT           ;CANNOT CONTINUE TESTING IF NOT
012676  000000                    HALT                      ;STOP TEST

012700  013777  004506  167260    MOV     @#RP4VEC,@RPVEC   ;SET RP04 VECTOR ADDRESS
                                                            ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                            ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                            ;'TIME' WILL ONLY SAVE
                                                            ;CURRENT CYLINDER ADDRESS
                                                            ;AND LOOK AHEAD REGISTERS

012706  013746  002344            MOV     @#WRIFOR,-(SP)    ;GET READY TO MOVE COMMAND
012712  052716  000101            BIS     #GO!IE,(SP)       ;GET READY TO SET GO AND
                                                            ;ENABLE INTERRUPT
012716  012677  167256            MOV     (SP)+,@RHCS1      ;GO WITH
                                                             ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                            ;WITH INTERRUPT ENABLED
012722  011100                    MOV     @R1,R0            ;SAVE RHCS1 DURING ABOVE OPERATION
012724  011305                    MOV     @R3,R5            ;SAVE RHDS1 DURING ABOVE OPERATION

                                  ;*ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR = 760 MICRO SEC

012726  104412                    WAT                       ;WAIT FOR RDY BIT TO SET
012730  002200                    RHCS1                     ;WAIT FOR RHCS1 REGISTER
012732  000200                    RDY                       ;WAIT FOR RDY BIT IN RHCS1 REGISTER
012734  001614                    908.                      ;ALLOW 9080 MICRO SECONDS
012736  001507                    839.                      ;RDY MUST SET BETWEEN
                                                            ;690 AND 17470 MICRO SECONDS
```

```
                                            ;*COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
                                            ;*R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

 012740  013746  002344             MOV     @#WRIFOR,-(SP)  ;SAVE COMMAND
 012744  052716  004101             BIS     #IE!DVA!GO,(SP) ;INCLUDE IE!DVA!GO
 012750  011637  001124             MOV     (SP),@#$GDDAT   ;SAVE FOR PRINTOUT
 012754  022600                     CMP     (SP)+,R0        ;DURING ABOVE OPERATION ONLY IE!DVA!GO
                                                            ;AND COMMAND SHOULD BE SET
 012756  001405                     BEQ     67$             ;BRANCH IF GOOD
 012760  010037  001126             MOV     R0,@#$BDDAT     ;BAD DATA
 012764  010137  004500             MOV     R1,@#REGADR     ;FAILING REGISTER RHCS1
 012770  104021                     ERROR   21              ;DURING ABOVE OPERATION ONLY
                                                            ;COMMAND AND IE!DVA!GO SHOULD BE SET
 012772  012746  010500     67$:    MOV     #MOL!DPR!VV,-(SP)       ;SAVE BITS SET DURING OPERATION IN RHDS1
 012776  011637  001124             MOV     (SP),@#$GDDAT   ;SAVE FOR PRINTOUT
 013002  022605                     CMP     (SP)+,R5        ;DURING ABOVE OPERATION ONLY MOL!DPR!VV
                                                            ;SHOULD BE SET
 013004  001405                     BEQ     69$             ;BRANCH IF GOOD
 013006  010537  001126             MOV     R5,@#$BDDAT     ;BAD DATA
 013012  010337  004500             MOV     R3,@#REGADR     ;FAILING REGISTER RHDS1
 013016  104063                     ERROR   63              ;DURING ABOVE OPERATION ONLY
                                                            ;MOL!DPR!VV SHOULD BE SET
 013020                     69$:

                                    ;*NOW CHANGE SAVE REGISTERS TO EXPECTED VALUES

 013020  004037  032706             JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
 013024  002172                     RHWC                    ;SAVED REGISTER TO CHANGE
 013026  000000                     0                       ;DATA

 013030  004037  032706             JSR     R0,@#FILLRE     ;MOV WRFROM+<268.*2> INTO SAVED RHBA
 013034  002174                     RHBA                    ;SAVED REGISTER TO CHANGE
 013036  003420                     WRFROM+<268.*2>                 ;DATA

 013040  004037  032706             JSR     R0,@#FILLRE     ;MOV 2 INTO SAVED RHDST
 013044  002204                     RHDST                   ;SAVED REGISTER TO CHANGE
 013046  000002                     2                       ;DATA


                                    ;*NOW COMPARE REGISTERS BEFORE WRITE HEADER AND DATA
                                    ;*WITH REGISTERS AFTER COMMAND

 013050  004037  034002             JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                            ;PRESENT VALUE
 013054  004512                     SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
 013056  002254                     WC                      ;TEST DATA STARTING FROM 'RHWC'
 013060  000022                     18.                     ;18. REGISTERS TO BE COMPARED
 013062  013066                     1$                      ;RETURN TO 1$ ON ERROR
 013064  013072                     2$                      ;RETURN TO 2$ ON NO ERROR


 013066  104027             1$:     ERROR   27              ;WRITE HEADER AND DATA
```

```
013070  000207                  RTS     PC              ;CAUSED IMPROPER REGISTER
                                                        ;CHANGE
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT
                                                        ;WAS THERE AFTER COMMAND
                                ;*NOW A SEARCH COMMAND WILL BE GIVEN
                                ;*BUT BEFORE THAT ALL POSSIBLE REGISTERS
                                ;*WILL BE FILLED FOR THE READ HEADER AND DATA SECTOR 1
                                ;*AS THERE WILL NOT BE MUCH TIME BETWEEN THE
                                ;*COMPLETION OF THE SEARCH AND THE SECTOR 1 COMING.
                                ;*FILL FOR THE READ HEADER AND DATA COMMAND WHICH WILL NOT
                                ;*BE EXECUTED TILL AFTER THE SEARCH
                                ;*THE SEARCH WILL ONLY LEAVE RHCS1 AND RHDST
                                ;*CHANGED ALL THE REST WILL BE UNCHANGED
013072                  2$:
013072  004737  033004          JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                        ;R3-RHDS1, R4-RHER1
                                                        ;GIVE RH-11 INITIALIZE
                                                        ;SETUP UNIT NUMBER
013076  004037  034766          JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
013102  000000                  0                       ;CYLINDER 0
013104     000                  .BYTE   0               ;SECTOR 0
013105     000                  .BYTE   0               ;TRACK 0
013106  177770                  -8.                     ;WORD COUNT = 8.
013110  003434                  REINTO                  ;BUS ADDRESS
                                                        ;STARTING ADDRESS OF DATA
                                                        ;BUFFER = REINTO
013112  000000                  0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
013114  014000                  ECI!FMT22                       ;16 BITS PER WORD FORMAT
                                                        ;INHIBIT ECC CORRECTION
                                                        ;DO NOT INHIBIT HEADER COMPARE
013116  002334                  SERCH                   ;GET READY TO DO A SERCH
                                                        ;SEARCH WITH 30 IN RHCS1
                                ;*SAVE REGISTERS FOR COMPARISON NOT AFTER THE
                                ;*SEARCH COMMAND BUT AFTER THE READ HEADER AND DATA
013120  004037  033152          JSR     R0,@#SAVER      ;SAVE REGISTERS
013124  002172                  RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
013126  004512                  SAVERE                  ;STARTING ADDRES OF WHERE
                                                        ;THE REGISTERS ARE SAVED
013130  000022                  18.                     ;NUMBER OF REGISTERS
                                                        ;SAVED = 18.
                                ;*NOW SAVE VALUES FOR RHCS1 AND RHDST WHICH
                                ;*WILL CHANGE AFTER THE SEARCH
013132  013746  002350          MOV     @#REFOR,-(SP)   ;SAVE READ HEADER AND DATA
```

```
013136  052716  000101                  BIS     #IE!GO,(SP)       ;INTERRUPT ENABLE AND GO
013142  012637  004650                  MOV     (SP)+,@#TMP0      ;SAVE IN R0 FOR RHCS1
013146  012737  000001  004656          MOV     #1,@#TMP5         ;SAVE TRACK 0 SECTOR 1 FOR RHDST

                                        ;*THE INTERRUPT VECTOR WILL BE SET TO GO TO 2$
                                        ;*AFTER THE SEARCH

013154  012777  013222  167004          MOV     #7$,@RPVEC        ;SET INTERRUPT VECTOR TO 2$
013162  004737  033064                  JSR     PC,@#CHECKT       ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                  ;AND THAT ALL STATUS BITS ARE = 0
013166  104400  056662                  TYPE    ,CPHALT           ;CANNOT CONTINUE TESTING IF NOT
013172  000000                          HALT                      ;STOP TEST

013174  013746  002334                  MOV     @#SERCH,-(SP)     ;GET READY TO MOVE COMMAND
013200  052716  000101                  BIS     #GO!IE,(SP)       ;GET READY TO SET GO AND
                                                                  ;ENABLE INTERRUPT
013204  012677  166770                  MOV     (SP)+,@RHCS1      ;GO WITH
                                                                  ;WITH INTERRUPT ENABLED

                                        ;*TIME IS NOT CRITICAL THIS ONLY WAITS FOR SEARCH COMPLETION

013210  104412                          WAT                       ;WAIT FOR DRY BIT TO SET
013212  002222                          RHDS1                     ;WAIT FOR RHDS1 REGISTER
013214  000200                          DRY                       ;WAIT FOR DRY BIT IN RHDS1 REGISTER
013216  001614                          908.                      ;ALLOW 9080 MICRO SECONDS
013220  001507                          839.                      ;DRY MUST SET BETWEEN
                                                                  ;690 AND 17470 MICRO SECONDS

013222  012737  000000  177776  7$:     MOV     #0,PS             ;SET PROSESSOR STATUS TO
                                                                  ;PRIORITY 0 IN CASE IT WAS
                                                                  ;TAKEN OUT OF WAT ROUTINE
                                                                  ;BEFORE RTI
013230  013777  004656  166746          MOV     @#TMP5,@RHDST     ;SET DESIRED SECTOR/TRACK
                                                                  ;REGISTER TO SECTOR 1,TRACK 0
013236  013777  004506  166722          MOV     @#RP4VEC,@RPVEC   ;SET RP04 VECTOR ADDRESS
                                                                  ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                  ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                  ;'TIME' WILL ONLY SAVE
                                                                  ;CURRENT CYLINDER ADDRESS
                                                                  ;AND LOOK AHEAD REGISTERS

013244  013777  004650  166726          MOV     @#TMP0,@RHCS1     ;FILL RHCS1 WITH READ COMMAND
                                                                  ;TOGETHER WITH INTERRUPT ENABLE
                                                                  ;AND GO

                                        ;*TIME ALLOWED HERE IS CRITICAL ANY TIME ERROR
                                        ;*INDICATES WRONG SEARCH IN THE SEARCH COMMAND

013252  104412                          WAT                       ;WAIT FOR RDY BIT TO SET
013254  002200                          RHCS1                     ;WAIT FOR RHCS1 REGISTER
013256  000200                          RDY                       ;WAIT FOR RDY BIT IN RHCS1 REGISTER
013260  000225                          149.                      ;ALLOW 1490 MICRO SECONDS
013262  000002                          2.                        ;RDY MUST SET BETWEEN
                                                                  ;1470 AND 1510 MICRO SECONDS
```

```
                                        ;*WRITE FROM BUFFER WILL BE FILLED WITH EXPECTED DATA

013264  004037  032630                  JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
013270  002370                          WRFROM                  ;LOCATION WHERE SAVED
013272  000004                          4                       ;NUMBER OF WORDS SAVED
013274  010000                          10000                   ;FIRST DATA WORD
013276  000001                          1                       ;SECOND DATA WORD
013300  000000                          0                       ;THIRD DATA WORD
013302  000000                          0                       ;FOURTH DATA WORD

013304  004037  032654                  JSR     R0,@#CLAREA     ;CLEAR 4 WORDS, FROM WRFROM+<4*2>
013310  002400                          WRFROM+<4*2>                    ;STARTING FROM WRFROM+<4*2>
013312  000004                          4                       ;4 WORDS
013314  000001                          1                       ;FILL WITH 1


                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES

013316  004037  032706                  JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
013322  002172                          RHWC                    ;SAVED REGISTER TO CHANGE
013324  000000                          0                       ;DATA


013326  004037  032706                  JSR     R0,@#FILLRE     ;MOV REINTO+<8.*2> INTO SAVED RHBA
013332  002174                          RHBA                    ;SAVED REGISTER TO CHANGE
013334  003454                          REINTO+<8.*2>                   ;DATA


013336  004037  032706                  JSR     R0,@#FILLRE     ;MOV 4272 INTO SAVED RHCS1
013342  002200                          RHCS1                   ;SAVED REGISTER TO CHANGE
013344  004272                          4272                    ;DATA


013346  004037  032706                  JSR     R0,@#FILLRE     ;MOV 2 INTO SAVED RHDST
013352  002204                          RHDST                   ;SAVED REGISTER TO CHANGE
013354  000002                          2                       ;DATA


                                        ;*COMPARE REGISTER BEFORE READ HEADER AND DATA
                                        ;*WITH REGISTERS AFTER COMMAND


013356  004037  034002                  JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                                ;PRESENT VALUE
013362  004512                          SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
013364  002254                          WC                      ;TEST DATA STARTING FROM 'RHWC'
013366  000022                          18.                     ;18. REGISTERS TO BE COMPARED
013370  013374                          3$                      ;RETURN TO 3$ ON ERROR
013372  013400                          4$                      ;RETURN TO 4$ ON NO ERROR

013374  104031                  3$:     ERROR   31              ;READ HEADER AND DATA CAUSED
013376  000207                          RTS     PC              ;IMPROPER REGISTER CHANGE
                                                                ;GOOD DATA GIVES WHAT SHOULD
```

```
                                                               ;BE THERE
                                                               ;RECEIVED DATA GIVES WHAT WAS
                                                               ;THERE AFTER COMMAND

                                          ;*NOW READ INTO BUFFER WILL BE CHECKED TO SEE
                                          ;*THE READ WAS GOOD
 013400                             4$:

 013400  004037  035032                   JSR     R0,@#COMPAR  ;COMPARE TWO BLOCKS OF MEMORY
 013404  002370                           WRFROM               ;GOOD DATA STARTS FROM WRFROM
 013406  003434                           REINTO               ;TEST DATA STARTS FROM REINTO
 013410  000010                           8.                   ;8.. WORDS TO BE COMPARED
 013412  013416                           5$                   ;RETURN TO 5$ ON ERROR
 013414  013422                           6$                   ;RETURN TO 6$ ON NO ERROR


 013416  104053                     5$:   ERROR   53           ;READ HEADER AND DATA
 013420  000207                           RTS     PC           ;AFTER A SEARCH CAUSED
                                                               ;AN ERROR
 013422                             6$:
```

```
                                                ;;*****************************************************************
                                                ;*TEST 13        SEARCH COMMAND

                                                ;*          THE ONLY THING NEW IN THIS TEST IS AN IMPLIED SEEK
                                                ;*          IN A SEARCH COMMAND
                                                ;*          THE HEADS START FROM CYLINDER 10 BY A SEEK
                                                ;*          COMMAND THEN A SEARCH SECTOR 0 TRACK 0 CYLINDER 0
                                                ;*          IS GIVEN
                                                ;*          THEN A READ COMMAND IS GIVEN FOR
                                                ;*          CYLINDER 0, TRACK 0, SECTOR 1
                                                ;*          TIME FOR THE READ IS THE ONLY INDICATOR
                                                ;*          OF CORRECT SEARCH

                                                ;;*****************************************************************
013422  000004                                  TST13:  SCOPE
013424  012706  001000                                  MOV     #STACK,SP       ;RESET STACK
013430  012737  000013  004504                          MOV     #13,@#TSTNM     ;SAVE TEST NUMBER

013436  004737  023004                                  JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                                ;R3-RHDS1, R4-RHER1
                                                                                ;GIVE RH-11 INITIALIZE
                                                                                ;SETUP UNIT NUMBER

                                                        ;*GET THE HEADS TO CYLINDER 10
013442  004737  033064                                  JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                                ;AND THAT ALL STATUS BITS ARE = 0
013446  104400  056662                                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
013452  000000                                          HALT                    ;STOP TEST
013454  013777  004506  166504                          MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                                ;'TIME' WILL ONLY SAVE
                                                                                ;CURRENT CYLINDER ADDRESS
                                                                                ;AND LOOK AHEAD REGISTERS

013462  004037  032754                                  JSR     R0,@#SEEKCY     ;SEEK FOR
013466  000012                                          10.                     ;CYLINDER 10.


013470  013746  002352                                  MOV     @#SEECOM,-(SP)  ;GET READY TO MOVE COMMAND
013474  052716  000101                                  BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                                ;ENABLE INTERRUPT
013500  012677  166474                                  MOV     (SP)+,@RHCS1    ;GO WITH
                                                                                ;4 IN RHCS1 FOR SEEK
                                                                                ;WITH INTERRUPT ENABLED

013504  104412                                          WAT                     ;WAIT FOR DRY BIT TO SET
013506  002222                                          RHDS1                   ;WAIT FOR RHDS1 REGISTER
013510  000200                                          DRY                     ;WAIT FOR DRY BIT IN RHDS1 REGISTER
013512  015530                                          7000.                   ;ALLOW 70000 MICRO SECONDS
013514  000043                                          35.                     ;DRY MUST SET BETWEEN
                                                                                ;69650 AND 70350 MICRO SECONDS
```

```
                                                      ;*FILL REGISTERS FOR READ HEADER AND DATA TO BE DONE AFTER SEARCH

013516  004737  033004                                JSR     PC,@#CLDISK      ;SET R1-RHCS1, R2-RHCS2
                                                                               ;R3-RHDS1, R4-RHER1
                                                                               ;GIVE RH-11 INITIALIZE
                                                                               ;SETUP UNIT NUMBER

013522  004037  034766                                JSR     R0,@#RUN         ;SETUP TO RUN FOR DATA COMMAND
013526  000000                                        0                        ;CYLINDER 0
013530     000                                        .BYTE   0                ;SECTOR 0
013531     000                                        .BYTE   0                ;TRACK 0
013532  177770                                        -8.                      ;WORD COUNT = 8.
013534  003434                                        REINTO                   ;BUS ADDRESS
                                                                               ;STARTING ADDRESS OF DATA
                                                                               ;BUFFER = REINTO
013536  000000                                        0                        ;DO NOT INHIBIT BUS ADDRESS INCREMENT
013540  014000                                        ECI!FMT22                        ;16 BITS PER WORD FORMAT
                                                                               ;INHIBIT ECC CORRECTION
                                                                               ;DO NOT INHIBIT HEADER COMPARE
013542  002334                                        SERCH                    ;GET READY TO DO A SERCH
                                                                               ;SEARCH WITH 30 IN RHCS1



                                                      ;*SAVE REGISTERS FOR COMPARISON AFTER SEARCH
                                                      ;*AND READ HEADER AND DATA
013544  004037  033152                                JSR     R0,@#SAVER       ;SAVE REGISTERS
013550  002172                                        RHWC                     ;RHWC IS THE FIRST REGISTER SAVED
013552  004512                                        SAVERE                   ;STARTING ADDRES OF WHERE
                                                                               ;THE REGISTERS ARE SAVED
013554  000022                                        18.                      ;NUMBER OF REGISTERS
                                                                               ;SAVED = 18.

                                                      ;*NOW GIVE THE SEARCH COMMAND
013556  004737  033064                                JSR     PC,@#CHECKT      ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                               ;AND THAT ALL STATUS BITS ARE = 0
013562  104400  056662                                TYPE    ,CPHALT          ;CANNOT CONTINUE TESTING IF NOT
013566  000000                                        HALT                     ;STOP TEST
013570  012777  013754  166370                        MOV     #3$,@RPVEC       ;INTERRUPT VECTOR SET TO 3$

013576  004037  032734                                JSR     R0,@#SRCH        ;SEARCH FOR
013602  000000                                        0                        ;CYLINDER 0
013604     000                                .BYTE   0                        ;SECTOR 0
013605     000                                .BYTE   0                        ;TRACK 0

013606  013700  002334                                MOV     @#SERCH,R0       ;EXPECTED CONTENTS OF RHCS1
                                                                               ;IMMEDIATELY AFTER GO
013612  052700  004301                                BIS     #DVA!RDY!IE!GO,R0 ;EXPECTED BITS IN RHCS1
013616  012705  010500                                MOV     #MOL!DPR!VV,R5  ;EXPECTED BITS IN RHDS1
                                                                               ;IMMEDIATELY AFTER GO


013622  013746  002334                                MOV     @#SERCH,-(SP)    ;GET READY TO MOVE COMMAND
013626  052716  000101                                BIS     #GO!IE,(SP)      ;GET READY TO SET GO AND
                                                                               ;ENABLE INTERRUPT
```

```
        013632  012677  166342                          MOV     (SP)+,@RHCS1            ;GO WITH
                                                                                        ;WITH INTERRUPT ENABLED
        013636  021100                                  CMP     @R1,R0                  ;IS RHCS1 GOOD
        013640  001413                                  BEQ     1$                      ;BRANCH IF GOOD
        013642  011137  001126                          MOV     @R1,@#$BDDAT            ;BAD DATA FOR RHCS1
        013646  010037  001124                          MOV     R0,@#$GDDAT             ;GOOD DATA
        013652  010137  004500                          MOV     R1,@#REGADR             ;FAILING REGISTER RHCS1
        013656  012737  000340  000036                  MOV     #340,@#TRAPVEC+2        ;TRAP PRIORITY = 7
        013664  104021                                  ERROR   21                      ;DURING SEARCH COMMAND
                                                                                        ;CONTENTS OF RHCS1 WAS
                                                                                        ;NOT AS EXPECTED
        013666  000414                                  BR      2$                      ;IF LAST ERROR 21 OCCURRED
                                                                                        ;THEN DO NOT CHECK RHDS1
                                                                                        ;AS TOO MUCH TIME HAS
                                                                                        ;PASSED

        013670  021305                          1$:     CMP     @R3,R5                  ;IS RHDS1 GOOD
        013672  001412                                  BEQ     2$                      ;BRANCH IF GOOD
        013674  011337  001126                          MOV     @R3,@#$BDDAT            ;BAD DATA FOR RHDS1
        013700  010537  001124                          MOV     R5,@#$GDDAT             ;GOOD DATA
        013704  010337  004500                          MOV     R3,@#REGADR             ;FAILING REGISTER RHDS1
        013710  012737  000340  000036                  MOV     #340,@#TRAPVEC+2        ;TRAP PRIORITY = 7
        013716  104063                                  ERROR   63                      ;DURING SEARCH COMMAND
                                                                                        ;CONTENTS OF RHDS1 WAS
                                                                                        ;IN CORRECT

        013720  013737  002350  004650          2$:     MOV     @#REFOR,@#TMP0          ;SAVE READ HEADER AND DATA
        013726  052737  000101  004650                  BIS     #IE!GO,@#TMP0           ;INCLUDE INTERRUPT ENABLE, GO
        013734  012737  000001  004656                  MOV     #1,@#TMP5               ;SAVE TRACK 0, SECTOR 1

                                                        ;*THIS IS ONLY A WAIT LOOP

        013742  104412                                  WAT                             ;WAIT FOR RDY BIT TO SET
        013744  002222                                  RHDS1                           ;WAIT FOR RHDS1 REGISTER
        013746  000200                                  RDY                             ;WAIT FOR RDY BIT IN RHDS1 REGISTER
        013750  015530                                  7000.                           ;ALLOW 70000 MICRO SECONDS
        013752  000043                                  35.                             ;RDY MUST SET BETWEEN
                                                                                        ;69650 AND 70350 MICRO SECONDS

        013754  012737  000200  000036          3$:     MOV     #200,@#TRAPVEC+2        ;TRAP PRIORITY = 4
        013762  012737  000000  177776                  MOV     #0,PS                   ;SET PROSESSOR STATUS TO 0
        013770  013777  004656  166206                  MOV     @#TMP5,@RHDST           ;SET DESIRED SECTOR/TRACK
                                                                                        ;REGISTER TO SECTOR 1, TRACK 0

        013776  013777  004506  166162                  MOV     @#RP4VEC,@RPVEC         ;SET RP04 VECTOR ADDRESS
                                                                                        ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                                        ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                                        ;'TIME' WILL ONLY SAVE
                                                                                        ;CURRENT CYLINDER ADDRESS
                                                                                        ;AND LOOK AHEAD REGISTERS
        014004  013711  004650                          MOV     @#TMP0,@R1              ;FILL RHCS1 WITH READ COMMAND
                                                                                        ;TOGETHER WITH INTERRUPT ENABLE
                                                                                        ;AND GO
```

```
                                         ;*TIME ALLOWED HERE IS CRITICAL ANY TIME ERROR
                                         ;*INDICATES WRONG SEARCH IN THE SEARCH COMMAND

014010  104412                           WAT                               ;WAIT FOR RDY BIT TO SET
014012  002200                           RHCS1                             ;WAIT FOR RHCS1 REGISTER
014014  000200                           RDY                               ;WAIT FOR RDY BIT IN RHCS1 REGISTER
014016  000225                           149.                              ;ALLOW 1490 MICRO SECONDS
014020  000002                           2.                                ;RDY MUST SET BETWEEN
                                                                           ;1470 AND 1510 MICRO SECONDS

                                         ;*WRITE FROM BUFFER WILL BE FILLED WITH EXPECTED DATA

014022  004037  032630                   JSR     R0,@#FLHEAD               ;SAVE HEADER DATA IN WRFROM
014026  002370                           WRFROM                            ;LOCATION WHERE SAVED
014030  000004                           4                                 ;NUMBER OF WORDS SAVED
014032  010000                           10000                             ;FIRST DATA WORD
014034  000001                           1                                 ;SECOND DATA WORD
014036  000000                           0                                 ;THIRD DATA WORD
014040  000000                           0                                 ;FOURTH DATA WORD

014042  004037  032654                   JSR     R0,@#CLAREA               ;CLEAR 4 WORDS, FROM WRFROM+<4*2>
014046  002400                           WRFROM+<4*2>                              ;STARTING FROM WRFROM+<4*2>
014050  000004                           4                                 ;4 WORDS
014052  000001                           1                                 ;FILL WITH 1


                                         ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES

014054  004037  032706                   JSR     R0,@#FILLRE               ;MOV 0 INTO SAVED RHWC
014060  002172                           RHWC                              ;SAVED REGISTER TO CHANGE
014062  000000                           0                                 ;DATA


014064  004037  032706                   JSR     R0,@#FILLRE               ;MOV REINTO+<8.*2> INTO SAVED RHBA
014070  002174                           RHBA                              ;SAVED REGISTER TO CHANGE
014072  003454                           REINTO+<8.*2>                             ;DATA


014074  004037  032706                   JSR     R0,@#FILLRE               ;MOV 4272 INTO SAVED RHCS1
014100  002200                           RHCS1                             ;SAVED REGISTER TO CHANGE
014102  004272                           4272                              ;DATA


014104  004037  032706                   JSR     R0,@#FILLRE               ;MOV 2 INTO SAVED RHDST
014110  002204                           RHDST                             ;SAVED REGISTER TO CHANGE
014112  000002                           2                                 ;DATA


014114  004037  032706                   JSR     R0,@#FILLRE               ;MOV 0 INTO SAVED RHCC
014120  002234                           RHCC                              ;SAVED REGISTER TO CHANGE
014122  000000                           0                                 ;DATA


                                         ;*COMPARE REGISTER BEFORE READ HEADER AND DATA
```

```
                                   ;*WITH REGISTERS AFTER COMMAND


014124  004037  034002             JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                           ;PRESENT VALUE
014130  004512                     SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
014132  002254                     WC                      ;TEST DATA STARTING FROM 'RHWC'
014134  000022                     18.                     ;18. REGISTERS TO BE COMPARED
014136  014142                     4$                      ;RETURN TO 4$ ON ERROR
014140  014146                     5$                      ;RETURN TO 5$ ON NO ERROR


014142  104031             4$:     ERROR   31              ;READ HEADER AND DATA CAUSED
014144  000207                     RTS     PC              ;IMPROPER REGISTER CHANGE
                                                           ;GOOD DATA GIVES WHAT SHOULD
                                                           ;BE THERE
                                                           ;RECEIVED DATA GIVES WHAT WAS
                                                           ;THERE AFTER COMMAND

                                   ;*NOW READ INTO BUFFER WILL BE CHECKED TO SEE
                                   ;*THE READ WAS GOOD
014146                     5$:

014146  004037  035032             JSR     R0,@#COMPAR     ;COMPARE TWO BLOCKS OF MEMORY
014152  002370                     WRFROM                  ;GOOD DATA STARTS FROM WRFROM
014154  003434                     REINTO                  ;TEST DATA STARTS FROM REINTO
014156  000010                     8.                      ;8., WORDS TO BE COMPARED
014160  014164                     6$                      ;RETURN TO 6$ ON ERROR
014162  014170                     7$                      ;RETURN TO 7$ ON NO ERROR


014164  104053             6$:     ERROR   53              ;READ HEADER AND DATA
014166  000207                     RTS     PC              ;AFTER A SEARCH CAUSED
                                                           ;AN ERROR
014170                     7$:
```

```

                                            ;;*************************************************************
                                            ;*      THE NEXT TEST REMOVES SECTOR 1 ON CYLINDER 0
                                            ;*      TRACK0 AND PUTS SECTOR 0 THERE.
                                            ;*      HENCE THE PACK IS UNFORMATTED FROM
                                            ;*      THIS POINT ON TO THE TEST WHEN SECTOR
                                            ;*      1 IS REPLACED.  IF TESTING IS STOPPED WITH
                                            ;*      AN ERROR IN THE SECTION OF THE PROGRAM BETWEEN
                                            ;*      THIS AND WHEN SECTOR 1 IS REPLACED THEN THE
                                            ;*      DISK BEING USED MAY HAVE BEEN UNFORMATTED
                                            ;*      IF THE LAST PASS OF THIS PROGRAM GIVES
                                            ;*      NO ERRORS IN THIS SECTION THEN THE DISK
                                            ;*      MAY NOT HAVE BEEN UNFORMATTED. HOWEVER IT
                                            ;*      IS RECOMMENDED THAT AFTER A PASS OF THIS
                                            ;*      PROGRAM THE DISK BE REFORMATTED.
                                            ;;*************************************************************







                                            ;;*************************************************************
                                            ;*TEST 14        HEADER COMPARE ERROR - RHER1 BIT #7 (HCE)

                                            ;*      WRITE HEADER AND DATA IS USED TO REMOVE SECTOR 1
                                            ;*      AND PUT SECTOR 0 THERE ON CYLINDER 0
                                            ;*      THEN A READ DATA IS GIVEN FOR SECTOR1
                                            ;*      HCE- BIT #7 IN RHER1 SHOULD SET.
                                            ;*      ALL REGISTERS ARE CHECKED
                                            ;*      ANY DATA READ IS CHECKED

                                            ;;*************************************************************
014170  000004                              ↑ST14:  SCOPE
014172  012706  001000                              MOV     #STACK,SP       ;RESET STACK
014176  012737  000014  004504                      MOV     #14,@#↑STNM     ;SAVE TEST NUMBER

014204  004737  033004                              JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                            ;R3-RHDS1, R4-RHER1
                                                                            ;GIVE RH-11 INITIALIZE
                                                                            ;SETUP UNIT NUMBER

                                                    ;*FILL WRITE FROM BUFFER WITH HEADER

014210  004037  032630                              JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
014214  002370                                      WRFROM                  ;LOCATION WHERE SAVED
014216  000005                                      5                       ;NUMBER OF WORDS SAVED
014220  010000                                      10000                   ;FIRST DATA WORD
014222  000000                                      0                       ;SECOND DATA WORD
014224  000000                                      0                       ;THIRD DATA WORD
014226  000000                                      0                       ;FOURTH DATA WORD
014230  000001                                      1                       ;FIFTH DATA WORD

                                                    ;*FILL READ INTO BUFFER WITH ALL ONES
```

```
014232  004037  032654          JSR     R0,@#CLAREA         ;CLEAR 256. WORDS, FROM REINTO
014236  003434                  REINTO                      ;STARTING FROM REINTO
014240  000400                  256.                        ;256. WORDS
014242  177777                  -1                          ;FILL WITH -1

                                ;*WRITE HEADER AND DATA IS LOADED

014244  004037  034766          JSR     R0,@#RUN            ;SETUP TO RUN FOR DATA COMMAND
014250  000000                  0.                          ;CYLINDER 0.
014252     001                  .BYTE   1.                  ;SECTOR 1.
014253     000                  .BYTE   0.                  ;TRACK 0.
014254  177773                  -1-4                        ;WORD COUNT (DATA) = 1 +
                                                            ;4 HEADER WORDS
014256  002370                  WRFROM                      ;BUS ADDRESS
                                                            ;STARTING ADDRESS OF DATA
                                                            ;BUFFER = WRFROM
014260  000000                  0                           ;DO NOT INHIBIT BUS ADDRESS INCREMENT
014262  010000                  FMT22                       ;16 BITS PER WORD FORMAT
                                                            ;DO NOT INHIBIT ECC CORRECTION
                                                            ;DO NOT INHIBIT HEADER COMPARE
014264  002344                  WRIFOR                      ;GET READY TO DO A WRIFOR
                                                    ;WRITE HEADER AND DATA WITH 62 IN RHCS1


                                ;*NOW SAVE REGISTERS FOR COMPARISON AFTER WRITE

014266  004037  033152          JSR     R0,@#SAVER          ;SAVE REGISTERS
014272  002172                  RHWC                        ;RHWC IS THE FIRST REGISTER SAVED
014274  004512                  SAVERE                      ;STARTING ADDRES OF WHERE
                                                            ;THE REGISTERS ARE SAVED
014276  000021                  17.                         ;NUMBER OF REGISTERS
                                                            ;SAVED = 17.

014300  004737  033064          JSR     PC,@#CHECKT         ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                            ;AND THAT ALL STATUS BITS ARE = 0
014304  104400  056662          TYPE    ,CPHALT             ;CANNOT CONTINUE TESTING IF NOT
014310  000000                  HALT                        ;STOP TEST

014312  013777  004506  165646  MOV     @#RP4VEC,@RPVEC     ;SET RP04 VECTOR ADDRESS
                                                            ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                            ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                            ;'TIME' WILL ONLY SAVE
                                                            ;CURRENT CYLINDER ADDRESS
                                                            ;AND LOOK AHEAD REGISTERS


014320  013746  002344          MOV     @#WRIFOR,-(SP)      ;GET READY TO MOVE COMMAND
014324  052716  000101          BIS     #GO!IE,(SP)         ;GET READY TO SET GO AND
                                                            ;ENABLE INTERRUPT
014330  012677  165644          MOV     (SP)+,@RHCS1        ;GO WITH
                                                            ;62 IN RHCS1 FOR WRITE HEADER AND DATA
```

```
                                                                ;WITH INTERRUPT ENABLED
                                        ;*TIME IS NOT CRITICAL
014334  104412                          WAT                     ;WAIT FOR RDY BIT TO SET
014336  002200                          RHCS1                   ;WAIT FOR RHCS1 REGISTER
014340  000200                          RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
014342  004704                          2500.                   ;ALLOW 25000 MICRO SECONDS
014344  004704                          2500.                   ;RDY MUST SET BETWEEN
                                                                ;00 AND 50000 MICRO SECONDS
                                        ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE
014346  004037  032706                  JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
014352  002172                          RHWC                    ;SAVED REGISTER TO CHANGE
014354  000000                          0                       ;DATA
014356  004037  032706                  JSR     R0,@#FILLRE     ;MOV WRFROM+<5*2> INTO SAVED RHBA
014362  002174                          RHBA                    ;SAVED REGISTER TC CHANGE
014364  002402                          WRFROM+<5*2>                    ;DATA
014366  004037  032706                  JSR     R0,@#FILLRE     ;MOV 2 INTO SAVED RHDST
014372  002204                          RHDST                   ;SAVED REGISTER TO CHANGE
014374  000002                          2                       ;DATA
                                        ;*COMPARE ALL REGISTERS
014376  004037  034002                  JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                                ;PRESENT VALUE
014402  004512                          SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
014404  002254                          WC                      ;TEST DATA STARTING FROM 'RHWC'
014406  000021                          17.                     ;17. REGISTERS TO BE COMPARED
014410  014414                          1$                      ;RETURN TO 1$ ON ERROR
014412  014420                          2$                      ;RETURN TO 2$ ON NO ERROR
014414  104027                  1$:     ERROR   27              ;WRITING HEADER AND DATA CAUSED
014416  000207                          RTS     PC
                                                                ;IMPROPER REGISTER CHANGE
                                                                ;GOOD DATA GIVES WHAT
                                                                ;SHOULD BE THERE
                                                                ;RECEIVED DATA GIVES WHAT
                                                                ;WAS THERE AFTER WRITE
```

```


                                                   ;*NOW A READ DATA WILL BE DONE ON CYLINDER=0, SECTOR=1,
                                                   ;*TRACK=0
                                                   ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA

014420                                     2$:

014420  004737  033004                     JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                   ;R3-RHDS1, R4-RHER1
                                                                   ;GIVE RH-11 INITIALIZE
                                                                   ;SETUP UNIT NUMBER

014424  004037  032654                     JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM
014430  002370                             WRFROM                  ;STARTING FROM WRFROM
014432  000400                             256.                    ;256. WORDS
014434  177777                             -1                      ;FILL WITH -1


                                           ;*READ COMMAND IS LOADED

014436  004037  034766                     JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
014442  000000                             0                       ;CYLINDER 0
014444     001                             .BYTE   1.              ;SECTOR 1.
014445     000                             .BYTE   0               ;TRACK 0
014446  177777                             -1                      ;WORD COUNT = 1
014450  003434                             REINTO                  ;BUS ADDRESS
                                                                   ;STARTING ADDRESS OF DATA
                                                                   ;BUFFER = REINTO
014452  000000                             0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
014454  010000                             FMT22                   ;16 BITS PER WORD FORMAT
                                                                   ;DO NOT INHIBIT ECC CORRECTION
                                                                   ;DO NOT INHIBIT HEADER COMPARE
014456  002346                             READAT                  ;GET READY TO DO A READAT
                                                   ;READ DATA WITH 70 IN RHCS1



                                           ;*SAVE REGISTERS FOR COMPARISON AFTER READ DATA
014460  004037  033152                     JSR     R0,@#SAVER      ;SAVE REGISTERS
014464  002172                             RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
014466  004512                             SAVERE                  ;STARTING ADDRES OF WHERE
                                                                   ;THE REGISTERS ARE SAVED
014470  000022                             18.                     ;NUMBER OF REGISTERS
                                                                   ;SAVED = 18.

014472  004737  033064                     JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                   ;AND THAT ALL STATUS BITS ARE = 0
014476  104400  056662                     TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
014502  000000                             HALT                    ;STOP TEST

014504  013777  004506  165454             MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                   ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                   ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                   ;'TIME' WILL ONLY SAVE
```

```
                                                                        ;CURRENT CYLINDER ADDRESS
                                                                        ;AND LOOK AHEAD REGISTERS

014512  013746  002346                  MOV     @#READAT,-(SP)          ;GET READY TO MOVE COMMAND
014516  052716  000101                  BIS     #GO!IE,(SP)             ;GET READY TO SET GO AND
                                                                        ;ENABLE INTERRUPT
014522  012677  165452                  MOV     (SP)+,@RHCS1            ;GO WITH
                                                                         ;70 IN RHCS1 FOR READ DATA
                                                                        ;WITH INTERRUPT ENABLED

                                        ;*TIME IS NOT CRITICAL

014526  104412                          WAT                             ;WAIT FOR RDY BIT TO SET
014530  002200                          RHCS1                           ;WAIT FOR RHCS1 REGISTER
014532  000200                          RDY                             ;WAIT FOR RDY BIT IN RHCS1 REGISTER
014534  010110                          4168.                           ;ALLOW 41680 MICRO SECONDS
014536  001502                          834.                            ;RDY MUST SET BETWEEN
                                                                        ;33340 AND 50020 MICRO SECONDS

                                        ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE

014540  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
014544  002222                          RHDS1                           ;CHANGE RHDS1 REGISTER

014546  000002                          2                               ;2 BIT/BITS TO BE CHANGED
014550  000001                          1                               ;NEW VALUE OF ATA IS 1
014552  100000                          ATA                             ;CHANGE ATA BIT
014554  000001                          1                               ;NEW VALUE OF ERR IS 1
014556  040000                          ERR                             ;CHANGE ERR BIT

014560  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
014564  002200                          RHCS1                           ;CHANGE RHCS1 REGISTER

014566  000002                          2                               ;2 BIT/BITS TO BE CHANGED
014570  000001                          1                               ;NEW VALUE OF SC IS 1
014572  100000                          SC                              ;CHANGE SC BIT
014574  000001                          1                               ;NEW VALUE OF TRE IS 1
014576  040000                          TRE                             ;CHANGE TRE BIT

014600  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
014604  002202                          RHER1                           ;CHANGE RHER1 REGISTER

014606  000001                          1                               ;1 BIT/BITS TO BE CHANGED
014610  000001                          1                               ;NEW VALUE OF HCE IS 1
014612  000200                          HCE                             ;CHANGE HCE BIT

014614  004037  032706                  JSR     R0,@#FILLRE             ;MOV 2 INTO SAVED RHDST
014620  002204                          RHDST                           ;SAVED REGISTER TO CHANGE
014622  000002                          2                               ;DATA


014624  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                        ;FOR WORKING DRIVE IN
```

```
                                                     ;SAVED RHAS LOCATION

                                ;*COMPARE ALL REGISTERS

014632  004037  034002          JSR     R0,@#COMREG  ;COMPARE SAVED REGISTERS WITH
                                                     ;PRESENT VALUE
014636  004512                  SAVERE               ;GOOD DATA SAVED IN 'SAVERE'
014640  002254                  WC                   ;TEST DATA STARTING FROM 'RHWC'
014642  000022                  18.                  ;18. REGISTERS TO BE COMPARED
014644  014650                  3$                   ;RETURN TO 3$ ON ERROR
014646  014654                  4$                   ;RETURN TO 4$ ON NO ERROR

014650  104047          3$:     ERROR   47           ;READING ON NON EXISTANT SECTOR
014652  000207                  RTS     PC
                                                     ;CAUSED AN ERROR
                                                     ;GOOD DATA GIVES WHAT SHOULD
                                                     ;BE THERE
                                                     ;RECEIVED DATA GIVES WHAT
                                                     ;WAS THERE AFTER READ

                                ;*READ DATA WILL BE COMPARED

014654                  4$:

014654  004037  035032          JSR     R0,@#COMPAR  ;COMPARE TWO BLOCKS OF MEMORY
014660  002370                  WRFROM               ;GOOD DATA STARTS FROM WRFROM
014662  003434                  REINTO               ;TEST DATA STARTS FROM REINTO
014664  000400                  256.                 ;256., WORDS TO BE COMPARED
014666  014672                  5$                   ;RETURN TO 5$ ON ERROR
014670  014676                  6$                   ;RETURN TO 6$ ON NO ERROR

014672  104050          5$:     ERROR   50           ;DATA READ FROM NON
014674  000207                  RTS     PC           ;EXISTANT SECTOR CAUSED AN ERROR
014676                  6$:
```

```
                                        ;;*******************************************************************
                                        ;*TEST 15        HEADER COMPARE ERROR - RHER1 BIT #7 (HCE)

                                        ;*       WRITE HEADER AND DATA IS USED TO REMOVE SECTOR 1
                                        ;*       AND PUT SECTOR 0 ON CYLINDER 0
                                        ;*       THEN A WRITE DATA IS GIVEN FOR SECTOR 1, TRACK 0, CYLINDER 0
                                        ;*       FOR 70. WORDS
                                        ;*       HCE - BIT 7 IN RHER1 SHOULD SET
                                        ;*       ALL REGISTERS ARE CHECKED
                                        ;*       THEN A READ HEADER AND DATA SECTOR 1, TRACK 0, CYLINDER 0
                                        ;*       IS GIVEN, HCE - BIT 7 SHOULD SET AND ALL
                                        ;*       HEADER AND DATA SHOULD BE READ

                                        ;;*******************************************************************
 014676  000004                         TST15:  SCOPE
 014700  012706  001000                         MOV     #STACK,SP               ;RESET STACK
 014704  012737  000015  004504                 MOV     #15,@#TSTNM             ;SAVE TEST NUMBER

 014712  004737  033004                         JSR     PC,@#CLDISK             ;SET R1-RHCS1, R2-RHCS2
                                                                                ;R3-RHDS1, R4-RHER1
                                                                                ;GIVE RH-11 INITIALIZE
                                                                                ;SETUP UNIT NUMBER

                                                ;*FILL WRITE FROM BUFFER WITH HEADER AND DATA

 014716  004037  032630                         JSR     R0,@#FLHEAD             ;SAVE HEADER DATA IN WRFROM
 014722  002370                                 WRFROM                          ;LOCATION WHERE SAVED
 014724  000006                                 6                               ;NUMBER OF WORDS SAVED
 014726  010000                                 10000                           ;FIRST DATA WORD
 014730  000000                                 0                               ;SECOND DATA WORD
 014732  000000                                 0                               ;THIRD DATA WORD
 014734  000000                                 0                               ;FOURTH DATA WORD
 014736  000001                                 1                               ;FIFTH DATA WORD
 014740  000001                                 1                               ;SIXTH DATA WORD

                                                ;*FILL READ INTO BUFFER WITH ALL ONES

 014742  004037  032654                         JSR     R0,@#CLAREA             ;CLEAR 256. WORDS, FROM REINTO
 014746  003434                                 REINTO                          ;STARTING FROM REINTO
 014750  000400                                 256.                            ;256. WORDS
 014752  177777                                 -1                              ;FILL WITH -1


                                                ;*WRITE HEADER AND DATA IS LOADED

 014754  004037  034766                         JSR     R0,@#RUN                ;SETUP TO RUN FOR DATA COMMAND
 014760  000000                                 0                               ;CYLINDER 0
 014762     001                                 .BYTE   1                       ;SECTOR 1
 014763     000                                 .BYTE   0                       ;TRACK 0
 014764  177772                                 -2-4                            ;WORD COUNT (DATA) = 2 +
                                                                                ;4 HEADER WORDS
 014766  002370                                 WRFROM                          ;BUS ADDRESS
                                                                                ;STARTING ADDRESS OF DATA
                                                                                ;BUFFER = WRFROM
```

```
014770  000000                              0                               ;DO NOT INHIBIT BUS ADDRESS INCREMENT
014772  010000                              FMT22                           ;16 BITS PER WORD FORMAT
                                                                            ;DO NOT INHIBIT ECC CORRECTION
                                                                            ;DO NOT INHIBIT HEADER COMPARE
014774  002344                              WRIFOR                          ;GET READY TO DO A WRIFOR
                                                                  ;WRITE HEADER AND DATA WITH 62 IN RHCS1

                                            ;*NOW SAVE REGISTERS FOR COMPARISON AFTER
                                            ;*WRITE HEADER AND DATA

015776  004037  033152                      JSR     R0,@#SAVER              ;SAVE REGISTERS
015002  002172                              RHWC                            ;RHWC IS THE FIRST REGISTER SAVED
015004  004512                              SAVERE                          ;STARTING ADDRES OF WHERE
                                                                            ;THE REGISTERS ARE SAVED
015006  000021                              17.                             ;NUMBER OF REGISTERS
                                                                            ;SAVED = 17.

015010  004737  033064                      JSR     PC,@#CHECKT             ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                            ;AND THAT ALL STATUS BITS ARE = 0
015014  104400  056662                      TYPE    ,CPHALT                 ;CANNOT CONTINUE TESTING IF NOT
015020  000000                              HALT                            ;STOP TEST

015022  013777  004506  165136              MOV     @#RP4VEC,@RPVEC         ;SET RP04 VECTOR ADDRESS
                                                                            ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                            ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                            ;'TIME' WILL ONLY SAVE
                                                                            ;CURRENT CYLINDER ADDRESS
                                                                            ;AND LOOK AHEAD REGISTERS

015030  013746  002344                      MOV     @#WRIFOR,-(SP)          ;GET READY TO MOVE COMMAND
015034  052716  000101                      BIS     #GO!IE,(SP)             ;GET READY TO SET GO AND
                                                                            ;ENABLE INTERRUPT
015040  012677  165134                      MOV     (SP)+,@RHCS1            ;GO WITH
                                                                             ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                                            ;WITH INTERRUPT ENABLED

                                            ;*TIME IS NOT CRITICAL

015044  104412                              WAT                             ;WAIT FOR RDY BIT TO SET
015046  002200                              RHCS1                           ;WAIT FOR RHCS1 REGISTER
015050  000200                              RDY                             ;WAIT FOR RDY BIT IN RHCS1 REGISTER
015052  004704                              2500.                           ;ALLOW 25000 MICRO SECONDS
015054  004704                              2500.                           ;RDY MUST SET BETWEEN
                                                                            ;00 AND 50000 MICRO SECONDS

                                            ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE

015056  004037  032706                      JSR     R0,@#FILLRE             ;MOV 0 INTO SAVED RHWC
015062  002172                              RHWC                            ;SAVED REGISTER TO CHANGE
015064  000000                              0                               ;DATA
```

```
015066 004037 032706            JSR     R0,@#FILLRE     ;MOV WRFROM+<6*2> INTO SAVED RHBA
015072 002174                   RHBA                    ;SAVED REGISTER TO CHANGE
015074 002404                   WRFROM+<6*2>                    ;DATA


015076 004037 032706            JSR     R0,@#FILLRE     ;MOV 2 INTO SAVED RHDST
015102 002204                   RHDST                   ;SAVED REGISTER TO CHANGE
015104 000002                   2                       ;DATA



                                ;*COMPARE ALL REGISTERS

015106 004037 034002            JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                        ;PRESENT VALUE
015112 004512                   SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
015114 002254                   WC                      ;TEST DATA STARTING FROM 'RHWC'
015116 000021                   17.                     ;17. REGISTERS TO BE COMPARED
015120 015124                   1$                      ;RETURN TO 1$ ON ERROR
015122 015130                   2$                      ;RETURN TO 2$ ON NO ERROR

015124 104027           1$:     ERROR   27              ;WRITING HEADER AND DATA CAUSED
015126 000207                   RTS     PC              ;IMPROPER REGISTER CHANGE
                                                        ;GOOD DATA GIVES WHAT
                                                        ;SHOULD BE THERE
                                                        ;RECEIVED DATA GIVES WHAT
                                                        ;WAS THERE AFTER WRITE
```

```
                                                ;*NOW A WRITE DATA WILL BE DONE ON SAME CYLINDER, SECTOR
                                                ;*TRACK

015130                                  2$:
                                                ;*FILL WRITE FROM BUFFER WITH DATA

015130  004037  032654                          JSR     R0,@#CLAREA     ;CLEAR 70. WORDS, FROM WRFROM
015134  002370                                  WRFROM                  ;STARTING FROM WRFROM
015136  000106                                  70.                     ;70. WORDS
015140  177400                                  177400                  ;FILL WITH 177400



                                                ;*WRITE DATA COMMAND IS LOADED

015142  004037  034766                          JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
015146  000000                                  0                       ;CYLINDER 0
015150     001                                  .BYTE   1               ;SECTOR 1
015151     000                                  .BYTE   0               ;TRACK 0
015152  177672                                  -70.                    ;WORD COUNT = 70.
015154  002370                                  WRFROM                  ;BUS ADDRESS
                                                                        ;STARTING ADDRESS OF DATA
                                                                        ;BUFFER = WRFROM
015156  000000                                  0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
015160  010000                                  FMT22                   ;16 BITS PER WORD FORMAT
                                                                        ;DO NOT INHIBIT ECC CORRECTION
                                                                        ;DO NOT INHIBIT HEADER COMPARE
015162  002342                                  WRIDAT                  ;GET READY TO DO A WRIDAT
                                                        ;WRITE DATA WITH 60 IN RHCS1



                                                ;*SAVE REGISTERS FOR COMPARISON AFTER WRITE DATA
015164  004037  033152                          JSR     R0,@#SAVER      ;SAVE REGISTERS
015170  002172                                  RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
015172  004512                                  SAVERE                  ;STARTING ADDRES OF WHERE
                                                                        ;THE REGISTERS ARE SAVED
015174  000022                                  18.                     ;NUMBER OF REGISTERS
                                                                        ;SAVED = 18.

015176  004737  03306                           JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                        ;AND THAT ALL STATUS BITS ARE = 0
015202  104400  056662                          TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
015206  000000                                  HALT                    ;STOP TEST

015210  013777  004506  164750                  MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                        ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                        ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                        ;'TIME' WILL ONLY SAVE
                                                                        ;CURRENT CYLINDER ADDRESS
                                                                        ;AND LOOK AHEAD REGISTERS


015216  013746  002342                          MOV     @#WRIDAT,-(SP)  ;GET READY TO MOVE COMMAND
015222  052716  000101                          BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
```

```
                                                        ;ENABLE INTERRUPT
015226  012677  164746          MOV     (SP)+,@RHCS1    ;GO WITH
                                                        ;60 IN RHCS1 FOR WRITE DATA
                                                        ;WITH INTERRUPT ENABLED

                                ;*TIME IS NOT CRITICAL

015232  104412                  WAT                     ;WAIT FOR RDY BIT TO SET
015234  002200                  RHCS1                   ;WAIT FOR RHCS1 REGISTER
015236  000200                  RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
015240  001614                  908.                    ;ALLOW 9080 MICRO SECONDS
015242  001502                  834.                    ;RDY MUST SET BETWEEN
                                                        ;740 AND 17420 MICRO SECONDS

                                ;*NOW CHANGE REGISTERS TO EXPECTED VALUE
015244  005737  004640          TST     @#RH70          ;RUNNING ON RH70 ?
015250  001421                  BEQ     9$              ;IF NOT, SKIP NEXT RH70 CODE


015252  004037  032706          JSR     R0,@#FILLRE     ;MOV -62. INTO SAVED RHWC
015256  002172                  RHWC                    ;SAVED REGISTER TO CHANGE
015260  177702                  -62.                    ;DATA


015262  004037  032706          JSR     R0,@#FILLRE     ;MOV WRFROM+<8.*2> INTO SAVED RHBA
015266  002174                  RHBA                    ;SAVED REGISTER TO CHANGE
015270  002410                  WRFROM+<8.*2>                   ;DATA


015272  004037  033674          JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
015276  002176                  RHCS2                   ;CHANGE RHCS2 REGISTER

015300  000002                  2                       ;2 BIT/BITS TO BE CHANGED
015302  000001                  1                       ;NEW VALUE OF OR IS 1
015304  000200                  OR                      ;CHANGE OR BIT
015306  000000                  0                       ;NEW VALUE OF IR IS 0
015310  000100                  IR                      ;CHANGE IR BIT
015312  000416                  BR      10$             ;SKIP NEXT RH11 CODE

015314                  9$:

015314  004037  032706          JSR     R0,@#FILLRE     ;MOV -4. INTO SAVED RHWC
015320  002172                  RHWC                    ;SAVED REGISTER TO CHANGE
015322  177774                  -4.                     ;DATA


015324  004037  032706          JSR     R0,@#FILLRE     ;MOV WRFROM+<66.*2> INTO SAVED RHBA
015330  002174                  RHBA                    ;SAVED REGISTER TO CHANGE
015332  002574                  WRFROM+<66.*2>                  ;DATA


015334  004037  033674          JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
015340  002176                  RHCS2                   ;CHANGE RHCS2 REGISTER
```

```
015342  000001                          1                               ;1 BIT/BITS TO BE CHANGED
015344  000001                          1                               ;NEW VALUE OF OR IS 1
015346  000200                          OR                              ;CHANGE OR BIT


015350                          10$:

015350  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
015354  002200                          RHCS1                           ;CHANGE RHCS1 REGISTER

015356  000002                          2                               ;2 BIT/BITS TO BE CHANGED
015360  000001                          1                               ;NEW VALUE OF SC IS 1
015362  100000                          SC                              ;CHANGE SC BIT
015364  000001                          1                               ;NEW VALUE OF TRE IS 1
015366  040000                          TRE                             ;CHANGE TRE BIT

015370  004037  032706                  JSR     R0,@#FILLRE             ;MOV 2 INTO SAVED RHDST
015374  002204                          RHDST                           ;SAVED REGISTER TO CHANGE
015376  000002                          2                               ;DATA


015400  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                        ;FOR WORKING DRIVE IN
                                                                        ;SAVED RHAS LOCATION

015406  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
015412  002202                          RHER1                           ;CHANGE RHER1 REGISTER

015414  000001                          1                               ;1 BIT/BITS TO BE CHANGED
015416  000001                          1                               ;NEW VALUE OF HCE IS 1
015420  000200                          HCE                             ;CHANGE HCE BIT

015422  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
015426  002222                          RHDS1                           ;CHANGE RHDS1 REGISTER

015430  000002                          2                               ;2 BIT/BITS TO BE CHANGED
015432  000001                          1                               ;NEW VALUE OF ATA IS 1
015434  100000                          ATA                             ;CHANGE ATA BIT
015436  000001                          1                               ;NEW VALUE OF ERR IS 1
015440  040000                          ERR                             ;CHANGE ERR BIT

                                        ;*COMPARE ALL REGISTERS

015442  004037  034002                  JSR     R0,@#COMREG             ;COMPARE SAVED REGISTERS WITH
                                                                        ;PRESENT VALUE
015446  004512                          SAVERE                          ;GOOD DATA SAVED IN 'SAVERE'
015450  002254                          WC                              ;TEST DATA STARTING FROM 'RHWC'
015452  000022                          18.                             ;18. REGISTERS TO BE COMPARED
015454  015460                          3$                              ;RETURN TO 3$ ON ERROR
015456  015464                          4$                              ;RETURN TO 4$ ON NO ERROR

015460  104052                  3$:     ERROR   52                      ;WRITE DATA ON NON EXISTANT SECTOR
015462  000207                                  RTS     PC              ;CAUSED IMPROPER REGISTER CHANGE
                                                                        ;ATTEMPTED WRITE WAS ON
```

```
                                                                     ;CYLINDER 0,SECTOR 1, TRACK 0
                                                                     ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                                                     ;RECEIVED DATA GIVES WHAT WAS THERE
                                                                     ;AFTER COMMAND


                                        ;*READ HEADER AND DATA SECTOR 1, TRACK 0, CYLINDER 0
                                        ;*WILL BE ATTEMPTED
 015464                         4$:

 015464  004737  033004                 JSR     PC,@#CLDISK          ;SET R1-RHCS1, R2-RHCS2
                                                                     ;R3-RHDS1, R4-RHER1
                                                                     ;GIVE RH-11 INITIALIZE
                                                                     ;SETUP UNIT NUMBER

                                        ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA

 015470  004037  032630                 JSR     R0,@#FLHEAD          ;SAVE HEADER DATA IN WRFROM
 015474  002370                         WRFROM                       ;LOCATION WHERE SAVED
 015476  000006                         6                            ;NUMBER OF WORDS SAVED
 015500  010000                         10000                        ;FIRST DATA WORD
 015502  000000                         0                            ;SECOND DATA WORD
 015504  000000                         0                            ;THIRD DATA WORD
 015506  000000                         0                            ;FOURTH DATA WORD
 015510  000001                         1                            ;FIFTH DATA WORD
 015512  000001                         1                            ;SIXTH DATA WORD

 015514  004037  032654                 JSR     R0,@#CLAREA          ;CLEAR 198. WORDS, FROM WRFROM+<6*2>
 015520  002404                         WRFROM+<6*2>                 ;STARTING FROM WRFROM+<6*2>
 015522  000306                         198.                         ;198. WORDS
 015524  000000                         0                            ;FILL WITH 0


 015526  004037  032654                 JSR     R0,@#CLAREA          ;CLEAR 50. WORDS, FROM WRFROM+<204.*2>
 015532  003220                         WRFROM+<204.*2>              ;STARTING FROM WRFROM+<204.*2>
 015534  000062                         50.                          ;50. WORDS
 015536  177777                         -1                           ;FILL WITH -1


                                        ;*FILL READ INTO BUFFER WITH ALL ONES

 015540  004037  032654                 JSR     R0,@#CLAREA          ;CLEAR 256. WORDS, FROM REINTO
 015544  003434                         REINTO                       ;STARTING FROM REINTO
 015546  000400                         256.                         ;256. WORDS
 015550  177777                         -1                           ;FILL WITH -1

                                        ;*FILL REGISTERS WITH READ HEADER AND DATA COMMAND

 015552  004037  034766                 JSR     R0,@#RUN             ;SETUP TO RUN FOR DATA COMMAND
 015556  000000                         0                            ;CYLINDER 0
 015560     001                         .BYTE   1                    ;SECTOR 1
 015561     000                         .BYTE   0                    ;TRACK 0
 015562  177464                         -200.-4                      ;WORD COUNT (DATA) = 200. +
                                                                     ;4 HEADER WORDS
```

```
015564  003434                           REINTO                       ;BUS ADDRESS
                                                                      ;STARTING ADDRESS OF DATA
                                                                      ;BUFFER = REINTO
015566  000000                           0                            ;DO NOT INHIBIT BUS ADDRESS INCREMENT
015570  014000                           ECI!FMT22                          ;16 BITS PER WORD FORMAT
                                                                      ;INHIBIT ECC CORRECTION
                                                                      ;DO NOT INHIBIT HEADER COMPARE
015572  002350                           REFOR                        ;GET READY TO DO A REFOR
                                                                      ;READ HEADER AND DATA WITH 72 IN RHCS1

                                         ;*SAVE REGISTERS FOR COMPARISON AFTER READ
                                         ;*HEADER AND DATA
015574  004037  033152                   JSR     R0,@#SAVER           ;SAVE REGISTERS
015600  002172                           RHWC                         ;RHWC IS THE FIRST REGISTER SAVED
015602  004512                           SAVERE                       ;STARTING ADDRES OF WHERE
                                                                      ;THE REGISTERS ARE SAVED
015604  000022                           18.                          ;NUMBER OF REGISTERS
                                                                      ;SAVED = 18.

015606  004737  033064                   JSR     PC,@#CHECKT          ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                      ;AND THAT ALL STATUS BITS ARE = 0
015612  104400  056662                   TYPE    ,CPHALT              ;CANNOT CONTINUE TESTING IF NOT
015616  000000                           HALT                         ;STOP TEST

015620  013777  004506  164340           MOV     @#RP4VEC,@RPVEC      ;SET RP04 VECTOR ADDRESS
                                                                      ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                      ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                      ;'TIME' WILL ONLY SAVE
                                                                      ;CURRENT CYLINDER ADDRESS
                                                                      ;AND LOOK AHEAD REGISTERS

015626  013746  002350                   MOV     @#REFOR,-(SP)        ;GET READY TO MOVE COMMAND
015632  052716  000101                   BIS     #GO!IE,(SP)          ;GET READY TO SET GO AND
                                                                      ;ENABLE INTERRUPT
015636  012677  164336                   MOV     (SP)+,@RHCS1         ;GO WITH
                                                                        ;72 IN RHCS1 FOR READ DATA
                                                                      ;WITH INTERRUPT ENABLED

                                         ;*TIME IS NOT CRITICAL

015642  104412                           WAT                          ;WAIT FOR RDY BIT TO SET
015644  002200                           RHCS1                        ;WAIT FOR RHCS1 REGISTER
015646  000200                           RDY                          ;WAIT FOR RDY BIT IN RHCS1 REGISTER
015650  001614                           908.                         ;ALLOW 9080 MICRO SECONDS
015652  001507                           839.                         ;RDY MUST SET BETWEEN
                                                                      ;690 AND 17470 MICRO SECONDS

                                         ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE

015654  004037  032706                   JSR     R0,@#FILLRE          ;MOV 0 INTO SAVED RHWC
015660  002172                           RHWC                         ;SAVED REGISTER TO CHANGE
015662  000000                           0                            ;DATA
```

```


015664  004037  032706              JSR     R0,@#FILLRE     ;MOV REINTO+<204.*2> INTO SAVED RHBA
015670  002174                      RHBA                    ;SAVED REGISTER TO CHANGE
015672  004264                      REINTO+<204.*2>                 ;DATA


015674  004037  033674              JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
015700  002202                      RHER1                   ;CHANGE RHER1 REGISTER

015702  000001                      1                       ;1 BIT/BITS TO BE CHANGED
015704  000001                      1                       ;NEW VALUE OF HCE IS 1
015706  000200                      HCE                     ;CHANGE HCE BIT

015710  004037  033674              JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
015714  002222                      RHDS1                   ;CHANGE RHDS1 REGISTER

015716  000002                      2                       ;2 BIT/BITS TO BE CHANGED
015720  000001                      1                       ;NEW VALUE OF ATA IS 1
015722  100000                      ATA                     ;CHANGE ATA BIT
015724  000001                      1                       ;NEW VALUE OF ERR IS 1
015726  040000                      ERR                     ;CHANGE ERR BIT

015730  004037  032706              JSR     R0,@#FILLRE     ;MOV 2 INTO SAVED RHDST
015734  002204                      RHDST                   ;SAVED REGISTER TO CHANGE
015736  000002                      2                       ;DATA


015740  004037  033674              JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
015744  002200                      RHCS1                   ;CHANGE RHCS1 REGISTER

015746  000001                      1                       ;1 BIT/BITS TO BE CHANGED
015750  000001                      1                       ;NEW VALUE OF SC!TRE IS 1
015752  140000                      SC!TRE                  ;CHANGE SC!TRE BIT

015754  053737  004644  004536      BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                            ;FOR WORKING DRIVE IN
                                                            ;SAVED RHAS LOCATION

                                    ;*COMPARE REGISTERS BEFORE READ HEADER AND DATA
                                    ;*WITH AFTER

015762  004037  034002              JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                            ;PRESENT VALUE
015766  004512                      SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
015770  002254                      WC                      ;TEST DATA STARTING FROM 'RHWC'
015772  000022                      18.                     ;18. REGISTERS TO BE COMPARED
015774  016000                      5$                      ;RETURN TO 5$ ON ERROR
015776  016004                      6$                      ;RETURN TO 6$ ON NO ERROR


016000  104031              5$:     ERROR   31              ;READ HEADER AND DATA WITH
016002  000207                      RTS     PC              ;FORCED HEADER COMPARE ERROR
                                                            ;CAUSED ERROR
```

```
                                                            ;GOOD DATA GIVES WHAT SHOULD
                                                            ;BE THERE
                                                            ;RECEIVED DATA GIVES WHAT
                                                            ;WAS THERE AFTER READ

                                    ;*NOW COMPARE READ DATA
                                    ;*THE COMMAND READ ONLY 204 WORDS, 4 HEADER WORDS
                                    ;*AND 200 DATA WORDS

016004                      6$:
016004  004037  035032              JSR     R0,@#COMPAR             ;COMPARE TWO BLOCKS OF MEMORY
016010  002370                      WRFROM                          ;GOOD DATA STARTS FROM WRFROM
016012  003434                      REINTO                          ;TEST DATA STARTS FROM REINTO
016014  000400                      256.                            ;256., WORDS TO BE COMPARED
016016  016022                      7$                              ;RETURN TO 7$ ON ERROR
016020  016026                      8$                              ;RETURN TO 8$ ON NO ERROR

016022  104034              7$:     ERROR   34                      ;DATA READ FROM A FORCED
016024  000207                      RTS     PC                      ;HEADER COMPARE ERROR IS
                                                                    ;INCORRECT
                                                                    ;GOOD DATA GIVES WHAT
                                                                    ;THE READ HEADER AND DATA
                                                                    ;SHOULD HAVE READ
                                                                    ;BAD DATA GIVES WHAT
                                                                    ;WAS IN BUFFER AFTER
                                                                    ;READ COMMAND
016026                      8$:
```

```

                                            ;;*************************************************************
                                            ;*TEST 16        HEADER COMPARE ERROR - RHER1 HCE

                                            ;*       WITH THE HEADS ON CYLINDER 0 A SEARCH COMMAND IS GIVEN
                                            ;*       FOR CYLINDER 0 TRACK 0 SECTOR 1, ALTHOUGH THE HEADER
                                            ;*       FOR THIS SECTOR IS CHANGED TO SECTOR 0 HCE-BIT #7
                                            ;*       IN RHER1 SHOULD NOT SET
                                            ;*       BECAUSE SEARCH DOES NOT READ HEADER BUT ONLY USES SECTOR COUNTER

                                            ;;*************************************************************
016026  000004                              TST16:  SCOPE
016030  012706  001000                              MOV     #STACK,SP          ;RESET STACK
016034  012737  000016  004504                      MOV     #16,@#TSTNM        ;SAVE TEST NUMBER

016042  004737  033004                              JSR     PC,@#CLDISK        ;SET R1-RHCS1, R2-RHCS2
                                                                               ;R3-RHDS1, R4-RHER1
                                                                               ;GIVE RH-11 INITIALIZE
                                                                               ;SETUP UNIT NUMBER

                                                    ;*GET HEADS TO CYLINDER 0
016046  004737  033064                              JSR     PC,@#CHECKT        ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                               ;AND THAT ALL STATUS BITS ARE = 0
016052  104400  056662                              TYPE    ,CPHALT            ;CANNOT CONTINUE TESTING IF NOT
016056  000000                                      HALT                       ;STOP TEST

016060  013777  004506  164100                      MOV     @#RP4VEC,@RPVEC    ;SET RP04 VECTOR ADDRESS
                                                                               ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                               ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                               ;'TIME' WILL ONLY SAVE
                                                                               ;CURRENT CYLINDER ADDRESS
                                                                               ;AND LOOK AHEAD REGISTERS


016066  013746  002326                              MOV     @#RECALI,-(SP)     ;GET READY TO MOVE COMMAND
016072  052716  000101                              BIS     #GO!IE,(SP)        ;GET READY TO SET GO AND
                                                                               ;ENABLE INTERRUPT
016076  012677  164076                              MOV     (SP)+,@RHCS1       ;GO WITH
                                                                               ;6 IN RHCS1 FOR RECALIBRATE
                                                                               ;WITH INTERRUPT ENABLED
016102  011100                                      MOV     @R1,R0             ;SAVE RHCS1 DURING ABOVE OPERATION
016104  011305                                      MOV     @R3,R5             ;SAVE RHDS1 DURING ABOVE OPERATION


016106  104412                                      WAT                        ;WAIT FOR DRY BIT TO SET
016110  002222                                      RHDS1                      ;WAIT FOR RHDS1 REGISTER
016112  000200                                      DRY                        ;WAIT FOR DRY BIT IN RHDS1 REGISTER
016114  012740                                      5600.                      ;ALLOW 56000 MICRO SECONDS
016116  012737                                      5599.                      ;DRY MUST SET BETWEEN
                                                                               ;10 AND 111990 MICRO SECONDS


016120  004737  033004                              JSR     PC,@#CLDISK        ;SET R1-RHCS1, R2-RHCS2
                                                                               ;R3-RHDS1, R4-RHER1
```

```
                                                                    ;GIVE RH-11 INITIALIZE
                                                                    ;SETUP UNIT NUMBER

                                        ;*FILL REGISTERS FOR SEARCH

016124  004037  032734                  JSR     R0,@#SRCH           ;SEARCH FOR
016130  000000                          0                           ;CYLINDER 0
016132     001                  .BYTE   1                           ;SECTOR 1
016133     000                  .BYTE   0                           ;TRACK 0


                                        ;*SAVE REGISTERS FOR COMPARISON AFTER SEARCH
016134  004037  033152                  JSR     R0,@#SAVER          ;SAVE REGISTERS
016140  002172                          RHWC                        ;RHWC IS THE FIRST REGISTER SAVED
016142  004512                          SAVERE                      ;STARTING ADDRES OF WHERE
                                                                    ;THE REGISTERS ARE SAVED
016144  000022                          18.                         ;NUMBER OF REGISTERS
                                                                    ;SAVED = 18.


016146  004737  033064                  JSR     PC,@#CHECKT         ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                    ;AND THAT ALL STATUS BITS ARE = 0
016152  104400  056662                  TYPE    ,CPHALT             ;CANNOT CONTINUE TESTING IF NOT
016156  000000                          HALT                        ;STOP TEST

016160  013777  004506  164000          MOV     @#RP4VEC,@RPVEC     ;SET RP04 VECTOR ADDRESS
                                                                    ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                    ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                    ;'TIME' WILL ONLY SAVE
                                                                    ;CURRENT CYLINDER ADDRESS
                                                                    ;AND LOOK AHEAD REGISTERS


016166  013746  002334                  MOV     @#SERCH,-(SP)       ;GET READY TO MOVE COMMAND
016172  052716  000101                  BIS     #GO!IE,(SP)         ;GET READY TO SET GO AND
                                                                    ;ENABLE INTERRUPT
016176  012677  163776                  MOV     (SP)+,@RHCS1        ;GO WITH
                                                                    ;WITH INTERRUPT ENABLED
016202  011100                          MOV     @R1,R0              ;SAVE RHCS1 DURING ABOVE OPERATION
016204  011305                          MOV     @R3,R5              ;SAVE RHDS1 DURING ABOVE OPERATION


016206  104412                          WAT                         ;WAIT FOR DRY BIT TO SET
016210  002222                          RHDS1                       ;WAIT FOR RHDS1 REGISTER
016212  000200                          DRY                         ;WAIT FOR DRY BIT IN RHDS1 REGISTER
016214  001614                          908.                        ;ALLOW 9080 MICRO SECONDS
016216  001507                          839.                        ;DRY MUST SET BETWEEN
                                                                    ;690 AND 17470 MICRO SECONDS

                                        ;*COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
                                        ;*R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

016220  013746  002334                  MOV     @#SERCH,-(SP)       ;SAVE COMMAND
016224  052716  004301                  BIS     #IE!GO!DVA!RDY,(SP)     ;INCLUDE IE!GO!DVA!RDY
```

```
016230  011637  001124                  MOV     (SP),@#$GDDAT    ;SAVE FOR PRINTOUT
016234  022600                          CMP     (SP)+,R0         ;DURING ABOVE OPERATION ONLY IE!GO!DVA!RDY
                                                                 ;AND COMMAND SHOULD BE SET
016236  001405                          BEQ     67$              ;BRANCH IF GOOD
016240  010037  001126                  MOV     R0,@#$BDDAT      ;BAD DATA
016244  010137  004500                  MOV     R1,@#REGADR      ;FAILING REGISTER RHCS1
016250  104021                          ERROR   21               ;DURING ABOVE OPERATION ONLY
                                                                 ;COMMAND AND IE!GO!DVA!RDY SHOULD BE SET
016252  012746  010500          67$:    MOV     #MOL!DPR!VV,-(SP)        ;SAVE BITS SET DURING OPERATION IN RHDS1
016256  011637  001124                  MOV     (SP),@#$GDDAT    ;SAVE FOR PRINTOUT
016262  022605                          CMP     (SP)+,R5         ;DURING ABOVE OPERATION ONLY MOL!DPR!VV
                                                                 ;SHOULD BE SET
016264  001405                          BEQ     69$              ;BRANCH IF GOOD
016266  010537  001126                  MOV     R5,@#$BDDAT      ;BAD DATA
016272  010337  004500                  MOV     R3,@#REGADR      ;FAILING REGISTER RHDS1
016276  104063                          ERROR   63               ;DURING ABOVE OPERATION ONLY
                                                                 ;MOL!DPR!VV SHOULD BE SET
016300                          69$:

                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE

016300  004037  033674                  JSR     R0,@#CHREG       ;CHANGE BITS IN SAVED REGISTER
016304  002200                          RHCS1                    ;CHANGE RHCS1 REGISTER

016306  000001                          1                        ;1 BIT/BITS TO BE CHANGED
016310  000001                          1                        ;NEW VALUE OF SC IS 1
016312  100000                          SC                       ;CHANGE SC BIT

016314  004037  033674                  JSR     R0,@#CHREG       ;CHANGE BITS IN SAVED REGISTER
016320  002222                          RHDS1                    ;CHANGE RHDS1 REGISTER

016322  000001                          1                        ;1 BIT/BITS TO BE CHANGED
016324  000001                          1                        ;NEW VALUE OF ATA IS 1
016326  100000                          ATA                      ;CHANGE ATA BIT

016330  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                 ;FOR WORKING DRIVE IN
                                                                 ;SAVED RHAS LOCATION

                                        ;*COMPARE REGISTERS BEFORE SEARCH WITH AFTER SEARCH

016336  004037  034002                  JSR     R0,@#COMREG      ;COMPARE SAVED REGISTERS WITH
                                                                 ;PRESENT VALUE
016342  004512                          SAVERE                   ;GOOD DATA SAVED IN 'SAVERE'
016344  002254                          WC                       ;TEST DATA STARTING FROM 'RHWC'
016346  000022                          18.                      ;18. REGISTERS TO BE COMPARED
016350  016354                          1$                       ;RETURN TO 1$ ON ERROR
016352  016360                          2$                       ;RETURN TO 2$ ON NO ERROR


016354  104047                  1$:     ERROR   47               ;SEARCH TO A NON-EXISTANT

016356  000207                          RTS     PC               ;SECTOR CAUSED IMPROPER
                                                                 ;REGISTER CHANGE
```

```
4180                                                    ;GOOD DATA GIVES WHAT SHOULD
4181                                                    ;BE THERE
4182                                                    ;RECEIVED DATA GIVES
4183                                                    ;WHAT WAS THERE AFTER
4184                                                    ;SEARCH
4185  016360                      2$:
4186
```

```
                                  ;;***********************************************************
                                  ;*TEST 17        RESTORE SECTOR 1 CYLINDER 1 TRACK 1

                                  ;*       THIS REPLACES REMOVED SECTOR
                                  ;*
                                  ;*
                                  ;*
                                  ;*       WRITE HEADER AND DATA CYLINDER 0, FORMAT 16 BITS PER WORD
                                  ;*       TRACK 0, SECTOR 1, KEYS=0, NUMBER OF WORDS 256 WORDS
                                  ;*       OF 0
                                  ;*       THEN READ HEADER AND DATA FOR ABOVE.
                                  ;*       WRITE FROM BUFFER AND READ INTO BUFFER ARE FILLED WITH
                                  ;*       10000,1,0,0, AND 256 OF 0
                                  ;*       THE WRITE COMMAND IS THEN LOADED INTO THE REGISTERS EXCEPT
                                  ;*       THE GO BIT, AND ALL THE REGISTERS ARE SAVED
                                  ;*       THEN GO IS GIVEN FOR WRITE HEADER AND DATA
                                  ;*
                                  ;*       THEN ALL REGISTERS ARE COMPARED TO CHECK FOR IMPROPER CHANGED
                                  ;*       THEN WRITE FROM BUFFER IS CHECKED TO SEE THAT NOTHING CHANGED
                                  ;*
                                  ;*
                                  ;*       NOW FOR THE READ COMMAND READ INTO BUFFER IS FILLED
                                  ;*       WITH ALL ONES, COMMAND IS LOADED INTO REGISTERS EXCEPT
                                  ;*       GO BIT AND ALL REGISTERS ARE SAVED
                                  ;*       GO IS GIVEN FOR THE READ COMMAND
                                  ;*



                                  ;*       ALL REGISTERS ARE CHECKED FOR IMPROPER CHANGE
                                  ;*       THEN THE READ DATA IS COMPARED.

                                  ;;***********************************************************
016360  000004                    TST17:  SCOPE
016362  012706  001000                    MOV     #STACK,SP          ;RESET STACK
016366  012737  000017  004504            MOV     #17,@#TSTNM        ;SAVE TEST NUMBER

016374  004737  033004                    JSR     PC,@#CLDISK        ;SET R1-RHCS1, R2-RHCS2
                                                                     ;R3-RHDS1, R4-RHER1
                                                                     ;GIVE RH-11 INITIALIZE
                                                                     ;SETUP UNIT NUMBER

                                          ;*FILL WRITE FROM BUFFER WITH HEADER

016400  004037  032630                    JSR     R0,@#FLHEAD        ;SAVE HEADER DATA IN WRFROM
016404  002370                            WRFROM                     ;LOCATION WHERE SAVED
016406  000004                            4                          ;NUMBER OF WORDS SAVED
016410  010000                            10000                      ;FIRST DATA WORD
016412  000001                            1                          ;SECOND DATA WORD
016414  000000                            0                          ;THIRD DATA WORD
016416  000000                            0                          ;FOURTH DATA WORD

                                          ;*FILL WRITE FROM BUFFER WITH DATA
```

```
016420  004037  032654          JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM+10
016424  002400                  WRFROM+10                         ;STARTING FROM WRFROM+10
016426  000400                  256.                    ;256. WORDS
016430  000000                  0                       ;FILL WITH 0



                                ;*NOW READ INTO BUFFER WILL BE FILLED WITH SAME DATA
                                ;*AS WRITE FROM BUFFER SO THAT AFTER A WRITE COMPARISONS
                                ;*CAN BE MADE TO MAKE SURE THAT WRITE DID NOT
                                ;*CHANGE WRITE FROM BUFFER

016432  004037  032630          JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN REINTO
016436  003434                  REINTO                  ;LOCATION WHERE SAVED
016440  000004                  4                       ;NUMBER OF WORDS SAVED
016442  010000                  10000                   ;FIRST DATA WORD
016444  000001                  1                       ;SECOND DATA WORD
016446  000000                  0                       ;THIRD DATA WORD
016450  000000                  0                       ;FOURTH DATA WORD

016452  004037  032654          JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM REINTO+10
016456  003444                  REINTO+10                         ;STARTING FROM REINTO+10
016460  000400                  256.                    ;256. WORDS
016462  000000                  0                       ;FILL WITH 0



                                ;*NOW THE WRITE HEADER AND DATA COMMAND WILL BE FILLED

016464  004037  034766          JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
016470  000000                  0                       ;CYLINDER 0
016472     001                  .BYTE   1               ;SECTOR 1
016473     000                  .BYTE   0               ;TRACK 0
016474  177374                  -256.-4                 ;WORD COUNT (DATA) = 256. +
                                                        ;4 HEADER WORDS
016476  002370                  WRFROM                  ;BUS ADDRESS
                                                        ;STARTING ADDRESS OF DATA
                                                        ;BUFFER = WRFROM
016500  000000                  0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
016502  010000                  FMT22                   ;16 BITS PER WORD FORMAT
                                                        ;DO NOT INHIBIT ECC CORRECTION
                                                        ;DO NOT INHIBIT HEADER COMPARE
016504  002344                  WRIFOR                  ;GET READY TO DO A WRIFOR
                                                ;WRITE HEADER AND DATA WITH 62 IN RHCS1



                                ;*NOW SAVE REGISTERS FOR COMPARISON AFTER WRITE HEADER AND DATA
016506  004037  033152          JSR     R0,@#SAVER      ;SAVE REGISTERS
016512  002172                  RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
016514  004512                  SAVERE                  ;STARTING ADDRES OF WHERE
                                                        ;THE REGISTERS ARE SAVED
016516  000021                  17.                     ;NUMBER OF REGISTERS
                                                        ;SAVED = 17.

016520  004737  033064          JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
```

```
                                                                ;AND THAT ALL STATUS BITS ARE = 0
016524  104400  056662                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
016530  000000                          HALT                    ;STOP TEST

016532  013777  004506  163426          MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                ;'TIME' WILL ONLY SAVE
                                                                ;CURRENT CYLINDER ADDRESS
                                                                ;AND LOOK AHEAD REGISTERS


016540  013746  002344                  MOV     @#WRIFOR,-(SP)  ;GET READY TO MOVE COMMAND
016544  052716  000101                  BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                ;ENABLE INTERRUPT
016550  012677  163424                  MOV     (SP)+,@RHCS1    ;GO WITH
                                                                ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                                ;WITH INTERRUPT ENABLED
016554  011100                          MOV     @R1,R0          ;SAVE RHCS1 DURING ABOVE OPERATION
016556  011305                          MOV     @R3,R5          ;SAVE RHDS1 DURING ABOVE OPERATION
                                        ;*ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR = 760 MICRO SEC

016560  104412                          WAT                     ;WAIT FOR RDY BIT TO SET
016562  002200                          RHCS1                   ;WAIT FOR RHCS1 REGISTER
016564  000200                          RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
016566  001614                          908.                    ;ALLOW 9080 MICRO SECONDS
016570  001507                          839.                    ;RDY MUST SET BETWEEN
                                                                ;690 AND 17470 MICRO SECONDS


                                        ;*COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
                                        ;*R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

016572  013746  002344                  MOV     @#WRIFOR,-(SP)  ;SAVE COMMAND
016576  052716  004101                  BIS     #IE!GO!DVA,(SP) ;INCLUDE IE!GO!DVA
016602  011637  001124                  MOV     (SP),@#$GDDAT   ;SAVE FOR PRINTOUT
016606  022600                          CMP     (SP)+,R0        ;DURING ABOVE OPERATION ONLY IE!GO!DVA
                                                                ;AND COMMAND SHOULD BE SET
016610  001405                          BEQ     64$             ;BRANCH IF GOOD
016612  010037  001126                  MOV     R0,@#$BDDAT     ;BAD DATA
016616  010137  004500                  MOV     R1,@#REGADR     ;FAILING REGISTER RHCS1
016622  104021                          ERROR   21              ;DURING ABOVE OPERATION ONLY
                                                                ;COMMAND AND IE!GO!DVA SHOULD BE SET
016624  012746  010500          64$:    MOV     #MOL!DPR!VV,-(SP)       ;SAVE BITS SET DURING OPERATION IN RHDS1
016630  011637  001124                  MOV     (SP),@#$GDDAT   ;SAVE FOR PRINTOUT
016634  022605                          CMP     (SP)+,R5        ;DURING ABOVE OPERATION ONLY MOL!DPR!VV
                                                                ;SHOULD BE SET
016636  001405                          BEQ     66$             ;BRANCH IF GOOD
016640  010537  001126                  MOV     R5,@#$BDDAT     ;BAD DATA
016644  010337  004500                  MOV     R3,@#REGADR     ;FAILING REGISTER RHDS1
016650  104063                          ERROR   63              ;DURING ABOVE OPERATION ONLY
                                                                ;MOL!DPR!VV SHOULD BE SET
016652                          66$:

                                        ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUES
```

```
016652  004037  032706            JSR     R0,@#FILLRE       ;MOV 0 INTO SAVED RHWC
016656  002172                    RHWC                      ;SAVED REGISTER TO CHANGE
016660  000000                    0                         ;DATA

016662  004037  032706            JSR     R0,@#FILLRE       ;MOV WRFROM+<260.*2> INTO SAVED RHBA
016666  002174                    RHBA                      ;SAVED REGISTER TO CHANGE
016670  003400                    WRFROM+<260.*2>                   ;DATA

016672  004037  032706            JSR     R0,@#FILLRE       ;MOV 2 INTO SAVED RHDST
016676  002204                    RHDST                     ;SAVED REGISTER TO CHANGE
016700  000002                    2                         ;DATA

                                  ;*NOW COMPARE REGISTERS BEFORE WRITE HEADER AND DATA
                                  ;*WITH REGISTERS AFTER COMMAND

016702  004037  034002            JSR     R0,@#COMREG       ;COMPARE SAVED REGISTERS WITH
                                                            ;PRESENT VALUE
016706  004512                    SAVERE                    ;GOOD DATA SAVED IN 'SAVERE'
016710  002254                    WC                        ;TEST DATA STARTING FROM 'RHWC'
016712  000021                    17.                       ;17. REGISTERS TO BE COMPARED
016714  016720                    1$                        ;RETURN TO 1$ ON ERROR
016716  016724                    2$                        ;RETURN TO 2$ ON NO ERROR

016720  104027             1$:    ERROR   27                ;WRITE HEADER AND DATA
016722  000207                    RTS     PC                ;CAUSED IMPROPER REGISTER
                                                            ;CHANGE
                                                            ;GOOD DATA GIVES WHAT SHOULD
                                                            ;BE THERE
                                                            ;RECEIVED DATA GIVES WHAT
                                                            ;WAS THERE AFTER COMMAND

                                  ;*NOW WRITE FROM BUFFER WILL BE CHECKED TO SEE THAT
                                  ;*NOTHER GOT CHANGED
016724                     2$:

016724  004037  035032            JSR     R0,@#COMPAR       ;COMPARE TWO BLOCKS OF MEMORY
016730  003434                    REINTO                    ;GOOD DATA STARTS FROM REINTO
016732  002370                    WRFROM                    ;TEST DATA STARTS FROM WRFROM
016734  000404                    260.                      ;260.  WORDS TO BE COMPARED
016736  016742                    3$                        ;RETURN TO 3$ ON ERROR
016740  016746                    4$                        ;RETURN TO 4$ ON NO ERROR

016742  104030             3$:    ERROR   30                ;WRITE HEADER AND DATA
016744  000207                    RTS     PC                ;CHANGED WRITE FROM BUFFER

                                  ;*NOW A READ HEADER AND DATA COMMAND WILL BE GIVEN
                                  ;*READ INTO BUFFER IS FILLED WITH ONES
```

```
016746                                  4$:
016746  004737  033004                          JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                        ;R3-RHDS1, R4-RHER1
                                                                        ;GIVE RH-11 INITIALIZE
                                                                        ;SETUP UNIT NUMBER
016752  004037  032654                          JSR     R0,@#CLAREA     ;CLEAR 260. WORDS, FROM REINTO
016756  003434                                  REINTO                  ;STARTING FROM REINTO
016760  000404                                  260.                    ;260. WORDS
016762  177777                                  -1                      ;FILL WITH -1
                                                ;*NOW FILL COMMAND
016764  004037  034766                          JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
016770  000000                                  0                       ;CYLINDER 0
016772     001                                  .BYTE   1               ;SECTOR 1
016773     000                                  .BYTE   0               ;TRACK 0
016774  177374                                  -256.-4                 ;WORD COUNT (DATA) = 256. +
                                                                        ;4 HEADER WORDS
016776  003434                                  REINTO                  ;BUS ADDRESS
                                                                        ;STARTING ADDRESS OF DATA
                                                                        ;BUFFER = REINTO
017000  000000                                  0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
017002  014000                                  ECI!FMT22                       ;16 BITS PER WORD FORMAT
                                                                        ;INHIBIT ECC CORRECTION
                                                                        ;DO NOT INHIBIT HEADER COMPARE
017004  002350                                  REFOR                   ;GET READY TO DO A REFOR
                                                                        ;READ HEADER AND DATA WITH 72 IN RHCS1
                                                ;*NOW SAVE REGISTERS FOR COMPARISON AFTER READ HEADER AND DATA
017006  004037  033152                          JSR     R0,@#SAVER      ;SAVE REGISTERS
017012  002172                                  RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
017014  004512                                  SAVERE                  ;STARTING ADDRES OF WHERE
                                                                        ;THE REGISTERS ARE SAVED
017016  000022                                  18.                     ;NUMBER OF REGISTERS
                                                                        ;SAVED = 18.
017020  004737  033064                          JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                        ;AND THAT ALL STATUS BITS ARE = 0
017024  104400  056662                          TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
017030  000000                                  HALT                    ;STOP TEST
017032  013777  004506  163126                  MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                        ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                        ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                        ;'TIME' WILL ONLY SAVE
                                                                        ;CURRENT CYLINDER ADDRESS
                                                                        ;AND LOOK AHEAD REGISTERS
017040  013746  002350                          MOV     @#REFOR,-(SP)   ;GET READY TO MOVE COMMAND
```

```
017044  052716  000101                  BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                ;ENABLE INTERRUPT
017050  012677  163124                  MOV     (SP)+,@RHCS1    ;GO WITH
                                                                 ;72 IN RHCS1 FOR READ DATA
                                                                ;WITH INTERRUPT ENABLED
017054  011100                          MOV     @R1,R0          ;SAVE RHCS1 DURING ABOVE OPERATION
017056  011305                          MOV     @R3,R5          ;SAVE RHDS1 DURING ABOVE OPERATION


017060  104412                          WAT                     ;WAIT FOR RDY BIT TO SET
017062  002200                          RHCS1                   ;WAIT FOR RHCS1 REGISTER
017064  000200                          RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
017066  001614                          908.                    ;ALLOW 9080 MICRO SECONDS
017070  001507                          839.                    ;RDY MUST SET BETWEEN
                                                                ;690 AND 17470 MICRO SECONDS

                                        ;*COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
                                        ;*R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

017072  013746  002350                  MOV     @#REFOR,-(SP)   ;SAVE COMMAND
017076  052716  004101                  BIS     #IE!GO!DVA,(SP) ;INCLUDE IE!GO!DVA
017102  011637  001124                  MOV     (SP),@#$GDDAT   ;SAVE FOR PRINTOUT
017106  022600                          CMP     (SP)+,R0        ;DURING ABOVE OPERATION ONLY IE!GO!DVA
                                                                ;AND COMMAND SHOULD BE SET
017110  001405                          BEQ     67$             ;BRANCH IF GOOD
017112  010037  001126                  MOV     R0,@#$BDDAT     ;BAD DATA
017116  010137  004500                  MOV     R1,@#REGADR     ;FAILING REGISTER RHCS1
017122  104021                          ERROR   21              ;DURING ABOVE OPERATION ONLY
                                                                ;COMMAND AND IE!GO!DVA SHOULD BE SET
017124  012746  010500          67$:    MOV     #MOL!DPR!VV,-(SP)       ;SAVE BITS SET DURING OPERATION IN RHDS1
017130  011637  001124                  MOV     (SP),@#$GDDAT   ;SAVE FOR PRINTOUT
017134  022605                          CMP     (SP)+,R5        ;DURING ABOVE OPERATION ONLY MOL!DPR!VV
                                                                ;SHOULD BE SET
017136  001405                          BEQ     69$             ;BRANCH IF GOOD
017140  010537  001126                  MOV     R5,@#$BDDAT     ;BAD DATA
017144  010337  004500                  MOV     R3,@#REGADR     ;FAILING REGISTER RHDS1
017150  104063                          ERROR   63              ;DURING ABOVE OPERATION ONLY
                                                                ;MOL!DPR!VV SHOULD BE SET
017152                          69$:

                                        ;*CHEANGE SAVED REGISTERS TO EXPECTED VALUES

017152  004037  032706                  JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
017156  002172                          RHWC                    ;SAVED REGISTER TO CHANGE
017160  000000                          0                       ;DATA

017162  004037  032706                  JSR     R0,@#FILLRE     ;MOV REINTO+<260.*2> INTO SAVED RHBA
017166  002174                          RHBA                    ;SAVED REGISTER TO CHANGE
017170  004444                          REINTO+<260.*2>                 ;DATA

017172  004037  032706                  JSR     R0,@#FILLRE     ;MOV 2 INTO SAVED RHDST
017176  002204                          RHDST                   ;SAVED REGISTER TO CHANGE
```

```
017200 000002                          2                               ;DATA
                                       ;*COMPARE REGISTER BEFORE READ HEADER AND DATA
                                       ;*WITH REGISTERS AFTER COMMAND
017202 004037 034002                   JSR     R0,@#COMREG             ;COMPARE SAVED REGISTERS WITH
                                                                       ;PRESENT VALUE
017206 004512                          SAVERE                          ;GOOD DATA SAVED IN 'SAVERE'
017210 002254                          WC                              ;TEST DATA STARTING FROM 'RHWC'
017212 000022                          18.                             ;18. REGISTERS TO BE COMPARED
017214 017220                          5$                              ;RETURN TO 5$ ON ERROR
017216 017224                          6$                              ;RETURN TO 6$ ON NO ERROR
017220 104031                  5$:     ERROR   31                      ;READ HEADER AND DATA CAUSED
017222 000207                          RTS     PC                      ;IMPROPER REGISTER CHANGE
                                                                       ;GOOD DATA GIVES WHAT SHOULD
                                                                       ;BE THERE
                                                                       ;RECEIVED DATA GIVES WHAT WAS
                                                                       ;THERE AFTER COMMAND
                                       ;*NOW READ INTO BUFFER WILL BE CHECKED TO SEE
                                       ;*THE READ WAS GOOD
017224                         6$:
017224 004037 035032                   JSR     R0,@#COMPAR             ;COMPARE TWO BLOCKS OF MEMORY
017230 002370                          WRFROM                          ;GOOD DATA STARTS FROM WRFROM
017232 003434                          REINTO                          ;TEST DATA STARTS FROM REINTO
017234 000404                          260.                            ;260., WORDS TO BE COMPARED
017236 017242                          7$                              ;RETURN TO 7$ ON ERROR
017240 017246                          10$                             ;RETURN TO 10$ ON NO ERROR
017242 104032                  7$:     ERROR   32                      ;WRITE HEADER AND DATA
017244 000207                          RTS     PC                      ;FOLLOWED BY A READ HEADER
                                                                       ;AND DATA GAVE A READ ERROR
                                                                       ;ERROR MAY BE IN READ OR WRITE
017246                         10$:
```

```

                                        ;;*************************************************************
                                        ;*TEST 20        INVALID ADDRESS ERROR - RHER1 - 'IAE'

                                        ;*       A WRITE HEADER AND DATA WILL BE ATTEMPTED TO CYLINDER 411./815.
                                        ;*       TRACK 0, SECTOR 0

                                        ;*       INVALID ADDRESS ERROR (IAE) BIT #10 IN RHER1 SHOULD SET

                                        ;;*************************************************************
017246  000004                          TST20:  SCOPE
017250  012706  001000                          MOV     #STACK,SP       ;RESET STACK
017254  012737  000020  004504                  MOV     #20,@#TSTNM     ;SAVE TEST NUMBER

017262  004737  033004                          JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                        ;R3-RHDS1, R4-RHER1
                                                                        ;GIVE RH-11 INITIALIZE
                                                                        ;SETUP UNIT NUMBER


                                                ;*CHECK THE DRIVE TYPE AND THEN FILL THE
                                                ;*WRITE FROM BUFFER WITH APPROPRIATE HEADER

                                        ;;*************************************************************
017266  005737  004636                          TST     @#RP06  ;TEST FOR RP06 DRIVE
017272  001411                                  BEQ     5$              ;TREAT UNIT AS AN RP04
                                                                        ;TREAT AS AN RP06
                                        ;;*************************************************************


017274  004037  032630                          JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
017300  002370                                  WRFROM                  ;LOCATION WHERE SAVED
017302  000004                                  4                       ;NUMBER OF WORDS SAVED
017304  011457                                  11457                   ;FIRST DATA WORD
017306  000000                                  0                       ;SECOND DATA WORD
017310  000000                                  0                       ;THIRD DATA WORD
017312  000000                                  0                       ;FOURTH DATA WORD
017314  000410                                  BR      6$              ;CONTINUE WITH SET UP

017316                                  5$:

017316  004037  032630                          JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
017322  002370                                  WRFROM                  ;LOCATION WHERE SAVED
017324  000004                                  4                       ;NUMBER OF WORDS SAVED
017326  010633                                  10633                   ;FIRST DATA WORD
017330  000000                                  0                       ;SECOND DATA WORD
017332  000000                                  0                       ;THIRD DATA WORD
017334  000000                                  0                       ;FOURTH DATA WORD
017336                                  6$:                             ;CONTINUE
                                                ;*FILL WRITE FROM BUFFER WITH DATA

017336  004037  032654                          JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM+10
017342  002400                                  WRFROM+10                       ;STARTING FROM WRFROM+10
017344  000400                                  256.                    ;256. WORDS
```

```
017346  177777                          0-1                     ;FILL WITH 0-1



                                        ;*THE DRIVE TYPE IS CHECKED AND THE APPROPRIATE
                                        ;*WRITE HEADER AND DATA COMMAND IS LOADED


                                ;;************************************************************
017350  005737  004636                  TST     @#RP06  ;TEST FOR RP06 DRIVE
017354  001412                          BEQ     3$                      ;TREAT UNIT AS RP04
                                                                        ;TREAT UNIT AS RP06
                                ;;************************************************************



017356  004037  034766                  JSR     R0,@#RUN                ;SETUP TO RUN FOR DATA COMMAND
017362  001457                          815.                            ;CYLINDER 815.
017364     000                          .BYTE   0                       ;SECTOR 0
017365     000                          .BYTE   0                       ;TRACK 0
017366  177374                          -256.-4                         ;WORD COUNT (DATA) = 256. +
                                                                        ;4 HEADER WORDS
017370  002370                          WRFROM                          ;BUS ADDRESS
                                                                        ;STARTING ADDRESS OF DATA
                                                                        ;BUFFER = WRFROM
017372  000000                          0                               ;DO NOT INHIBIT BUS ADDRESS INCREMENT
017374  010000                          FMT22                           ;16 BITS PER WORD FORMAT
                                                                        ;DO NOT INHIBIT ECC CORRECTION
                                                                        ;DO NOT INHIBIT HEADER COMPARE
017376  002344                          WRIFOR                          ;GET READY TO DO A WRIFOR
                                                        ;WRITE HEADER AND DATA WITH 62 IN RHCS1

017400  000411                          BR      4$                      ;CONTINUE WITH TESTING
017402                          3$:

017402  004037  034766                  JSR     R0,@#RUN                ;SETUP TO RUN FOR DATA COMMAND
017406  000633                          411.                            ;CYLINDER 411.
017410     000                          .BYTE   0                       ;SECTOR 0
017411     000                          .BYTE   0                       ;TRACK 0
017412  177374                          -256.-4                         ;WORD COUNT (DATA) = 256. +
                                                                        ;4 HEADER WORDS
017414  002370                          WRFROM                          ;BUS ADDRESS
                                                                        ;STARTING ADDRESS OF DATA
                                                                        ;BUFFER = WRFROM
017416  000000                          0                               ;DO NOT INHIBIT BUS ADDRESS INCREMENT
017420  010000                          FMT22                           ;16 BITS PER WORD FORMAT
                                                                        ;DO NOT INHIBIT ECC CORRECTION
                                                                        ;DO NOT INHIBIT HEADER COMPARE
017422  002344                          WRIFOR                          ;GET READY TO DO A WRIFOR
                                                        ;WRITE HEADER AND DATA WITH 62 IN RHCS1

017424                          4$:                                     ;CONTINUE
```

```
                                        ;*NOW SAVE REGISTERS FOR COMPARISON AFTER
                                        ;*WRITE HEADER AND DATA

017424  004037  033152                  JSR     R0,@#SAVER        ;SAVE REGISTERS
017430  002172                          RHWC                      ;RHWC IS THE FIRST REGISTER SAVED
017432  004512                          SAVERE                    ;STARTING ADDRES OF WHERE
                                                                  ;THE REGISTERS ARE SAVED
017434  000022                          18.                       ;NUMBER OF REGISTERS
                                                                  ;SAVED = 18.

017436  004737  033064                  JSR     PC,@#CHECKT       ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                  ;AND THAT ALL STATUS BITS ARE = 0
017442  104400  056662                  TYPE    ,CPHALT           ;CANNOT CONTINUE TESTING IF NOT
017446  000000                          HALT                      ;STOP TEST

017450  013777  004506  162510          MOV     @#RP4VEC,@RPVEC   ;SET RP04 VECTOR ADDRESS
                                                                  ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                  ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                  ;'TIME' WILL ONLY SAVE
                                                                  ;CURRENT CYLINDER ADDRESS
                                                                  ;AND LOOK AHEAD REGISTERS


017456  013746  002344                  MOV     @#WRIFOR,-(SP)    ;GET READY TO MOVE COMMAND
017462  052716  000101                  BIS     #GO!IE,(SP)       ;GET READY TO SET GO AND
                                                                  ;ENABLE INTERRUPT
017466  012677  162506                  MOV     (SP)+,@RHCS1      ;GO WITH
                                                                  ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                                  ;WITH INTERRUPT ENABLED



017472  104412                          WAT                       ;WAIT FOR IAE BIT TO SET
017474  002202                          RHER1                     ;WAIT FOR RHER1 REGISTER
017476  002000                          IAE                       ;WAIT FOR IAE BIT IN RHER1 REGISTER
017500  000011                          9.                        ;ALLOW 90 MICRO SECONDS
017502  000011                          9.                        ;IAE MUST SET BETWEEN
                                                                  ;00 AND 180 MICRO SECONDS




                                        ;*CHANGE         THE SAVED REGISTERS TO EXPECTED VALUES

                                        ;*AS EXCEPTION IS ASSERTED BEFORE RUN IS LATCHED,
                                        ;*RHWC,RHBA,RHCS1 & RHCS2 CANNOT BE PREDETERMINED -
                                        ;*THEY WILL VARY DEPENDING ON GATE DELAYS FOR DIFFERENT UNITS

017504  017737  162462  004512          MOV     @RHWC,@#SAVERE    ;RHWC IS UNPREDICTABLE
                                                                  ;AS EXPLAINED ABOVE
017512  017737  162456  004514          MOV     @RHBA,@#SAVERE+2;RHBA IS UNPREDICTABLE
                                                                  ;AS EXPLAINED ABOVE
017520  017737  162452  004516          MOV     @RHCS2,@#SAVERE+4;RHCS2 IS UNPREDICTABLE
                                                                  ;AS EXPLAINED ABOVE
017526  017737  162446  004520          MOV     @RHCS1,@#SAVERE+6;RHCS1 IS UNPREDICTABLE
                                                                  ;AS EXPLAINED ABOVE
```

```
017534  004037  033674                  JSR     R0,@#CHREG          ;CHANGE BITS IN SAVED REGISTER
017540  002222                          RHDS1                       ;CHANGE RHDS1 REGISTER

017542  000002                          2                           ;2 BIT/BITS TO BE CHANGED
017544  000001                          1                           ;NEW VALUE OF ATA IS 1
017546  100000                          ATA                         ;CHANGE ATA BIT
017550  000001                          1                           ;NEW VALUE OF ERR IS 1
017552  040000                          ERR                         ;CHANGE ERR BIT

017554  004037  033674                  JSR     R0,@#CHREG          ;CHANGE BITS IN SAVED REGISTER
017560  002202                          RHER1                       ;CHANGE RHER1 REGISTER

017562  000001                          1                           ;1 BIT/BITS TO BE CHANGED
017564  000001                          1                           ;NEW VALUE OF IAE IS 1
017566  002000                          IAE                         ;CHANGE IAE BIT

017570  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                    ;FOR WORKING DRIVE IN
                                                                    ;SAVED RHAS LOCATION
017576  017737  162402  004524          MOV     @RHDST,@#SAVERE+12 ;RHDST IS INDETERMINATE
                                                                    ;SO IT IS NOT CHECKED



                                        ;*COMPARE REGISTERS BEFORE ATTEMPTED WRITE WITH
                                        ;*CONTENTS AFTER ATTEMPTED WRITE WITH AN 'IAE' ERROR
                                ;;************************************************************


017604  004037  034002                  JSR     R0,@#COMREG         ;COMPARE SAVED REGISTERS WITH
                                                                    ;PRESENT VALUE
017610  004512                          SAVERE                      ;GOOD DATA SAVED IN 'SAVERE'
017612  002254                          WC                          ;TEST DATA STARTING FROM 'RHWC'
017614  000022                          18.                         ;18. REGISTERS TO BE COMPARED
017616  017622                          1$                          ;RETURN TO 1$ ON ERROR
017620  017626                          2$                          ;RETURN TO 2$ ON NO ERROR


017622  104054                  1$:     ERROR   54                  ;ATTEMPTED OPERATION WITH
017624  000207                          RTS     PC                  ;INVALID ADDRESS CAUSED
                                                                    ;IMPROPER REGISTER CHANGE
                                                                    ;GOOD DATA GIVES WHAT SHOULD
                                                                    ;BE THERE
017626                          2$:                                 ;RECEIVED DATA GIVES REGISTER
                                                                    ;CONTENTS AFTER ATTEMPTED
                                                                    ;WRITE HEADER AND DATA
```

```
                                        ;;*****************************************************************
                                        ;*TEST 21        INVALID ADDRESS ERROR - RHER1 (BIT #10)IAE

                                        ;*       A WRITE DATA IS ATTEMPTED TO CYLINDER 0, TRACK 19,
                                        ;*       SECTOR 0
                                        ;*       INVALID ADDRESS ERROR IAE BIT #10 IN RHER1
                                        ;*       SHOULD SET

                                        ;;*****************************************************************
017626  000004                          TST21:  SCOPE
017630  012706  001000                          MOV     #STACK,SP               ;RESET STACK
017634  012737  000021  004504                  MOV     #21,@#TSTNM             ;SAVE TEST NUMBER

017642  004737  033004                          JSR     PC,@#CLDISK             ;SET R1-RHCS1, R2-RHCS2
                                                                                ;R3-RHDS1, R4-RHER1
                                                                                ;GIVE RH-11 INITIALIZE
                                                                                ;SETUP UNIT NUMBER

                                                ;*FILL WRITE FROM BUFFER WITH DATA

017646  004037  032654                          JSR     R0,@#CLAREA             ;CLEAR 256. WORDS, FROM WRFROM
017652  002370                                  WRFROM                          ;STARTING FROM WRFROM
017654  000400                                  256.                            ;256. WORDS
017656  000377                                  377                             ;FILL WITH 377


                                                ;*WRITE DATA COMMAND WILL BE FILLED

017660  004037  034766                          JSR     R0,@#RUN                ;SETUP TO RUN FOR DATA COMMAND
017664  000000                                  0                               ;CYLINDER 0
017666     000                                  .BYTE   0                       ;SECTOR 0
017667     023                                  .BYTE   19.                     ;TRACK 19.
017670  177400                                  -256.                           ;WORD COUNT = 256.
017672  002370                                  WRFROM                          ;BUS ADDRESS
                                                                                ;STARTING ADDRESS OF DATA
                                                                                ;BUFFER = WRFROM
017674  000000                                  0                               ;DO NOT INHIBIT BUS ADDRESS INCREMENT
017676  010000                                  FMT22                           ;16 BITS PER WORD FORMAT
                                                                                ;DO NOT INHIBIT ECC CORRECTION
                                                                                ;DO NOT INHIBIT HEADER COMPARE
017700  002342                                  WRIDAT                          ;GET READY TO DO A WRIDAT
                                                                ;WRITE DATA WITH 60 IN RHCS1



                                                ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED WRITE DATA
017702  004037  033152                          JSR     R0,@#SAVER              ;SAVE REGISTERS
017706  002172                                  RHWC                            ;RHWC IS THE FIRST REGISTER SAVED
017710  004512                                  SAVERE                          ;STARTING ADDRES OF WHERE
                                                                                ;THE REGISTERS ARE SAVED
017712  000022                                  18.                             ;NUMBER OF REGISTERS
                                                                                ;SAVED = 18.

017714  004737  033064                          JSR     PC,@#CHECKT             ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
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                                                                  ;AND THAT ALL STATUS BITS ARE = 0
017720  104400  056662                    TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
017724  000000                            HALT                    ;STOP TEST

017726  013777  004506  162232            MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                  ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                  ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                  ;'TIME' WILL ONLY SAVE
                                                                  ;CURRENT CYLINDER ADDRESS
                                                                  ;AND LOOK AHEAD REGISTERS


017734  013746  002342                    MOV     @#WRIDAT,-(SP)  ;GET READY TO MOVE COMMAND
017740  052716  000101                    BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                  ;ENABLE INTERRUPT
017744  012677  162230                    MOV     (SP)+,@RHCS1    ;GO WITH
                                                                  ;60 IN RHCS1 FOR WRITE DATA
                                                                  ;WITH INTERRUPT ENABLED


017750  104412                            WAT                     ;WAIT FOR IAE BIT TO SET
017752  002202                            RHER1                   ;WAIT FOR RHER1 REGISTER
017754  002000                            IAE                     ;WAIT FOR IAE BIT IN RHER1 REGISTER
017756  000011                            9.                      ;ALLOW 90 MICRO SECONDS
017760  000011                            9.                      ;IAE MUST SET BETWEEN
                                                                  ;00 AND 180 MICRO SECONDS

                                          ;*CHANGE        SAVED REGISTERS TO EXPECTED VALUES



                                          ;*AS EXCEPTION IS ASSERTED BEFORE RUN IS LATCHED
                                          ;*RHWC,RHBA,RHCS1,RHCS2,  CANNOT BE PEREDETERMINED
                                          ;*THEY WILL VARY DEPENDING ON GATE DELAYS ON DIFFRENT UNITS

017762  017737  162204  004512            MOV     @RHWC,@#SAVERE  ;RHWC IS UNPREDICTABLE
                                                                  ;AS EXPLAINED ABOVE
017770  017737  162200  004514            MOV     @RHBA,@#SAVERE+2;RHBA IS UNPREDICTABLE
                                                                  ;AS EXPLAINED ABOVE
017776  017737  162174  004516            MOV     @RHCS2,@#SAVERE+4;RHCS2 IS UNPREDICTABLE
                                                                  ;AS EXPLAINED ABOVE
020004  017737  162170  004520            MOV     @RHCS1,@#SAVERE+6;RHCS1 IS UNPREDICTABLE
                                                                  ;AS EXPLAINED ABOVE

020012  004037  033674                    JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
020016  002222                            RHDS1                   ;CHANGE RHDS1 REGISTER

020020  000002                            2                       ;2 BIT/BITS TO BE CHANGED
020022  000001                            1                       ;NEW VALUE OF ATA IS 1
020024  100000                            ATA                     ;CHANGE ATA BIT
020026  000001                            1                       ;NEW VALUE OF ERR IS 1
020030  040000                            ERR                     ;CHANGE ERR BIT
020032  017737  162146  004524            MOV     @RHDST,@#SAVERE+12 ;RHDST IS INDETERMINATE SO IT IS NOT CHECKED

```

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020040  004037  033674                  JSR     R0,@#CHREG          ;CHANGE BITS IN SAVED REGISTER
020044  002202                          RHER1                       ;CHANGE RHER1 REGISTER

020046  000001                          1                           ;1 BIT/BITS TO BE CHANGED
020050  000001                          1                           ;NEW VALUE OF IAE IS 1
020052  002000                          IAE                         ;CHANGE IAE BIT

020054  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                    ;FOR WORKING DRIVE IN
                                                                    ;SAVED RHAS LOCATION

                                        ;*COMPARE REGISTERS BEFORE ATTEMPTED WRITE DATA
                                        ;*WITH AFTER ATTEMPT, IAE SHOULD BE SET

020062  004037  034002                  JSR     R0,@#COMREG         ;COMPARE SAVED REGISTERS WITH
                                                                    ;PRESENT VALUE
020066  004512                          SAVERE                      ;GOOD DATA SAVED IN 'SAVERE'
020070  002254                          WC                          ;TEST DATA STARTING FROM 'RHWC'
020072  000022                          18.                         ;18. REGISTERS TO BE COMPARED
020074  020100                          1$                          ;RETURN TO 1$ ON ERROR
020076  020104                          2$                          ;RETURN TO 2$ ON NO ERROR


020100  104054                  1$:     ERROR   54                  ;ATTEMPTED WRITE DATA
020102  000207                          RTS     PC                  ;WITH INVALID ADDRESS
                                                                    ;CAUSED IMPROPER REGISTER
                                                                    ;CHANGE
020104                          2$:                                 ;GOOD DATA GIVES WHAT
                                                                    ;SHOULD BE THERE
                                                                    ;RECEIVED DATA GIVES WHAT
                                                                    ;WAS THERE AFTER AFTER ATTEMPT

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                                                ;;*************************************************************
                                                ;*TEST 22        INVALID ADDRESS ERROR RHER1 -BIT #10

                                                ;*       A READ HEADER AND DATA IS ATTEMPTED TO CYLINDER 0
                                                ;*       TRACK 0, SECTOR 22
                                                ;*       INVALID ADDRESS ERROR IAE BIT #10 IN RHER1
                                                ;*       SHOULD SET
                                                ;*       THIS WILL START WITH THE HEADS ON CYLINDER 10
                                                ;*       TO PROVE THAT IAE SETS EVEN BEFORE THE IMPLIED
                                                ;*       SEEK

                                                ;;*************************************************************
020104  000004                                  TST22:  SCOPE
020106  012706  001000                                  MOV     #STACK,SP               ;RESET STACK
020112  012737  000022  004504                          MOV     #22,@#TSTNM             ;SAVE TEST NUMBER

020120  004737  033004                                  JSR     PC,@#CLDISK             ;SET R1-RHCS1, R2-RHCS2
                                                                                        ;R3-RHDS1, R4-RHER1
                                                                                        ;GIVE RH-11 INITIALIZE
                                                                                        ;SETUP UNIT NUMBER

                                                        ;*GET THE HEADS TO CYLINDER 10

020124  004737  033064                                  JSR     PC,@#CHECKT             ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                                        ;AND THAT ALL STATUS BITS ARE = 0
020130  104400  056662                                  TYPE    ,CPHALT                 ;CANNOT CONTINUE TESTING IF NOT
020134  000000                                          HALT                            ;STOP TEST

020136  013777  004506  162022                          MOV     @#RP4VEC,@RPVEC         ;SET RP04 VECTOR ADDRESS
                                                                                        ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                                        ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                                        ;'TIME' WILL ONLY SAVE
                                                                                        ;CURRENT CYLINDER ADDRESS
                                                                                        ;AND LOOK AHEAD REGISTERS

020144  004037  032754                                  JSR     R0,@#SEEKCY             ;SEEK FOR
020150  000010                                          10                              ;CYLINDER 10



020152  013746  002352                                  MOV     @#SEECOM,-(SP)          ;GET READY TO MOVE COMMAND
020156  052716  000101                                  BIS     #GO!IE,(SP)             ;GET READY TO SET GO AND
                                                                                        ;ENABLE INTERRUPT
020162  012677  162012                                  MOV     (SP)+,@RHCS1            ;GO WITH
                                                                                        ;4 IN RHCS1 FOR SEEK
                                                                                        ;WITH INTERRUPT ENABLED

020166  104412                                          WAT                             ;WAIT FOR DRY BIT TO SET
020170  002222                                          RHDS1                           ;WAIT FOR RHDS1 REGISTER
020172  000200                                          DRY                             ;WAIT FOR DRY BIT IN RHDS1 REGISTER
020174  015530                                          7000.                           ;ALLOW 70000 MICRO SECONDS
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020176  015530                          7000.                          ;DRY MUST SET BETWEEN
                                                                       ;00 AND 140000 MICRO SECONDS

020200  004737  033004                  JSR     PC,@#CLDISK            ;SET R1-RHCS1, R2-RHCS2
                                                                       ;R3-RHDS1, R4-RHER1
                                                                       ;GIVE RH-11 INITIALIZE
                                                                       ;SETUP UNIT NUMBER

                                        ;*FILL READ INTO BUFFER WITH 125252

020204  004037  032654                  JSR     R0,@#CLAREA            ;CLEAR 260 WORDS, FROM REINTO
020210  003434                          REINTO                         ;STARTING FROM REINTO
020212  000260                          260                            ;260 WORDS
020214  125252                          125252                         ;FILL WITH 125252

                                        ;*THE READ HEADER AND DATA COMMAND IS FILLED

020216  004037  034766                  JSR     R0,@#RUN               ;SETUP TO RUN FOR DATA COMMAND
020222  000000                          0                              ;CYLINDER 0
020224     026                          .BYTE   22.                    ;SECTOR 22.
020225     000                          .BYTE   0                      ;TRACK 0
020226  177374                          -256.-4                        ;WORD COUNT (DATA) = 256. +
                                                                       ;4 HEADER WORDS
020230  003434                          REINTO                         ;BUS ADDRESS
                                                                       ;STARTING ADDRESS OF DATA
                                                                       ;BUFFER = REINTO
020232  000000                          0                              ;DO NOT INHIBIT BUS ADDRESS INCREMENT
020234  014000                          FMT22!ECI                              ;16 BITS PER WORD FORMAT
                                                                       ;INHIBIT ECC CORRECTION
                                                                       ;DO NOT INHIBIT HEADER COMPARE
020236  002350                          REFOR                          ;GET READY TO DO A REFOR
                                                                       ;READ HEADER AND DATA WITH 72 IN RHCS1

                                        ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED READ
020240  004037  033152                  JSR     R0,@#SAVER             ;SAVE REGISTERS
020244  002172                          RHWC                           ;RHWC IS THE FIRST REGISTER SAVED
020246  004512                          SAVERE                         ;STARTING ADDRES OF WHERE
                                                                       ;THE REGISTERS ARE SAVED
020250  000022                          18.                            ;NUMBER OF REGISTERS
                                                                       ;SAVED = 18.

020252  004737  033064                  JSR     PC,@#CHECKT            ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                       ;AND THAT ALL STATUS BITS ARE = 0
020256  104400  056662                  TYPE    ,CPHALT                ;CANNOT CONTINUE TESTING IF NOT
020262  000000                          HALT                           ;STOP TEST

020264  013777  004506  161674          MOV     @#RP4VEC,@RPVEC        ;SET RP04 VECTOR ADDRESS
                                                                       ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                       ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                       ;'TIME' WILL ONLY SAVE
                                                                       ;CURRENT CYLINDER ADDRESS
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                                                              ;AND LOOK AHEAD REGISTERS
020272  013746  002350                  MOV     @#REFOR,-(SP)    ;GET READY TO MOVE COMMAND
020276  052716  000101                  BIS     #GO!IE,(SP)      ;GET READY TO SET GO AND
                                                                 ;ENABLE INTERRUPT
020302  012677  161672                  MOV     (SP)+,@RHCS1     ;GO WITH
                                                                   ;72 IN RHCS1 FOR READ DATA
                                                                 ;WITH INTERRUPT ENABLED
020306  104412                          WAT                      ;WAIT FOR IAE BIT TO SET
020310  002202                          RHER1                    ;WAIT FOR RHER1 REGISTER
020312  002000                          IAE                      ;WAIT FOR IAE BIT IN RHER1 REGISTER
020314  000002                          2.                       ;ALLOW 20 MICRO SECONDS
020316  000002                          2.                       ;IAE MUST SET BETWEEN
                                                                 ;00 AND 40 MICRO SECONDS
                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES
                                        ;*AS EXCEPTION IS ASSERTED BEFORE RUN IS LATCHED
                                        ;*RHWC,RHBA,RHCS1,RHCS2,  CANNOT BE PEREDETERMINED
                                        ;*THEY WILL VARY DEPENDING ON GATE DELAYS ON DIFFRENT UNITS
020320  017737  161646  004512          MOV     @RHWC,@#SAVERE         ;RHWC IS UNPREDICTABLE
                                                                       ;AS EXPLAINED ABOVE
020326  017737  161642  004514          MOV     @RHBA,@#SAVERE+2       ;RHBA IS UNPREDICTABLE
                                                                       ;AS EXPLAINED ABOVE
020334  017737  161636  004516          MOV     @RHCS2,@#SAVERE+4      ;RHCS2 IS UNPREDICTABLE
                                                                       ;AS EXPLAINED ABOVE
020342  017737  161632  004520          MOV     @RHCS1,@#SAVERE+6      ;RHCS1 IS UNPREDICTABLE
                                                                       ;AS EXPLAINED ABOVE
020350  004037  033674                  JSR     R0,@#CHREG       ;CHANGE BITS IN SAVED REGISTER
020354  002222                          RHDS1                    ;CHANGE RHDS1 REGISTER
020356  000002                          2                        ;2 BIT/BITS TO BE CHANGED
020360  000001                          1                        ;NEW VALUE OF ATA IS 1
020362  100000                          ATA                      ;CHANGE ATA BIT
020364  000001                          1                        ;NEW VALUE OF ERR IS 1
020366  040000                          ERR                      ;CHANGE ERR BIT
020370  017737  161610  004524          MOV     @RHDST,@#SAVERE+12     ;RHDST IS INDETERMINATE SO IT IS NOT CHECKED
020376  004037  033674                  JSR     R0,@#CHREG       ;CHANGE BITS IN SAVED REGISTER
020402  002202                          RHER1                    ;CHANGE RHER1 REGISTER
020404  000001                          1                        ;1 BIT/BITS TO BE CHANGED
020406  000001                          1                        ;NEW VALUE OF IAE IS 1
020410  002000                          IAE                      ;CHANGE IAE BIT
020412  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                 ;FOR WORKING DRIVE IN
```

```
                                                                        ;SAVED RHAS LOCATION

                                                ;*COMPARE REGISTERS BEFORE ATTEMPTED READ HEADER
                                                ;*AND DATA WITH AFTER ATTEMPTED READ

020420  004037  034002                          JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                                        ;PRESENT VALUE
020424  004512                                  SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
020426  002254                                  WC                      ;TEST DATA STARTING FROM 'RHWC'
020430  000022                                  18.                     ;18. REGISTERS TO BE COMPARED
020432  020436                                  1$                      ;RETURN TO 1$ ON ERROR
020434  020442                                  2$                      ;RETURN TO 2$ ON NO ERROR


020436  104054                          1$:     ERROR   54              ;ATTEMPTED READ HEADER
020440  000207                                  RTS     PC              ;AND DATA WITH INVALID
                                                                        ;ADDRESS CAUSED IMPROPER
                                                                        ;REGISTER CHANGE
                                                                        ;GOOD DATA GIVES WHAT
                                                                        ;SHOULD BE THERE
                                                                        ;RECEIVED DATA GIVES
                                                                        ;REGISTER CONTENTS
                                                                        ;AFTER ATTEMPTED
                                                                        ;READ
020442                                  2$:
```

```

                                    ;;*************************************************************
                                    ;*TEST 23          INVALID ADDRESS ERROR - RHER1  (BIT #10)IAE

                                    ;*        A READ DATA IS ATTEMPTED TO CYLINDER 0, TRACK 0
                                    ;*        SECTOR 20 - FORMAT 18 BITS PER WORD
                                    ;*        INVALID ADDRESS ERROR IAE BIT #10 IN RHER1
                                    ;*        SHOULD SET

                                    ;;*************************************************************
020442  000004                      TST23:  SCOPE
020444  012706  001000                      MOV     #STACK,SP        ;RESET STACK
020450  012737  000023  004504              MOV     #23,@#TSTNM      ;SAVE TEST NUMBER

020456  004737  033004                      JSR     PC,@#CLDISK      ;SET R1-RHCS1, R2-RHCS2
                                                                     ;R3-RHDS1, R4-RHER1
                                                                     ;GIVE RH-11 INITIALIZE
                                                                     ;SETUP UNIT NUMBER

                                            ;*FILL READ INTO BUFFER WITH 125252

020462  004037  032654                      JSR     R0,@#CLAREA      ;CLEAR 260 WORDS, FROM REINTO
020466  003434                              REINTO                   ;STARTING FROM REINTO
020470  000260                              260                      ;260 WORDS
020472  125252                              125252                   ;FILL WITH 125252

                                            ;*THE READ HEADER AND DATA COMMAND IS FILLED

020474  004037  034766                      JSR     R0,@#RUN         ;SETUP TO RUN FOR DATA COMMAND
020500  000000                              0                        ;CYLINDER 0
020502     024                              .BYTE   20.              ;SECTOR 20.
020503     000                              .BYTE   0                ;TRACK 0
020504  177400                              -256.                    ;WORD COUNT = 256.
020506  003434                              REINTO                   ;BUS ADDRESS
                                                                     ;STARTING ADDRESS OF DATA
                                                                     ;BUFFER = REINTO
020510  000000                              0                        ;DO NOT INHIBIT BUS ADDRESS INCREMENT
020512  004000                              ECI                      ;18 BITS PER WORD FORMAT
                                                                     ;INHIBIT ECC CORRECTION
                                                                     ;DO NOT INHIBIT HEADER COMPARE
020514  002346                              READAT                   ;GET READY TO DO A READAT
                                                         ;READ DATA WITH 70 IN RHCS1



                                            ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED READ
020516  004037  033152                      JSR     R0,@#SAVER       ;SAVE REGISTERS
020522  002172                              RHWC                     ;RHWC IS THE FIRST REGISTER SAVED
020524  004512                              SAVERE                   ;STARTING ADDRES OF WHERE
                                                                     ;THE REGISTERS ARE SAVED
020526  000022                              18.                      ;NUMBER OF REGISTERS
                                                                     ;SAVED = 18.

020530  004737  033064                      JSR     PC,@#CHECKT      ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
```

```
                                                                 ;AND THAT ALL STATUS BITS ARE = 0
020534  104400  056662                   TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
020540  000000                           HALT                    ;STOP TEST
020542  013777  004506  161416           MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                 ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                 ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                 ;'TIME' WILL ONLY SAVE
                                                                 ;CURRENT CYLINDER ADDRESS
                                                                 ;AND LOOK AHEAD REGISTERS
020550  013746  002346                   MOV     @#READAT,-(SP)  ;GET READY TO MOVE COMMAND
020554  052716  000101                   BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                 ;ENABLE INTERRUPT
020560  012677  161414                   MOV     (SP)+,@RHCS1    ;GO WITH
                                                                 ;70 IN RHCS1 FOR READ DATA
                                                                 ;WITH INTERRUPT ENABLED
020564  104412                           WAT                     ;WAIT FOR IAE BIT TO SET
020566  002202                           RHER1                   ;WAIT FOR RHER1 REGISTER
020570  002000                           IAE                     ;WAIT FOR IAE BIT IN RHER1 REGISTER
020572  000002                           2.                      ;ALLOW 20 MICRO SECONDS
020574  000002                           2.                      ;IAE MUST SET BETWEEN
                                                                 ;00 AND 40 MICRO SECONDS
                                         ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES
020576  004037  033674                   JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
020602  002200                           RHCS1                   ;CHANGE RHCS1 REGISTER
020604  000002                           2                       ;2 BIT/BITS TO BE CHANGED
020606  000001                           1                       ;NEW VALUE OF SC IS 1
020610  100000                           SC                      ;CHANGE SC BIT
020612  000001                           1                       ;NEW VALUE OF TRE IS 1
020614  040000                           TRE                     ;CHANGE TRE BIT
020616  017737  161362  004524           MOV     @RHDST,@#SAVERE+12;RHDST IS UNPREDICTABLE
020624  004037  033674                   JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
020630  002222                           RHDS1                   ;CHANGE RHDS1 REGISTER
020632  000002                           2                       ;2 BIT/BITS TO BE CHANGED
020634  000001                           1                       ;NEW VALUE OF ATA IS 1
020636  100000                           ATA                     ;CHANGE ATA BIT
020640  000001                           1                       ;NEW VALUE OF ERR IS 1
020642  040000                           ERR                     ;CHANGE ERR BIT
020644  004037  033674                   JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
020650  002202                           RHER1                   ;CHANGE RHER1 REGISTER
020652  000001                           1                       ;1 BIT/BITS TO BE CHANGED
020654  000001                           1                       ;NEW VALUE OF IAE IS 1
020656  002000                           IAE                     ;CHANGE IAE BIT
```

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020660  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                     ;FOR WORKING DRIVE IN
                                                                     ;SAVED RHAS LOCATION

                                        ;*COMPARE REGISTERS BEFORE ATTEMPTED READ
                                        ;*DATA WITH AFTER ATTEMPTED READ DATA

020666  004037  034002                  JSR     R0,@#COMREG          ;COMPARE SAVED REGISTERS WITH
                                                                     ;PRESENT VALUE
020672  004512                          SAVERE                       ;GOOD DATA SAVED IN 'SAVERE'
020674  002254                          WC                           ;TEST DATA STARTING FROM 'RHWC'
020676  000022                          18.                          ;18. REGISTERS TO BE COMPARED
020700  020704                          1$                           ;RETURN TO 1$ ON ERROR
020702  020710                          2$                           ;RETURN TO 2$ ON NO ERROR


020704  104054                  1$:     ERROR   54                   ;ATTEMPTED READ
020706  000207                          RTS     PC                   ;DATA WITH INVALID
                                                                     ;ADDRESS CAUSED IMPROPER
                                                                     ;REGISTER CHANGE
                                                                     ;GOOD DATA GIVES WHAT
                                                                     ;SHOULD BE THERE
                                                                     ;RECEIVED DATA GIVES
                                                                     ;REGISTERS CONTENTS
                                                                     ;AFTER ATTEMPTED
                                                                     ;READ
020710                          2$:

```

```

                                          ;;*************************************************************
                                          ;*TEST 24        ADDRESS OVERFLOW ERROR - RHER1 (BIT#9) AOE

                                          ;*       A WRITE HEADER AND DATA COMMAND IS GIVEN FOR CYLINDER 0,TRACK 0
                                          ;*       SECTOR 0, 256 WORDS OF 0
                                          ;*       NO CHECK IS DONE AFTER THIS WRITE
                                          ;*
                                          ;*       A WRITE HEADER AND DATA COMMAND IS GIVEN FOR
                                          ;*       CYLINDER 410./814., TRACK 18, SECTOR 21, 261 WORDS
                                          ;*
                                          ;*       ADDRESS OVERFLOW ERROR - RHER1 BIT#9 (AOE) SHOULD SET
                                          ;*       AFTER SECTOR 21 IS WRITTEN
                                          ;*       ALL REGISTERS ARE CHECKED
                                          ;*
                                          ;*       A READ HEADER AND DATA CYLINDER 410./814., TRACK 18, SECTOR 21,
                                          ;*       260+66+4=330  WORDS IS ISSUED
                                          ;*
                                          ;*       SECTOR 21 SHOULD BE READ CORRECTLY BUT NO MORE
                                          ;*       READS SHOULD HAPPEN, AGAIN THE 'AOE' BIT SHOULD SET
                                          ;*
                                          ;*       CYLINDER 0, TRACK 0, SECTOR 0 IS READ AND THERE
                                          ;*       SHOULD BE NO CHANGE IN DATA IN THIS SECTOR FROM
                                          ;*       THE LAST WRITE HEADER AND DATA COMMAND

                                          ;;*************************************************************
 020710  000004                           TST24:  SCOPE
 020712  012706  001000                           MOV     #STACK,SP          ;RESET STACK
 020716  012737  000024  004504                   MOV     #24,@#TSTNM        ;SAVE TEST NUMBER

 020724  004737  033004                           JSR     PC,@#CLDISK        ;SET R1-RHCS1, R2-RHCS2
                                                                             ;R3-RHDS1, R4-RHER1
                                                                             ;GIVE RH-11 INITIALIZE
                                                                             ;SETUP UNIT NUMBER

                                                  ;*FILL WRITE FROM BUFFER WITH HEADER

 020730  004037  032630                           JSR     R0,@#FLHEAD        ;SAVE HEADER DATA IN WRFROM
 020734  002370                                   WRFROM                     ;LOCATION WHERE SAVED
 020736  000004                                   4                          ;NUMBER OF WORDS SAVED
 020740  010000                                   10000                      ;FIRST DATA WORD
 020742  000000                                   0                          ;SECOND DATA WORD
 020744  000000                                   0                          ;THIRD DATA WORD
 020746  000000                                   0                          ;FOURTH DATA WORD

                                                  ;*FILL WRITE FROM BUFFER WITH DATA

 020750  004037  032654                           JSR     R0,@#CLAREA        ;CLEAR 256. WORDS, FROM WRFROM+<4*2>
 020754  002400                                   WRFROM+<4*2>                 ;STARTING FROM WRFROM+<4*2>
 020756  000400                                   256.                       ;256. WORDS
 020760  000000                                   0                          ;FILL WITH 0
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                                               ;*THE FIRST WRITE OPERATION IS DONE
                                               ;*FILL WRITE HEADER AND DATA COMMAND
                                          ;;*************************************************************

020762  004037  034766                   JSR     R0,@#RUN            ;SETUP TO RUN FOR DATA COMMAND
020766  000000                           0                           ;CYLINDER 0
020770     000                           .BYTE   0                   ;SECTOR 0
020771     000                           .BYTE   0                   ;TRACK 0
020772  177374                           -256.-4                     ;WORD COUNT (DATA) = 256. +
                                                                     ;4 HEADER WORDS
020774  002370                           WRFROM                      ;BUS ADDRESS
                                                                     ;STARTING ADDRESS OF DATA
                                                                     ;BUFFER = WRFROM
020776  000000                           0                           ;DO NOT INHIBIT BUS ADDRESS INCREMENT
021000  010000                           FMT22                       ;16 BITS PER WORD FORMAT
                                                                     ;DO NOT INHIBIT ECC CORRECTION
                                                                     ;DO NOT INHIBIT HEADER COMPARE
021002  002344                           WRIFOR                      ;GET READY TO DO A WRIFOR
                                                          ;WRITE HEADER AND DATA WITH 62 IN RHCS1


021004  004737  033064                   JSR     PC,@#CHECKT         ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                     ;AND THAT ALL STATUS BITS ARE = 0
021010  104400  056662                   TYPE    ,CPHALT             ;CANNOT CONTINUE TESTING IF NOT
021014  000000                           HALT                        ;STOP TEST

021016  013777  004506  161142           MOV     @#RP4VEC,@RPVEC     ;SET RP04 VECTOR ADDRESS
                                                                     ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                     ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                     ;'TIME' WILL ONLY SAVE
                                                                     ;CURRENT CYLINDER ADDRESS
                                                                     ;AND LOOK AHEAD REGISTERS


021024  013746  002344                   MOV     @#WRIFOR,-(SP)      ;GET READY TO MOVE COMMAND
021030  052716  000101                   BIS     #GO!IE,(SP)         ;GET READY TO SET GO AND
                                                                     ;ENABLE INTERRUPT
021034  012677  161140                   MOV     (SP)+,@RHCS1        ;GO WITH
                                                                      ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                                     ;WITH INTERRUPT ENABLED


021040  104412                           WAT                         ;WAIT FOR RDY BIT TO SET
021042  002200                           RHCS1                       ;WAIT FOR RHCS1 REGISTER
021044  000200                           RDY                         ;WAIT FOR RDY BIT IN RHCS1 REGISTER
021046  004704                           2500.                       ;ALLOW 25000 MICRO SECONDS
021050  004704                           2500.                       ;RDY MUST SET BETWEEN
                                                                     ;00 AND 50000 MICRO SECONDS

021052  004737  033004                   JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                     ;R3-RHDS1, R4-RHER1
                                                                     ;GIVE RH-11 INITIALIZE
                                                                     ;SETUP UNIT NUMBER
```

```
                                        ;*CHECK THE DRIVE TYPE AND DO THE
                                        ;*APPROPRIATE SECOND WRITE OPERATION

                                        ;*FILL WRITE FROM BUFFER WITH HEADER
                                ;;*************************************************************


                                ;;*************************************************************
021056  005737  004636                  TST     @#RP06  ;TEST FOR RP06 DRIVE
021062  001411                          BEQ     15$             ;TREAT DRIVE AS AN RP04
                                                                ;TREAT AS AN RP06
                                ;;*************************************************************


021064  004037  032630                  JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
021070  002370                          WRFROM                  ;LOCATION WHERE SAVED
021072  000004                          4                       ;NUMBER OF WORDS SAVED
021074  011456                          11456                   ;FIRST DATA WORD
021076  011025                          <18.*400>!<21.>                 ;SECOND DATA WORD
021100  000000                          0                       ;THIRD DATA WORD
021102  000000                          0                       ;FOURTH DATA WORD
021104  000410                          BR      16$             ;CONTINUE WITH THE SECOND WRITE


021106                          15$:

021106  004037  032630                  JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
021112  002370                          WRFROM                  ;LOCATION WHERE SAVED
021114  000004                          4                       ;NUMBER OF WORDS SAVED
021116  010632                          10632                   ;FIRST DATA WORD
021120  011025                          <18.*400>!<21.>                 ;SECOND DATA WORD
021122  000000                          0                       ;THIRD DATA WORD
021124  000000                          0                       ;FOURTH DATA WORD
021126                          16$:                            ;CONTINUE WRITE

                                        ;*FILL WRITE FROM BUFFER WITH DATA - 65125

021126  004037  032654                  JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM+<4*2>
021132  002400                          WRFROM+<4*2>                    ;STARTING FROM WRFROM+<4*2>
021134  000400                          256.                    ;256. WORDS
021136  065125                          <26.*2000>!<18.*40>!<21.>                       ;FILL WITH <26.*2000>!<18.*40>!<



                                        ;*CHECK THE DRIVE TYPE AND
                                        ;*FILL WRITE FROM BUFFER WITH APPROPRIATE NEXT HEADER

                                        ;*THIS IS A NON EXISTANT HEADER AND SHOULD NOT BE WRITTEN
                                        ;*SINCE 'AOE' SHOULD INHIBIT THE WRITE OPERATION



                                ;;*************************************************************
021140  005737  004636                  TST     @#RP06  ;TEST FOR RP06 DRIVE
```

```
021144  001411                    BEQ     17$             ;TREAT UNIT AS AN RP04
                                                          ;TREAT AS AN RP06
                          ;;*************************************************************



021146  004037  032630            JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM+<260.*2>
021152  003400                    WRFROM+<260.*2>                 ;LOCATION WHERE SAVED
021154  000004                    4                       ;NUMBER OF WORDS SAVED
021156  011457                    11457                   ;FIRST DATA WORD
021160  000000                    0                       ;SECOND DATA WORD
021162  000000                    0                       ;THIRD DATA WORD
021164  000000                    0                       ;FOURTH DATA WORD
021166  000410                    BR      18$             ;CONTINUE WITH TEST


021170                    17$:

021170  004037  032630            JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM+<260.*2>
021174  003400                    WRFROM+<260.*2>                 ;LOCATION WHERE SAVED
021176  000004                    4                       ;NUMBER OF WORDS SAVED
021200  010633                    10633                   ;FIRST DATA WORD
021202  000000                    0                       ;SECOND DATA WORD
021204  000000                    0                       ;THIRD DATA WORD
021206  000000                    0                       ;FOURTH DATA WORD
021210                    18$:                            ;CONTINUE
                                  ;*FILL WRITE FROM BUFFER WITH DATA FOR NEXT SECTOR

021210  004037  032654            JSR     R0,@#CLAREA     ;CLEAR 2 WORDS, FROM WRFROM+<264.*2>
021214  003410                    WRFROM+<264.*2>                 ;STARTING FROM WRFROM+<264.*2>
021216  000002                    2                       ;2 WORDS
021220  066000                    <27.*2000>                      ;FILL WITH <27.*2000>



                                  ;*CHECK THE DRIVE TYPE AND DO THE APPROPRIATE
                                  ;*FILL WRITE HEADER AND DATA COMMAND



                          ;;*************************************************************
021222  005737  004636            TST     @#RP06  ;TEST FOR RP06 DRIVE
021226  001412                    BEQ     7$              ;TREAT UNIT AS AN RP04
                                                          ;TREAT UNIT AS AN RP06
                          ;;*************************************************************


021230  004037  034766            JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
021234  001456                    814.                    ;CYLINDER 814.
021236     025                    .BYTE   21.             ;SECTOR 21.
021237     022                    .BYTE   18.             ;TRACK 18.
021240  177373                    -257.-4                 ;WORD COUNT (DATA) = 257. +
                                                          ;4 HEADER WORDS
021242  002370                    WRFROM                  ;BUS ADDRESS
                                                          ;STARTING ADDRESS OF DATA
                                                          ;BUFFER = WRFROM
```

```
021244  000000                           0                          ;DO NOT INHIBIT BUS ADDRESS INCREMENT
021246  010000                           FMT22                      ;16 BITS PER WORD FORMAT
                                                                    ;DO NOT INHIBIT ECC CORRECTION
                                                                    ;DO NOT INHIBIT HEADER COMPARE
021250  002344                           WRIFOR                     ;GET READY TO DO A WRIFOR
                                                            ;WRITE HEADER AND DATA WITH 62 IN RHCS1
021252  000411                           BR      8$
021254                           7$:
021254  004037  034766                   JSR     R0,@#RUN           ;SETUP TO RUN FOR DATA COMMAND
021260  000632                           410.                       ;CYLINDER 410.
021262     025                           .BYTE   21.                ;SECTOR 21.
021263     022                           .BYTE   18.                ;TRACK 18.
021264  177373                           -257.-4                    ;WORD COUNT (DATA) = 257. +
                                                                    ;4 HEADER WORDS
021266  002370                           WRFROM                     ;BUS ADDRESS
                                                                    ;STARTING ADDRESS OF DATA
                                                                    ;BUFFER = WRFROM
021270  000000                           0                          ;DO NOT INHIBIT BUS ADDRESS INCREMENT
021272  010000                           FMT22                      ;16 BITS PER WORD FORMAT
                                                                    ;DO NOT INHIBIT ECC CORRECTION
                                                                    ;DO NOT INHIBIT HEADER COMPARE
021274  002344                           WRIFOR                     ;GET READY TO DO A WRIFOR
                                                            ;WRITE HEADER AND DATA WITH 62 IN RHCS1
021276                           8$:
                                         ;*SAVE REGISTERS FOR COMPARISON AFTER WIRTE HEADER AND DATA
021276  004037  033152                   JSR     R0,@#SAVER         ;SAVE REGISTERS
021302  002172                           RHWC                       ;RHWC IS THE FIRST REGISTER SAVED
021304  004512                           SAVERE                     ;STARTING ADDRES OF WHERE
                                                                    ;THE REGISTERS ARE SAVED
021306  000022                           18.                        ;NUMBER OF REGISTERS
                                                                    ;SAVED = 18.
021310  004737  033064                   JSR     PC,@#CHECKT        ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                    ;AND THAT ALL STATUS BITS ARE = 0
021314  104400  056662                   TYPE    ,CPHALT            ;CANNOT CONTINUE TESTING IF NOT
021320  000000                           HALT                       ;STOP TEST
021322  013777  004506  160636           MOV     @#RP4VEC,@RPVEC    ;SET RP04 VECTOR ADDRESS
                                                                    ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                    ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                    ;'TIME' WILL ONLY SAVE
                                                                    ;CURRENT CYLINDER ADDRESS
                                                                    ;AND LOOK AHEAD REGISTERS
021330  013746  002344                   MOV     @#WRIFOR,-(SP)     ;GET READY TO MOVE COMMAND
021334  052716  000101                   BIS     #GO!IE,(SP)        ;GET READY TO SET GO AND
                                                                    ;ENABLE INTERRUPT
021340  012677  160634                   MOV     (SP)+,@RHCS1       ;GO WITH
                                                                    ;62 IN RHCS1 FOR WRITE HEADER AND DATA
```

```
                                                        ;WITH INTERRUPT ENABLED


021344  104412                  WAT                     ;WAIT FOR RDY BIT TO SET
021346  002200                  RHCS1                   ;WAIT FOR RHCS1 REGISTER
021350  000200                  RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
021352  004704                  2500.                   ;ALLOW 25000 MICRO SECONDS
021354  004704                  2500.                   ;RDY MUST SET BETWEEN
                                                        ;00 AND 50000 MICRO SECONDS

                                ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES

021356  004037  032706          JSR     R0,@#FILLRE     ;MOV WRFROM+<260.*2>+<1.*2> INTO SAVED RHBA
021362  002174                  RHBA                    ;SAVED REGISTER TO CHANGE
021364  003402                  WRFROM+<260.*2>+<1.*2>          ;DATA


021366  004037  032706          JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
021372  002172                  RHWC                    ;SAVED REGISTER TO CHANGE
021374  000000                  0                       ;DATA


021376  004037  033674          JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
021402  002200                  RHCS1                   ;CHANGE RHCS1 REGISTER

021404  000002                  2                       ;2 BIT/BITS TO BE CHANGED
021406  000001                  1                       ;NEW VALUE OF SC IS 1
021410  100000                  SC                      ;CHANGE SC BIT
021412  000001                  1                       ;NEW VALUE OF TRE IS 1
021414  040000                  TRE                     ;CHANGE TRE BIT

021416  004037  033674          JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
021422  002176                  RHCS2                   ;CHANGE RHCS2 REGISTER

021424  000002                  2                       ;2 BIT/BITS TO BE CHANGED
021426  000001                  1                       ;NEW VALUE OF OR IS 1
021430  000200                  OR                      ;CHANGE OR BIT
021432  000001                  1                       ;NEW VALUE OF IR IS 1
021434  000100                  IR                      ;CHANGE IR BIT

021436  004037  032706          JSR     R0,@#FILLRE     ;MOV AOE INTO SAVED RHER1
021442  002202                  RHER1                   ;SAVED REGISTER TO CHANGE
021444  001000                  AOE                     ;DATA


021446  004037  033674          JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
021452  002222                  RHDS1                   ;CHANGE RHDS1 REGISTER

021454  000003                  3                       ;3 BIT/BITS TO BE CHANGED
021456  000001                  1                       ;NEW VALUE OF ATA IS 1
021460  100000                  ATA                     ;CHANGE ATA BIT
021462  000001                  1                       ;NEW VALUE OF ERR IS 1
021464  040000                  ERR                     ;CHANGE ERR BIT
021466  000001                  1                       ;NEW VALUE OF LBT IS 1
```

```
021470  002000                          LBT                                     ;CHANGE LBT BIT

021472  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24    ;SET APPROPIATE 'ATA' BITS
                                                                        ;FOR WORKING DRIVE IN
                                                                        ;SAVED RHAS LOCATION

                                        ;*CHECK DEVICE TYPE BEFORE SETTING UP 'RHCA' & 'RHCC'

                                ;;*************************************************************
021500  005737  004636                  TST     @#RP06  ;TEST FOR RP06 DRIVE
021504  001411                          BEQ     9$                      ;TREAT AS RP04
                                                                        ;TREAT AS RP06
                                ;;*************************************************************

021506  004037  032706                  JSR     R0,@#FILLRE             ;MOV 815. INTO SAVED RHCA
021512  002212                          RHCA                            ;SAVED REGISTER TO CHANGE
021514  001457                          815.                            ;DATA

021516  004037  032706                  JSR     R0,@#FILLRE             ;MOV 814. INTO SAVED RHCC
021522  002234                          RHCC                            ;SAVED REGISTER TO CHANGE
021524  001456                          814.                            ;DATA

021526  000410                          BR      10$                     ;CONTINUE WITH TEST
021530                          9$:

021530  004037  032706                  JSR     R0,@#FILLRE             ;MOV 411. INTO SAVED RHCA
021534  002212                          RHCA                            ;SAVED REGISTER TO CHANGE
021536  000633                          411.                            ;DATA

021540  004037  032706                  JSR     R0,@#FILLRE             ;MOV 410. INTO SAVED RHCC
021544  002234                          RHCC                            ;SAVED REGISTER TO CHANGE
021546  000632                          410.                            ;DATA

021550                          10$:                                    ;CONTINUE WITH TEST



021550  017737  160430  004524          MOV     @RHDST,@#SAVERE+12 ;RHDST IS UNPREDICTABLE

                                        ;*COMPARE REGISTERS BEFORE WRITE HEADER AND DATA WITH AFTER

021556  004037  034002                  JSR     R0,@#COMREG             ;COMPARE SAVED REGISTERS WITH
                                                                        ;PRESENT VALUE
021562  004512                          SAVERE                          ;GOOD DATA SAVED IN 'SAVERE'
021564  002254                          WC                              ;TEST DATA STARTING FROM 'RHWC'
021566  000022                          18.                             ;18. REGISTERS TO BE COMPARED
021570  021574                          1$                              ;RETURN TO 1$ ON ERROR
021572  021600                          2$                              ;RETURN TO 2$ ON NO ERROR


021574  104055                  1$:     ERROR   55                      ;WRITING HEADER AND DATA WITH
```

B14


```
021576  000207                  RTS     PC              ;EXPECTED ADDRESS OVERFLOW ERROR
                                                        ;CAUSED IMPROPER REGISTER
                                                        ;CHANGE
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT
                                                        ;WAS THERE AFTER WRITE
                                                        ;HEADER AND DATA
```

```
                                        ;*NOW PREPARE TO DO A READ HEADER AND DATA
                                        ;*(THE FIRST READ OPERATION)

                                        ;*CHECK THE DRIVE TYPE AND FILL
                                        ;*WRITE FROM BUFFER WITH APPROPRIATE EXPECTED HEADER
                                ;;***********************************************************
021600                          2$:

021600  004737  033004                  JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                    ;R3-RHDS1, R4-RHER1
                                                                    ;GIVE RH-11 INITIALIZE
                                                                    ;SETUP UNIT NUMBER

                                ;;***********************************************************
021604  005737  004636                  TST     @#RP06  ;TEST FOR RP06 DRIVE
021610  001411                          BEQ     19$                 ;TREAT UNIT AS AN RP04
                                                                    ;TREAT AS AN RP06
                                ;;***********************************************************

021612  004037  032630                  JSR     R0,@#FLHEAD         ;SAVE HEADER DATA IN WRFROM
021616  002370                          WRFROM                      ;LOCATION WHERE SAVED
021620  000004                          4                           ;NUMBER OF WORDS SAVED
021622  011456                          11456                       ;FIRST DATA WORD
021624  011025                          <18.*400>!<21.>                     ;SECOND DATA WORD
021626  000000                          0                           ;THIRD DATA WORD
021630  000000                          0                           ;FOURTH DATA WORD
021632  000410                          BR      20$                 ;CONTINUE WITH TEST


021634                          19$:

021634  004037  032630                  JSR     R0,@#FLHEAD         ;SAVE HEADER DATA IN WRFROM
021640  002370                          WRFROM                      ;LOCATION WHERE SAVED
021642  000004                          4                           ;NUMBER OF WORDS SAVED
021644  010632                          10632                       ;FIRST DATA WORD
021646  011025                          <18.*400>!<21.>                     ;SECOND DATA WORD
021650  000000                          0                           ;THIRD DATA WORD
021652  000000                          0                           ;FOURTH DATA WORD
021654                          20$:                                ;CONTINUE


                                        ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA

021654  004037  032654                  JSR     R0,@#CLAREA         ;CLEAR 256. WORDS, FROM WRFROM+<4*2>
021660  002400                          WRFROM+<4*2>                        ;STARTING FROM WRFROM+<4*2>
021662  000400                          256.                        ;256. WORDS
021664  065125                          <26.*2000>!<18.*40>!<21.>                               ;FILL WITH <26.*2000>!<18.*40>!<


                                        ;*FILL WRITE FROM BUFFER WITH 377 FROM WORDS 261 TO 266
```

```
021666  004037  032654              JSR     R0,@#CLAREA     ;CLEAR 6 WORDS, FROM WRFROM+<260.*2>
021672  003400                      WRFROM+<260.*2>                 ;STARTING FROM WRFROM+<260.*2>
021674  000006                      6                       ;6 WORDS
021676  000377                      377                     ;FILL WITH 377


                                    ;*CLEAR READ INTO BUFFER

021700  004037  032654              JSR     R0,@#CLAREA     ;CLEAR 266. WORDS, FROM REINTO
021704  003434                      REINTO                  ;STARTING FROM REINTO
021706  000412                      266.                    ;266. WORDS
021710  000377                      377                     ;FILL WITH 377



021712  004737  033004              JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                            ;R3-RHDS1, R4-RHER1
                                                            ;GIVE RH-11 INITIALIZE
                                                            ;SETUP UNIT NUMBER


                                    ;*CHECK THE DRIVE TYPE AND DO THE APPROPRIATE
                                    ;*FILL READ HEADER AND DATA COMMAND

                            ;;***********************************************************************
021716  005737  004636              TST     @#RP06  ;TEST FOR RP06 DRIVE
021722  001412                      BEQ     11$             ;TREAT UNIT AS AN RP04
                                                            ;TREAT UNIT AS AN RP06
                            ;;***********************************************************************

021724  004037  034766              JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
021730  001456                      814.                    ;CYLINDER 814.
021732     025                      .BYTE   21.             ;SECTOR 21.
021733     022                      .BYTE   18.             ;TRACK 18.
021734  177266                      -326.-4                 ;WORD COUNT (DATA) = 326. +
                                                            ;4 HEADER WORDS
021736  003434                      REINTO                  ;BUS ADDRESS
                                                            ;STARTING ADDRESS OF DATA
                                                            ;BUFFER = REINTO
021740  000000                      0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
021742  014000                      ECI!FMT22                       ;16 BITS PER WORD FORMAT
                                                            ;INHIBIT ECC CORRECTION
                                                            ;DO NOT INHIBIT HEADER COMPARE
021744  002350                      REFOR                   ;GET READY TO DO A REFOR
                                                            ;READ HEADER AND DATA WITH 72 IN RHCS1

021746  000411                      BR      12$             ;CONTINUE
021750                      11$:

021750  004037  034766              JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
021754  000632                      410.                    ;CYLINDER 410.
021756     025                      .BYTE   21.             ;SECTOR 21.
021757     022                      .BYTE   18.             ;TRACK 18.
021760  177266                      -326.-4                 ;WORD COUNT (DATA) = 326. +
```

```
                                                                ;4 HEADER WORDS
021762  003434                          REINTO                  ;BUS ADDRESS
                                                                ;STARTING ADDRESS OF DATA
                                                                ;BUFFER = REINTO
021764  000000                          0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
021766  014000                          ECI!FMT22                       ;16 BITS PER WORD FORMAT
                                                                ;INHIBIT ECC CORRECTION
                                                                ;DO NOT INHIBIT HEADER COMPARE
021770  002350                          REFOR                   ;GET READY TO DO A REFOR
                                                                ;READ HEADER AND DATA WITH 72 IN RHCS1

021772                          12$:                            ;CONTINUE WITH TESTING


                                        ;*SAVE REGISTERS FOR COMPARISON AFTER
                                        ;*READ HEADER AND DATA
021772  004037  033152                  JSR     R0,@#SAVER      ;SAVE REGISTERS
021776  002172                          RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
022000  004512                          SAVERE                  ;STARTING ADDRES OF WHERE
                                                                ;THE REGISTERS ARE SAVED
022002  000022                          18.                     ;NUMBER OF REGISTERS
                                                                ;SAVED = 18.

022004  004737  033064                  JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                ;AND THAT ALL STATUS BITS ARE = 0
022010  104400  056662                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
022014  000000                          HALT                    ;STOP TEST

022016  013777  004506  160142          MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                ;'TIME' WILL ONLY SAVE
                                                                ;CURRENT CYLINDER ADDRESS
                                                                ;AND LOOK AHEAD REGISTERS


022024  013746  002350                  MOV     @#REFOR,-(SP)   ;GET READY TO MOVE COMMAND
022030  052716  000101                  BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                ;ENABLE INTERRUPT
022034  012677  160140                  MOV     (SP)+,@RHCS1    ;GO WITH
                                                                 ;72 IN RHCS1 FOR READ DATA
                                                                ;WITH INTERRUPT ENABLED


022040  104412                          WAT                     ;WAIT FOR RDY BIT TO SET
022042  002200                          RHCS1                   ;WAIT FOR RHCS1 REGISTER
022044  000200                          RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
022046  001614                          908.                    ;ALLOW 9080 MICRO SECONDS
022050  001507                          839.                    ;RDY MUST SET BETWEEN
                                                                ;690 AND 17470 MICRO SECONDS

                                        ;*CHANGE        SAVED REGISTERS TO EXPECTED VALUES

022052  004037  032706                  JSR     R0,@#FILLRE     ;MOV REINTO+<260.*2> INTO SAVED RHBA
```

```
022056  002174                          RHBA                            ;SAVED REGISTER TO CHANGE
022060  004444                          REINTO+<260.*2>                     ;DATA

022062  004037  032706                  JSR     R0,@#FILLRE             ;MOV -70. INTO SAVED RHWC
022066  002172                          RHWC                            ;SAVED REGISTER TO CHANGE
022070  177672                          -70.                            ;DATA

022072  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
022076  002200                          RHCS1                           ;CHANGE RHCS1 REGISTER

022100  000002                          2                               ;2 BIT/BITS TO BE CHANGED
022102  000001                          1                               ;NEW VALUE OF SC IS 1
022104  100000                          SC                              ;CHANGE SC BIT
022106  000001                          1                               ;NEW VALUE OF TRE IS 1
022110  040000                          TRE                             ;CHANGE TRE BIT

022112  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
022116  002222                          RHDS1                           ;CHANGE RHDS1 REGISTER

022120  000003                          3                               ;3 BIT/BITS TO BE CHANGED
022122  000001                          1                               ;NEW VALUE OF ATA IS 1
022124  100000                          ATA                             ;CHANGE ATA BIT
022126  000001                          1                               ;NEW VALUE OF ERR IS 1
022130  040000                          ERR                             ;CHANGE ERR BIT
022132  000001                          1                               ;NEW VALUE OF LBT IS 1
022134  002000                          LBT                             ;CHANGE LBT BIT

022136  004037  032706                  JSR     R0,@#FILLRE             ;MOV AOE INTO SAVED RHER1
022142  002202                          RHER1                           ;SAVED REGISTER TO CHANGE
022144  001000                          AOE                             ;DATA


                                        ;*CHECK DRIVE TYPE BEFORE SETTING UP 'RHCA'

                                ;;************************************************************
022146  005737  004636                  TST     @#RP06  ;TEST FOR RP06 DRIVE
022152  001405                          BEQ     13$                     ;TREAT UNIT AS AN RP04
                                                                        ;TREAT UNIT AS AN RP06
                                ;;************************************************************

022154  004037  032706                  JSR     R0,@#FILLRE             ;MOV 815. INTO SAVED RHCA
022160  002212                          RHCA                            ;SAVED REGISTER TO CHANGE
022162  001457                          815.                            ;DATA

022164  000404                          BR      14$                     ;CONTINUE
022166                          13$:

022166  004037  032706                  JSR     R0,@#FILLRE             ;MOV-411. INTO SAVED RHCA
022172  002212                          RHCA                            ;SAVED REGISTER TO CHANGE
022174  000633                          411.                            ;DATA

022176                          14$:                                    ;CONTINUE WITH TEST
```

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022176 053737 004644 004536         BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                 ;FOR WORKING DRIVE IN
                                                                 ;SAVED RHAS LOCATION
022204 017737 157774 004524         MOV     @RHDST,@#SAVERE+12 ;RHDST IS UNPREDICTABLE

                                    ;*COMPARE REGISTERS BEFORE READ HEADER AND DATA WITH
                                    ;*REGISTERS AFTER COMMAND

022212 004037 034002                JSR     R0,@#COMREG          ;COMPARE SAVED REGISTERS WITH
                                                                 ;PRESENT VALUE
022216 004512                       SAVERE                       ;GOOD DATA SAVED IN 'SAVERE'
022220 002254                       WC                           ;TEST DATA STARTING FROM 'RHWC'
022222 000022                       18.                          ;18. REGISTERS TO BE COMPARED
022224 022230                       3$                           ;RETURN TO 3$ ON ERROR
022226 022234                       4$                           ;RETURN TO 4$ ON NO ERROR


022230 104055               3$:     ERROR   55                   ;READING HEADER AND DATA WITH
022232 000207                       RTS     PC                   ;EXPECTED ADDRESS OVERFLOW
                                                                 ;ERROR CAUSED IMPROPER
                                                                 ;REGISTER CHANGE
                                                                 ;GOOD DATA GIVES WHAT SHOULD
                                                                 ;BE THERE
                                                                 ;RECEIVED DATA GIVES WHAT
                                                                 ;WAS THERE AFTER COMMAND

                                    ;*NOW COMPARE THE DATA READ
022234                      4$:

022234 004037 035032                JSR     R0,@#COMPAR          ;COMPARE TWO BLOCKS OF MEMORY
022240 002370                       WRFROM                       ;GOOD DATA STARTS FROM WRFROM
022242 003434                       REINTO                       ;TEST DATA STARTS FROM REINTO
022244 000412                       266.                         ;266.. WORDS TO BE COMPARED
022246 022252                       5$                           ;RETURN TO 5$ ON ERROR
022250 022256                       6$                           ;RETURN TO 6$ ON NO ERROR


022252 104056               5$:     ERROR   56                   ;DATA READ WITH AN EXPECTED
022254 000207                       RTS     PC                   ;ADDRESS OVERFLOW ERROR
                                                                 ;IS INCORRECT
                                                                 ;WORD NO 1 TO 260 SHOULD
                                                                 ;BE READ CORRECTLY
                                                                 ;WORD NO 261 TO 266 SHOULD
                                                                 ;NOT CHANGE DUE TO THE READ
022256                      6$:

022256 004737 033004                JSR     PC,@#CLDISK          ;SET R1-RHCS1, R2-RHCS2
                                                                 ;R3-RHDS1, R4-RHER1
                                                                 ;GIVE RH-11 INITIALIZE
                                                                 ;SETUP UNIT NUMBER

```

```
                                    ;*NOW PREPARE TO READ CYLINDER 0, SECTOR 0, TRACK 0
                                    ;*TO SEE THAT NOTHING GOT WRITTEN ON THERE
                                    ;*WITH THE ADDRESS OVER FLOW BIT SET (AOE)
                                ;;*********************************************************************

                                    ;*FILL WRITE FROM BUFFER WITH EXPECTED HEADER

022262  004037  032630              JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
022266  002370                      WRFROM                  ;LOCATION WHERE SAVED
022270  000004                      4                       ;NUMBER OF WORDS SAVED
022272  010000                      10000                   ;FIRST DATA WORD
022274  000000                      0                       ;SECOND DATA WORD
022276  000000                      0                       ;THIRD DATA WORD
022300  000000                      0                       ;FOURTH DATA WORD

022302  004037  032654              JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM+<4*2>
022306  002400                      WRFROM+<4*2>                    ;STARTING FROM WRFROM+<4*2>
022310  000400                      256.                    ;256. WORDS
022312  000000                      0                       ;FILL WITH 0


                                    ;*FILL READ INTO BUFFER WITH 377

022314  004037  032654              JSR     R0,@#CLAREA     ;CLEAR 260. WORDS, FROM REINTO
022320  003434                      REINTO                  ;STARTING FROM REINTO
022322  000404                      260.                    ;260. WORDS
022324  000377                      377                     ;FILL WITH 377



022326  004737  033004              JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                            ;R3-RHDS1, R4-RHER1
                                                            ;GIVE RH-11 INITIALIZE
                                                            ;SETUP UNIT NUMBER

                                    ;*FILL COMMAND FOR READ HEADER AND DATA

022332  004037  034766              JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
022336  000000                      0                       ;CYLINDER 0
022340     000                      .BYTE   0               ;SECTOR 0
022341     000                      .BYTE   0               ;TRACK 0
022342  177374                      -256.-4                 ;WORD COUNT (DATA) = 256. +
                                                            ;4 HEADER WORDS
022344  003434                      REINTO                  ;BUS ADDRESS
                                                            ;STARTING ADDRESS OF DATA
                                                            ;BUFFER = REINTO
022346  000000                      0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
022350  014000                      ECI!FMT22                       ;16 BITS PER WORD FORMAT
                                                            ;INHIBIT ECC CORRECTION
                                                            ;DO NOT INHIBIT HEADER COMPARE
022352  002350                      REFOR                   ;GET READY TO DO A REFOR
                                                            ;READ HEADER AND DATA WITH 72 IN RHCS1
```

```
                                            ;*SAVE REGISTERS FOR COMPARISON AFTER READ
022354  004037  033152                      JSR     R0,@#SAVER      ;SAVE REGISTERS
022360  002172                              RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
022362  004512                              SAVERE                  ;STARTING ADDRES OF WHERE
                                                                    ;THE REGISTERS ARE SAVED
022364  000021                              17.                     ;NUMBER OF REGISTERS
                                                                    ;SAVED = 17.
022366  004737  033064                      JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                    ;AND THAT ALL STATUS BITS ARE = 0
022372  104400  056662                      TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
022376  000000                              HALT                    ;STOP TEST

022400  013777  004506  157560              MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                    ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                    ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                    ;'TIME' WILL ONLY SAVE
                                                                    ;CURRENT CYLINDER ADDRESS
                                                                    ;AND LOOK AHEAD REGISTERS


022406  013746  002350                      MOV     @#REFOR,-(SP)   ;GET READY TO MOVE COMMAND
022412  052716  000101                      BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                    ;ENABLE INTERRUPT
022416  012677  157556                      MOV     (SP)+,@RHCS1    ;GO WITH
                                                                    ; 72 IN RHCS1 FOR READ DATA
                                                                    ;WITH INTERRUPT ENABLED


022422  104412                              WAT                     ;WAIT FOR RDY BIT TO SET
022424  002200                              RHCS1                   ;WAIT FOR RHCS1 REGISTER
022426  000200                              RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
022430  004704                              2500.                   ;ALLOW 25000 MICRO SECONDS
022432  004704                              2500.                   ;RDY MUST SET BETWEEN
                                                                    ;00 AND 50000 MICRO SECONDS

                                            ;*CHANGE        REGISTERS TO EXPECTED VALUE

022434  004037  032706                      JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
022440  002172                              RHWC                    ;SAVED REGISTER TO CHANGE
022442  000000                              0                       ;DATA


022444  004037  032706                      JSR     R0,@#FILLRE     ;MOV REINTO+<260.*2> INTO SAVED RHBA
022450  002174                              RHBA                    ;SAVED REGISTER TO CHANGE
022452  004444                              REINTO+<260.*2>                 ;DATA


022454  004037  032706                      JSR     R0,@#FILLRE     ;MOV 1 INTO SAVED RHDST
022460  002204                              RHDST                   ;SAVED REGISTER TO CHANGE
022462  000001                              1                       ;DATA


022464                              ST22A:  ;COMPARE REGISTER BEFORE READ WITH AFTER
```

```
022464  004037  034002          JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                        ;PRESENT VALUE
022470  004512                  SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
022472  002254                  WC                      ;TEST DATA STARTING FROM 'RHWC'
022474  000021                  17.                     ;17. REGISTERS TO BE COMPARED
022476  022502                  4$                      ;RETURN TO 4$ ON ERROR
022500  022506                  1$                      ;RETURN TO 1$ ON NO ERROR


022502  104031          4$:     ERROR   31              ;READ HEADER AND DATA ON
022504  000207                  RTS     PC              ;CYLINDER 0, SECTOR 0
                                                        ;TRACK 0 AFTER A FORCED
                                                        ;ADDRESS OVER FLOW ERROR
                                                        ;CAUSED IMPROPER REGISTER
                                                        ;CHANGE
                                                        ;GOOD DATA GIVES WHAT
                                                        ;SHOULD BE THERE
                                                        ;RECEIVED DATA GIVES WHAT
                                                        ;WAS THERE AFTER READ
                                                        ;HEADER AND DATA
                                                        ;IF HEADER COMPARE ERROR
                                                        ;IS FOUND AND THE DATA
                                                        ;ERROR GIVES THE NEW
                                                        ;HEADER TO
                                                        ;CYLINDER 633/1457 (OCTAL)
                                                        ;THEN 'AOE' OVER FLOWED
                                                        ;INTO HERE


                                ;*COMPARE DATA/READ
022506                  1$:

022506  004037  035032          JSR     R0,@#COMPAR     ;COMPARE TWO BLOCKS OF MEMORY
022512  002370                  WRFROM                  ;GOOD DATA STARTS FROM WRFROM
022514  003434                  REINTO                  ;TEST DATA STARTS FROM REINTO
022516  000404                  260.                    ;260., WORDS TO BE COMPARED
022520  022524                  2$                      ;RETURN TO 2$ ON ERROR
022522  022530                  3$                      ;RETURN TO 3$ ON NO ERROR


022524  104032          2$:     ERROR   32              ;READ HEADER AND DATA
022526  000207                  RTS     PC              ;ON CYLINDER 0, TRACK 0
                                                        ;SECTOR 0 AFTER A FORCED
                                                        ;'AOE' ERROR CAUSED
                                                        ;AN ERROR
                                                        ;IF FIRST WORD IS
                                                        ;10633/11457 (OCTAL) THEN
                                                        ;'AOE' OVER FLOWED INTO HERE
022530                  3$:
```

```

                                       ;;***********************************************************
                                       ;*TEST 25        FORMAT ERROR - RHER1 (BIT #4)FMT

                                       ;*       AN ATTEMPT WILL BE MADE TO WRITE DATA ON CYLINDER 0
                                       ;*       SECTOR 0 TRACK 0 WITH 18 BITS PER WORD WHEN THE
                                       ;*       HEADER HAS 16 BITS PER WORD SET
                                       ;*
                                       ;*       THIS SHOULD GIVE FORMAT ERROR FER BIT #4 IN RHER1
                                       ;*
                                       ;*       THEN THIS SECTOR WILL BE READ IN THE CORRECT FORMAT
                                       ;*       16 BITS PER WORD TO CHECK THAT NOTHING GOT WRITTEN
                                       ;;***********************************************************
 022530  000004                        TST25:  SCOPE
 022532  012706  001000                        MOV     #STACK,SP           ;RESET STACK
 022536  012737  000025  004504                MOV     #25,@#TSTNM         ;SAVE TEST NUMBER

 022544  004737  033004                        JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                           ;R3-RHDS1, R4-RHER1
                                                                           ;GIVE RH-11 INITIALIZE
                                                                           ;SETUP UNIT NUMBER

                                               ;*FIRST WRITE HEADER AND DATA CYLINDER 0, TRACK 0, SECTOR 0
                                               ;*FILL WRITE FROM BUFFER WITH HEADER

 022550  004037  032630                        JSR     R0,@#FLHEAD         ;SAVE HEADER DATA IN WRFROM
 022554  002370                                WRFROM                      ;LOCATION WHERE SAVED
 022556  000004                                4                           ;NUMBER OF WORDS SAVED
 022560  010000                                10000                       ;FIRST DATA WORD
 022562  000000                                0                           ;SECOND DATA WORD
 022564  000000                                0                           ;THIRD DATA WORD
 022566  000000                                0                           ;FOURTH DATA WORD

                                               ;*FILL WRITE FROM BUFFER WITH DATA

 022570  004037  032654                        JSR     R0,@#CLAREA         ;CLEAR 256. WORDS, FROM WRFROM+<4*2>
 022574  002400                                WRFROM+<4*2>                      ;STARTING FROM WRFROM+<4*2>
 022576  000400                                256.                        ;256. WORDS
 022600  000000                                0                           ;FILL WITH 0


                                               ;*FILL COMMAND

 022602  004037  034766                        JSR     R0,@#RUN            ;SETUP TO RUN FOR DATA COMMAND
 022606  000000                                0                           ;CYLINDER 0
 022610     000                                .BYTE   0                   ;SECTOR 0
 022611     000                                .BYTE   0                   ;TRACK 0
 022612  177374                                -256.-4                     ;WORD COUNT (DATA) = 256. +
                                                                           ;4 HEADER WORDS
 022614  002370                                WRFROM                      ;BUS ADDRESS
                                                                           ;STARTING ADDRESS OF DATA
                                                                           ;BUFFER = WRFROM
 022616  000000                                0                           ;DO NOT INHIBIT BUS ADDRESS INCREMENT
 022620  010000                                FMT22                       ;16 BITS PER WORD FORMAT
```

```
                                                        ;DO NOT INHIBIT ECC CORRECTION
                                                        ;DO NOT INHIBIT HEADER COMPARE
022622  002344                  WRIFOR                  ;GET READY TO DO A WRIFOR
                                                ;WRITE HEADER AND DATA WITH 62 IN RHCS1
022624  004737  033064          JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                        ;AND THAT ALL STATUS BITS ARE = 0
022630  104400  056662          TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
022634  000000                  HALT                    ;STOP TEST
022636  013777  004506  157322  MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                        ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                        ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                        ;'TIME' WILL ONLY SAVE
                                                        ;CURRENT CYLINDER ADDRESS
                                                        ;AND LOOK AHEAD REGISTERS
022644  013746  002344          MOV     @#WRIFOR,-(SP)  ;GET READY TO MOVE COMMAND
022650  052716  000101          BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                        ;ENABLE INTERRUPT
022654  012677  157320          MOV     (SP)+,@RHCS1    ;GO WITH
                                                        ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                        ;WITH INTERRUPT ENABLED
022660  104412                  WAT                     ;WAIT FOR RDY BIT TO SET
022662  002200                  RHCS1                   ;WAIT FOR RHCS1 REGISTER
022664  000200                  RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
022666  004704                  2500.                   ;ALLOW 25000 MICRO SECONDS
022670  004704                  2500.                   ;RDY MUST SET BETWEEN
                                                        ;00 AND 50000 MICRO SECONDS
022672  004737  033004          JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                        ;R3-RHDS1, R4-RHER1
                                                        ;GIVE RH-11 INITIALIZE
                                                        ;SETUP UNIT NUMBER
```

```
                                        ;*NOW PREPARE TO WRITE WITH WRONG FORMAT

                                        ;*FILL WRITE FROM BUFFER

022676  004037  032654                  JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM
022702  002370                          WRFROM                  ;STARTING FROM WRFROM
022704  000400                          256.                    ;256. WORDS
022706  000377                          377                     ;FILL WITH 377


                                        ;*FILL WRITE DATA COMMAND

022710  004037  034766                  JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
022714  000000                          0                       ;CYLINDER 0
022716     000                          .BYTE   0               ;SECTOR 0
022717     000                          .BYTE   0               ;TRACK 0
022720  177400                          -256.                   ;WORD COUNT = 256.
022722  002370                          WRFROM                  ;BUS ADDRESS
                                                                ;STARTING ADDRESS OF DATA
                                                                ;BUFFER = WRFROM
022724  000000                          0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
022726  000000                          0                       ;18 BITS PER WORD FORMAT
                                                                ;DO NOT INHIBIT ECC CORRECTION
                                                                ;DO NOT INHIBIT HEADER COMPARE
022730  002342                          WRIDAT                  ;GET READY TO DO A WRIDAT
                                                      ;WRITE DATA WITH 60 IN RHCS1


                                        ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED WRITE DATA
                                        ;*WITH WRONG FORMAT
022732  004037  033152                  JSR     R0,@#SAVER      ;SAVE REGISTERS
022736  002172                          RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
022740  004512                          SAVERE                  ;STARTING ADDRES OF WHERE
                                                                ;THE REGISTERS ARE SAVED
022742  000022                          18.                     ;NUMBER OF REGISTERS
                                                                ;SAVED = 18.

022744  004737  033064                  JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                ;AND THAT ALL STATUS BITS ARE = 0
022750  104400  056662                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
022754  000000                          HALT                    ;STOP TEST

022756  013777  004506  157202          MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                ;'TIME' WILL ONLY SAVE
                                                                ;CURRENT CYLINDER ADDRESS
                                                                ;AND LOOK AHEAD REGISTERS


022764  013746  002342                  MOV     @#WRIDAT,-(SP)  ;GET READY TO MOVE COMMAND
022770  052716  000101                  BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                ;ENABLE INTERRUPT
```

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022774  012677  157200          MOV     (SP)+,@RHCS1        ;GO WITH
                                                             ;60 IN RHCS1 FOR WRITE DATA
                                                            ;WITH INTERRUPT ENABLED

023000  104412                  WAT                         ;WAIT FOR RDY BIT TO SET
023002  002200                  RHCS1                       ;WAIT FOR RHCS1 REGISTER
023004  000200                  RDY                         ;WAIT FOR RDY BIT IN RHCS1 REGISTER
023006  001522                  850.                        ;ALLOW 8500 MICRO SECONDS
023010  001510                  840.                        ;RDY MUST SET BETWEEN
                                                            ;100 AND 16900 MICRO SECONDS

                                ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE
023012  005737  004640          TST     @#RH70              ;RH70 CONTROLLER ?
023016  001411                  BEQ     7$                  ;IF NOT, SKIP NEXT RH70 CODE

023020  004037  032706          JSR     R0,@#FILLRE         ;MOV -248. INTO SAVED RHWC
023024  002172                  RHWC                        ;SAVED REGISTER TO CHANGE
023026  177410                  -248.                       ;DATA

023030  004037  032706          JSR     R0,@#FILLRE         ;MOV WRFROM+<8.*2> INTO SAVED RHBA
023034  002174                  RHBA                        ;SAVED REGISTER TO CHANGE
023036  002410                  WRFROM+<8.*2>                         ;DATA

023040  000410                  BR      8$                  ;SKIP NEXT RH11 CODE

023042                  7$:

023042  004037  032706          JSR     R0,@#FILLRE         ;MOV -190. INTO SAVED RHWC
023046  002172                  RHWC                        ;SAVED REGISTER TO CHANGE
023050  177502                  -190.                       ;DATA

023052  004037  032706          JSR     R0,@#FILLRE         ;MOV WRFROM+<66.*2> INTO SAVED RHBA
023056  002174                  RHBA                        ;SAVED REGISTER TO CHANGE
023060  002574                  WRFROM+<66.*2>                        ;DATA

023062                  8$:

023062  004037  033674          JSR     R0,@#CHREG          ;CHANGE BITS IN SAVED REGISTER
023066  002200                  RHCS1                       ;CHANGE RHCS1 REGISTER

023070  000002                  2                           ;2 BIT/BITS TO BE CHANGED
023072  000001                  1                           ;NEW VALUE OF SC IS 1
023074  100000                  SC                          ;CHANGE SC BIT
023076  000001                  1                           ;NEW VALUE OF TRE IS 1
023100  040000                  TRE                         ;CHANGE TRE BIT

023102  004037  033674          JSR     R0,@#CHREG          ;CHANGE BITS IN SAVED REGISTER
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023106  002176                          RHCS2                           ;CHANGE RHCS2 REGISTER
023110  000001                          1                               ;1 BIT/BITS TO BE CHANGED
023112  000001                          1                               ;NEW VALUE OF OR IS 1
023114  000200                          OR                              ;CHANGE OR BIT
023116  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
023122  002222                          RHDS1                           ;CHANGE RHDS1 REGISTER
023124  000002                          2                               ;2 BIT/BITS TO BE CHANGED
023126  000001                          1                               ;NEW VALUE OF ATA IS 1
023130  100000                          ATA                             ;CHANGE ATA BIT
023132  000001                          1                               ;NEW VALUE OF ERR IS 1
023134  040000                          ERR                             ;CHANGE ERR BIT
023136  004037  032706                  JSR     R0,@#FILLRE             ;MOV 1 INTO SAVED RHDST
023142  002204                          RHDST                           ;SAVED REGISTER TO CHANGE
023144  000001                          1                               ;DATA
023146  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24    ;SET APPROPIATE 'ATA' BITS
                                                                        ;FOR WORKING DRIVE IN
                                                                        ;SAVED RHAS LOCATION
023154  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
023160  002202                          RHER1                           ;CHANGE RHER1 REGISTER
023162  000001                          1                               ;1 BIT/BITS TO BE CHANGED
023164  000001                          1                               ;NEW VALUE OF FER IS 1
023166  000020                          FER                             ;CHANGE FER BIT
023170  017746  157002                  MOV     @RHCS2,-(SP)            ;GET RHCS2
023174  042716  177477                  BIC     #^C<IR!OR>,(SP)         ;KEEP IR AND OR
023200  042737  000300  004516          BIC     #IR!OR,@#SAVERE+4       ;CLEAR SAVED IR OR
023206  052637  004516                  BIS     (SP)+,@#SAVERE+4        ;SET OR IR AS REQUIRED

                                ;*COMPARE REGISTERS BEFORE WRITE DATA WITH AFTER ATTEMPT

023212  004037  034002                  JSR     R0,@#COMREG             ;COMPARE SAVED REGISTERS WITH
                                                                        ;PRESENT VALUE
023216  004512                          SAVERE                          ;GOOD DATA SAVED IN 'SAVERE'
023220  002254                          WC                              ;TEST DATA STARTING FROM 'RHWC'
023222  000022                          18.                             ;18. REGISTERS TO BE COMPARED
023224  023230                          1$                              ;RETURN TO 1$ ON ERROR
023226  023234                          2$                              ;RETURN TO 2$ ON NO ERROR
023230  104057                  1$:     ERROR   57                      ;ATTEMPTING TO WRITE DATA
023232  000207                          RTS     PC                      ;WITH WRONG FORMAT BIT CAUSED
                                                                        ;IMPROPER REGISTER CHANGE
                                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                                        ;BE THERE
                                                                        ;RECEIVED DATA GIVES WHAT WAS
```

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                                                        ;THERE AFTER ATTEMPTED WRITE
                                    ;*NOW PREPARE TO READ WITH CORRECT FORMAT TO CHECK
                                    ;*THAT NOTHING GOT WRITTEN
023234                      2$:
023234  004737  033004              JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                        ;R3-RHDS1, R4-RHER1
                                                        ;GIVE RH-11 INITIALIZE
                                                        ;SETUP UNIT NUMBER
                                    ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA
023240  004037  032654              JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM
023244  002370                      WRFROM                  ;STARTING FROM WRFROM
023246  000400                      256.                    ;256. WORDS
023250  000000                      0                       ;FILL WITH 0
                                    ;*FILL READ INTO BUFFER WITH 125252
023252  004037  032654              JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM REINTO
023256  003434                      REINTO                  ;STARTING FROM REINTO
023260  000400                      256.                    ;256. WORDS
023262  125252                      125252                  ;FILL WITH 125252
                                    ;*FILL COMMAND TO READ DATA
023264  004037  034766              JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
023270  000000                      0                       ;CYLINDER 0
023272     000                      .BYTE   0               ;SECTOR 0
023273     000                      .BYTE   0               ;TRACK 0
023274  177400                      -256.                   ;WORD COUNT = 256.
023276  003434                      REINTO                  ;BUS ADDRESS
                                                        ;STARTING ADDRESS OF DATA
                                                        ;BUFFER = REINTO
023300  000000                      0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
023302  014000                      FMT22!ECI                       ;16 BITS PER WORD FORMAT
                                                        ;INHIBIT ECC CORRECTION
                                                        ;DO NOT INHIBIT HEADER COMPARE
023304  002346                      READAT                  ;GET READY TO DO A READAT
                                                ;READ DATA WITH 70 IN RHCS1
                                    ;*SAVE REGISTERS FOR COMPARISON AFTER NORMAL READ
023306  004037  033152              JSR     R0,@#SAVER      ;SAVE REGISTERS
023312  002172                      RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
023314  004512                      SAVERE                  ;STARTING ADDRES OF WHERE
                                                        ;THE REGISTERS ARE SAVED
023316  000022                      18.                     ;NUMBER OF REGISTERS
                                                        ;SAVED = 18.
023320  004737  033064              JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                        ;AND THAT ALL STATUS BITS ARE = 0
```

```
023324  104400  056662                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
023330  000000                          HALT                    ;STOP TEST

023332  013777  004506  156626          MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                ;'TIME' WILL ONLY SAVE
                                                                ;CURRENT CYLINDER ADDRESS
                                                                ;AND LOOK AHEAD REGISTERS


023340  013746  002346                  MOV     @#READAT,-(SP)  ;GET READY TO MOVE COMMAND
023344  052716  000101                  BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                ;ENABLE INTERRUPT
023350  012677  156624                  MOV     (SP)+,@RHCS1    ;GO WITH
                                                                ;70 IN RHCS1 FOR READ DATA
                                                                ;WITH INTERRUPT ENABLED


023354  104412                          WAT                     ;WAIT FOR RDY BIT TO SET
023356  002200                          RHCS1                   ;WAIT FOR RHCS1 REGISTER
023360  000200                          RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
023362  001614                          908.                    ;ALLOW 9080 MICRO SECONDS
023364  001507                          839.                    ;RDY MUST SET BETWEEN
                                                                ;690 AND 17470 MICRO SECONDS

                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE

023366  004037  032706                  JSR     R0,@#FILLRE     ;MOV REINTO+<256.*2> INTO SAVED RHBA
023372  002174                          RHBA                    ;SAVED REGISTER TO CHANGE
023374  004434                          REINTO+<256.*2>                 ;DATA


023376  004037  032706                  JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
023402  002172                          RHWC                    ;SAVED REGISTER TO CHANGE
023404  000000                          0                       ;DATA


023406  004037  032706                  JSR     R0,@#FILLRE     ;MOV 1 INTO SAVED RHDST
023412  002204                          RHDST                   ;SAVED REGISTER TO CHANGE
023414  000001                          1                       ;DATA

023416  017746  156554                  MOV     @RHCS2,-(SP)    ;GET RHCS2
023422  042716  177477                  BIC     #^C<IR!OR>,(SP) ;KEEP IR AND OR
023426  042737  000300  004516          BIC     #IR!OR,@#SAVERE+4;CLEAR SAVED IR OR
023434  052637  004516                  BIS     (SP)+,@#SAVERE+4;SET OR IR AS REQUIRED




                                        ;*COMPARE REGISTERS BEFORE READ WITH AFTER

023440  004037  034002                  JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                                ;PRESENT VALUE
```

```
023444  004512                          SAVERE                          ;GOOD DATA SAVED IN 'SAVERE'
023446  002254                          WC                              ;TEST DATA STARTING FROM 'RHWC'
023450  000022                          18.                             ;18. REGISTERS TO BE COMPARED
023452  023456                          3$                              ;RETURN TO 3$ ON ERROR
023454  023462                          4$                              ;RETURN TO 4$ ON NO ERROR


023456  104033                  3$:     ERROR   33                      ;READ DATA AFTER AN
023460  000207                          RTS     PC                      ;ATTEMPTED WRITE WITH WRONG
                                                                        ;IMPROPER REGISTER CHANGE
                                                                        ;FORMAT CAUSED
                                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                                        ;BE THERE
                                                                        ;RECEIVED DATA GIVES WHAT
                                                                        ;WAS THERE AFTER READ

                                        ;*COMPARE DATA READ AFTER ATTEMPTED WRITE WITH
                                        ;*WRONG FORMAT BIT
023462                          4$:

023462  004037  035032                  JSR     R0,@#COMPAR             ;COMPARE TWO BLOCKS OF MEMORY
023466  002370                          WRFROM                          ;GOOD DATA STARTS FROM WRFROM
023470  003434                          REINTO                          ;TEST DATA STARTS FROM REINTO
023472  000400                          256.                            ;256., WORDS TO BE COMPARED
023474  023500                          5$                              ;RETURN TO 5$ ON ERROR
023476  023504                          6$                              ;RETURN TO 6$ ON NO ERROR


023500  104034                  5$:     ERROR   34                      ;DATA READ AFTER AN ATTEMPT
023502  000207                          RTS     PC                      ;TO WRITE WITH WRONG FORMAT
                                                                        ;WAS INCORRECT

023504                          6$:
```

```
                                        ;;*************************************************************
                                        ;*TEST 26        FORMAT ERROR - RHER1 (BIT #4)FMT

                                        ;*      AN ATTEMPT IS MADE TO READ DATA WITH WRONG
                                        ;*      FORMAT BIT
                                        ;*
                                        ;*      FORMAT ERROR BIT #4 IN RHER1 SHOULD SET
                                        ;*      NO DATA SHOULD BE READ

                                        ;;*************************************************************
023504  000004                          TST26:  SCOPE
023506  012706  001000                          MOV     #STACK,SP       ;RESET STACK
023512  012737  000026  004504                  MOV     #26,@#TSTNM     ;SAVE TEST NUMBER

023520  004737  033004                          JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                        ;R3-RHDS1, R4-RHER1
                                                                        ;GIVE RH-11 INITIALIZE
                                                                        ;SETUP UNIT NUMBER

                                                ;*FILL WRITE FROM BUFFER WITH 107070

023524  004037  032654                          JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM
023530  002370                                  WRFROM                  ;STARTING FROM WRFROM
023532  000400                                  256.                    ;256. WORDS
023534  107070                                  107070                  ;FILL WITH 107070


                                                ;*FILL READ INTO BUFFER WITH 107070

023536  004037  032654                          JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM REINTO
023542  003434                                  REINTO                  ;STARTING FROM REINTO
023544  000400                                  256.                    ;256. WORDS
023546  107070                                  107070                  ;FILL WITH 107070


                                                ;*FILL COMMAND TO READ WITH WRONG FORMAT.

023550  004037  034766                          JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
023554  000000                                  0                       ;CYLINDER 0
023556     000                                  .BYTE   0               ;SECTOR 0
023557     000                                  .BYTE   0               ;TRACK 0
023560  177400                                  -256.                   ;WORD COUNT = 256.
023562  003434                                  REINTO                  ;BUS ADDRESS
                                                                        ;STARTING ADDRESS OF DATA
                                                                        ;BUFFER = REINTO
023564  000000                                  0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
023566  004000                                  ECI                     ;18 BITS PER WORD FORMAT
                                                                        ;INHIBIT ECC CORRECTION
                                                                        ;DO NOT INHIBIT HEADER COMPARE
023570  002346                                  READAT                  ;GET READY TO DO A READAT
                                                                ;READ DATA WITH 70 IN RHCS1



                                                ;*SAVE REGISTERS FOR COMPARAISON AFTER READ
```

```
023572  004037  033152                  JSR     R0,@#SAVER      ;SAVE REGISTERS
023576  002172                          RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
023600  004512                          SAVERE                  ;STARTING ADDRES OF WHERE
                                                                ;THE REGISTERS ARE SAVED
023602  000022                          18.                     ;NUMBER OF REGISTERS
                                                                ;SAVED = 18.

023604  004737  033064                  JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                ;AND THAT ALL STATUS BITS ARE = 0
023610  104400  056662                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
023614  000000                          HALT                    ;STOP TEST

023616  013777  004506  156342          MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                ;'TIME' WILL ONLY SAVE
                                                                ;CURRENT CYLINDER ADDRESS
                                                                ;AND LOOK AHEAD REGISTERS

023624  013746  002346                  MOV     @#READAT,-(SP)  ;GET READY TO MOVE COMMAND
023630  052716  000101                  BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                ;ENABLE INTERRUPT
023634  012677  156340                  MOV     (SP)+,@RHCS1    ;GO WITH
                                                                ;70 IN RHCS1 FOR READ DATA
                                                                ;WITH INTERRUPT ENABLED

023640  104412                          WAT                     ;WAIT FOR RDY BIT TO SET
023642  002200                          RHCS1                   ;WAIT FOR RHCS1 REGISTER
023644  000200                          RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
023646  001522                          850.                    ;ALLOW 8500 MICRO SECONDS
023650  001510                          840.                    ;RDY MUST SET BETWEEN
                                                                ;100 AND 16900 MICRO SECONDS

                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE

023652  004037  033674                  JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
023656  002200                          RHCS1                   ;CHANGE RHCS1 REGISTER

023660  000002                          2                       ;2 BIT/BITS TO BE CHANGED
023662  000001                          1                       ;NEW VALUE OF SC IS 1
023664  100000                          SC                      ;CHANGE SC BIT
023666  000001                          1                       ;NEW VALUE OF TRE IS 1
023670  040000                          TRE                     ;CHANGE TRE BIT

023672  004037  033674                  JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
023676  002222                          RHDS1                   ;CHANGE RHDS1 REGISTER

023700  000002                          2                       ;2 BIT/BITS TO BE CHANGED
023702  000001                          1                       ;NEW VALUE OF ATA IS 1
023704  100000                          ATA                     ;CHANGE ATA BIT
023706  000001                          1                       ;NEW VALUE OF ERR IS 1
```

```
023710  040000                          ERR                             ;CHANGE ERR BIT

023712  004037  032706                  JSR     R0,@#FILLRE             ;MOV 1 INTO SAVED RHDST
023716  002204                          RHDST                           ;SAVED REGISTER TO CHANGE
023720  000001                          1                               ;DATA


023722  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
023726  002202                          RHER1                           ;CHANGE RHER1 REGISTER

023730  000001                          1                               ;1 BIT/BITS TO BE CHANGED
023732  000001                          1                               ;NEW VALUE OF FER IS 1
023734  000020                          FER                             ;CHANGE FER BIT

023736  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                        ;FOR WORKING DRIVE IN
                                                                        ;SAVED RHAS LOCATION
023744  017746  156226                  MOV     @RHCS2,-(SP)            ;GET RHCS2
023750  042716  177477                  BIC     #^C<IR!OR>,(SP)         ;KEEP IR AND OR
023754  042737  000300  004516          BIC     #IR!OR,@#SAVERE+4;CLEAR SAVED IR OR
023762  052637  004516                  BIS     (SP)+,@#SAVERE+4;SET OR IR AS REQUIRED



                                        ;*COMPARE REGISTERS BEFORE WRITE DATA WITH AFTER ATTEMPT

023766  004037  034002                  JSR     R0,@#COMREG             ;COMPARE SAVED REGISTERS WITH
                                                                        ;PRESENT VALUE
023772  004512                          SAVERE                          ;GOOD DATA SAVED IN 'SAVERE'
023774  002254                          WC                              ;TEST DATA STARTING FROM 'RHWC'
023776  000022                          18.                             ;18. REGISTERS TO BE COMPARED
024000  024004                          1$                              ;RETURN TO 1$ ON ERROR
024002  024010                          2$                              ;RETURN TO 2$ ON NO ERROR


024004  104057                  1$:     ERROR   57                      ;ATTEMPTING TO READ DATA
024006  000207                          RTS     PC                      ;WITH WRONG FORMAT BIT CAUSED
                                                                        ;IMPROPER REGISTER CHANGE
                                                                        ;GOOD DATA GIVES WHAT SHOULD BE
                                                                        ;THERE
                                                                        ;RECEIVED DATA GIVES WHAT WAS THERE
                                                                        ;AFTER READ DATA

                                        ;*COMPARE READ INTO BUFFER TO CHECK THAT NOTHING WAS READ
024010                          2$:

024010  004037  035032                  JSR     R0,@#COMPAR             ;COMPARE TWO BLOCKS OF MEMORY
024014  002370                          WRFROM                          ;GOOD DATA STARTS FROM WRFROM
024016  003434                          REINTO                          ;TEST DATA STARTS FROM REINTO
024020  000400                          256.                            ;256., WORDS TO BE COMPARED
024022  024026                          3$                              ;RETURN TO 3$ ON ERROR
024024  024032                          4$                              ;RETURN TO 4$ ON NO ERROR
```

```
024026  104034          3$:     ERROR   34              ;ATTEMPT TO READ
024030  000207                  RTS     PC              ;WITH WRONG FORMAT BIT
                                                        ;CHANGED READ INTO BUFFER
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;BAD DATA GIVES WHAT WAS
                                                        ;THERE AFTER READ DATA

024032                  4$:
```

```

                                        ;;*************************************************************
                                        ;*TEST 27        REGISTER MODIFICATION REFUSED - RHER1(BIT #2),RMR

                                        ;*      CYLINDER1 TRACK 0, SECTOR 0 WILL BE WRITTEN WITH
                                        ;*      200 WORDS OF 2000 BY A WRITE HEADER AND DATA COMMAND
                                        ;*
                                        ;*      THE HEADS WILL BE BROUGHT TO CYLINDER 0 BY A SEEK
                                        ;*
                                        ;*      A READ DATA COMMAND WILL BE GIVEN TO CYLINDER 1 TRACK 0
                                        ;*      SECTOR 0 150. WORDS. THIS WILL TAKE AT
                                        ;*      LEAST 7 MILI SECONDS.  IMMEDIATELY AFTER GO AT
                                        ;*      IMPLIED SEEK TIME, WRITE INTO A REGISTER WILL BE ATTMEPTED
                                        ;*      THEN READY WILL BE WAITED ON TO COMPLETE THE READ DATA
                                        ;*      THEN ALL REGISTERS WILL BE COMPARED AND THE DATA READ
                                        ;*      SHOULD BE GOOD
                                        ;*      THIS WILL BE REPEATED FOR RHCS1, RHER1, RHDST, RHER2
                                        ;*      RHOF, RHCA, RHER3

                                        ;;*************************************************************
024032  000004                          TST27:  SCOPE
024034  012706  001000                          MOV     #STACK,SP       ;RESET STACK
024040  012737  000027  004504                  MOV     #27,@#TSTNM     ;SAVE TEST NUMBER

024046  004737  033004                          JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                        ;R3-RHDS1, R4-RHER1
                                                                        ;GIVE RH-11 INITIALIZE
                                                                        ;SETUP UNIT NUMBER
024052  012737  002200  004650                  MOV     #RHCS1,@#TMP0   ;FIRST REGISTER TO BE TESTED
024060  012737  000007  004656                  MOV     #7,@#TMP5       ;NUMBER OF REGISTERS TO BE TESTED

                                                ;*PREPARE TO WRITE HEADER AND DATA CYLINDER 1, TRACK 0, SECTOR 0
                                                ;*FILL WRITE FROM BUFFER WITH HEADER

024066                                  ST22:

024066  004737  033004                          JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                        ;R3-RHDS1, R4-RHER1
                                                                        ;GIVE RH-11 INITIALIZE
                                                                        ;SETUP UNIT NUMBER

024072  004037  032630                          JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
024076  002370                                  WRFROM                  ;LOCATION WHERE SAVED
024100  000004                                  4                       ;NUMBER OF WORDS SAVED
024102  010001                                  10001                   ;FIRST DATA WORD
024104  000000                                  0                       ;SECOND DATA WORD
024106  000000                                  0                       ;THIRD DATA WORD
024110  000000                                  0                       ;FOURTH DATA WORD

                                                ;*FILL WRITE FROM BUFFER WITH DATA

024112  004037  032654                          JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM+<4*2>
024116  002400                                  WRFROM+<4*2>                    ;STARTING FROM WRFROM+<4*2>
024120  000400                                  256.                    ;256. WORDS
```

```
024122  002000                          2000                            ;FILL WITH 2000

                                        ;*FILL COMMAND

024124  004037  034766                  JSR     R0,@#RUN                ;SETUP TO RUN FOR DATA COMMAND
024130  000001                          1                               ;CYLINDER 1
024132     000                          .BYTE   0                       ;SECTOR 0
024133     000                          .BYTE   0                       ;TRACK 0
024134  177464                          -200.-4                         ;WORD COUNT (DATA) = 200. +
                                                                        ;4 HEADER WORDS
024136  002370                          WRFROM                          ;BUS ADDRESS
                                                                        ;STARTING ADDRESS OF DATA
                                                                        ;BUFFER = WRFROM
024140  000000                          0                               ;DO NOT INHIBIT BUS ADDRESS INCREMENT
024142  010000                          FMT22                           ;16 BITS PER WORD FORMAT
                                                                        ;DO NOT INHIBIT ECC CORRECTION
                                                                        ;DO NOT INHIBIT HEADER COMPARE
024144  002344                          WRIFOR                          ;GET READY TO DO A WRIFOR
                                                        ;WRITE HEADER AND DATA WITH 62 IN RHCS1


024146  004737  033064                  JSR     PC,@#CHECKT             ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                        ;AND THAT ALL STATUS BITS ARE = 0
024152  104400  056662                  TYPE    ,CPHALT                 ;CANNOT CONTINUE TESTING IF NOT
024156  000000                          HALT                            ;STOP TEST

024160  013777  004506  156000          MOV     @#RP4VEC,@RPVEC         ;SET RP04 VECTOR ADDRESS
                                                                        ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                        ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                        ;'TIME' WILL ONLY SAVE
                                                                        ;CURRENT CYLINDER ADDRESS
                                                                        ;AND LOOK AHEAD REGISTERS


024166  013746  002344                  MOV     @#WRIFOR,-(SP)          ;GET READY TO MOVE COMMAND
024172  052716  000101                  BIS     #GO!IE,(SP)             ;GET READY TO SET GO AND
                                                                        ;ENABLE INTERRUPT
024176  012677  155776                  MOV     (SP)+,@RHCS1            ;GO WITH
                                                                        ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                                        ;WITH INTERRUPT ENABLED

                                        ;*TIME IS NOT IMPORTANT

024202  104412                          WAT                             ;WAIT FOR RDY BIT TO SET
024204  002200                          RHCS1                           ;WAIT FOR RHCS1 REGISTER
024206  000200                          RDY                             ;WAIT FOR RDY BIT IN RHCS1 REGISTER
024210  004704                          2500.                           ;ALLOW 25000 MICRO SECONDS
024212  004704                          2500.                           ;RDY MUST SET BETWEEN
                                                                        ;00 AND 50000 MICRO SECONDS

                                        ;*NOW BRING THE HEADS TO CYLINDER 0

024214  004737  033064                  JSR     PC,@#CHECKT             ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                        ;AND THAT ALL STATUS BITS ARE = 0
```

```
024220  104400  056662                  TYPE    ,CPHALT             ;CANNOT CONTINUE TESTING IF NOT
024224  000000                          HALT                        ;STOP TEST


024226  004037  032754                  JSR     R0,@#SEEKCY         ;SEEK FOR
024232  000000                          0                           ;CYLINDER 0


024234  013777  004506  155724          MOV     @#RP4VEC,@RPVEC     ;SET RP04 VECTOR ADDRESS
                                                                    ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                    ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                    ;'TIME' WILL ONLY SAVE
                                                                    ;CURRENT CYLINDER ADDRESS
                                                                    ;AND LOOK AHEAD REGISTERS


024242  013746  002352                  MOV     @#SEECOM,-(SP)      ;GET READY TO MOVE COMMAND
024246  052716  000101                  BIS     #GO!IE,(SP)         ;GET READY TO SET GO AND
                                                                    ;ENABLE INTERRUPT
024252  012677  155722                  MOV     (SP)+,@RHCS1        ;GO WITH
                                                                     ;4 IN RHCS1 FOR SEEK
                                                                    ;WITH INTERRUPT ENABLED


024256  104412                          WAT                         ;WAIT FOR DRY BIT TO SET
024260  002222                          RHDS1                       ;WAIT FOR RHDS1 REGISTER
024262  000200                          DRY                         ;WAIT FOR DRY BIT IN RHDS1 REGISTER
024264  002776                          1534.                       ;ALLOW 15340 MICRO SECONDS
024266  001502                          834.                        ;DRY MUST SET BETWEEN
                                                                    ;7000 AND 23680 MICRO SECONDS

                                        ;*PREPARE FOR A READ DATA

                                        ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA FROM READ

024270  004037  032654                  JSR     R0,@#CLAREA         ;CLEAR 150. WORDS, FROM WRFROM
024274  002370                          WRFROM                      ;STARTING FROM WRFROM
024276  000226                          150.                        ;150. WORDS
024300  002000                          2000                        ;FILL WITH 2000


024302  004037  032654                  JSR     R0,@#CLAREA         ;CLEAR 106. WORDS, FROM WRFROM+<150.*2>
024306  003044                          WRFROM+<150.*2>                     ;STARTING FROM WRFROM+<150.*2>
024310  000152                          106.                        ;106. WORDS
024312  000077                          77                          ;FILL WITH 77


                                        ;*FILL READ INTO BUFFER WITH DATA OTHER THAN WHAT IS EXPECTED

024314  004037  032654                  JSR     R0,@#CLAREA         ;CLEAR 256. WORDS, FROM REINTO
024320  003434                          REINTO                      ;STARTING FROM REINTO
024322  000400                          256.                        ;256. WORDS
024324  000077                          77                          ;FILL WITH 77
```

```
                                          ;*FILL READ DATA COMMAND
024326  004037  034766                    JSR     R0,@#RUN          ;SETUP TO RUN FOR DATA COMMAND
024332  000001                            1                         ;CYLINDER 1
024334     000                            .BYTE   0                 ;SECTOR 0
024335     000                            .BYTE   0                 ;TRACK 0
024336  177552                            -150.                     ;WORD COUNT = 150.
024340  003434                            REINTO                    ;BUS ADDRESS
                                                                    ;STARTING ADDRESS OF DATA
                                                                    ;BUFFER = REINTO
024342  000000                            0                         ;DO NOT INHIBIT BUS ADDRESS INCREMENT
024344  014000                            ECI!FMT22                         ;16 BITS PER WORD FORMAT
                                                                    ;INHIBIT ECC CORRECTION
                                                                    ;DO NOT INHIBIT HEADER COMPARE
024346  002346                            READAT                    ;GET READY TO DO A READAT
                                                          ;READ DATA WITH 70 IN RHCS1


                                          ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED WRITE
                                          ;*INTO A REGISTER WHILE THE READ IS GOING ON
024350  004037  033152                    JSR     R0,@#SAVER        ;SAVE REGISTERS
024354  002172                            RHWC                      ;RHWC IS THE FIRST REGISTER SAVED
024356  004512                            SAVERE                    ;STARTING ADDRES OF WHERE
                                                                    ;THE REGISTERS ARE SAVED
024360  000022                            18.                       ;NUMBER OF REGISTERS
                                                                    ;SAVED = 18.

024362  004737  033064                    JSR     PC,@#CHECKT       ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                    ;AND THAT ALL STATUS BITS ARE = 0
024366  104400  056662                    TYPE    ,CPHALT           ;CANNOT CONTINUE TESTING IF NOT
024372  000000                            HALT                      ;STOP TEST

024374  013777  004506  155564            MOV     @#RP4VEC,@RPVEC   ;SET RP04 VECTOR ADDRESS
                                                                    ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                    ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                    ;'TIME' WILL ONLY SAVE
                                                                    ;CURRENT CYLINDER ADDRESS
                                                                    ;AND LOOK AHEAD REGISTERS


024402  013746  002346                    MOV     @#READAT,-(SP)    ;GET READY TO MOVE COMMAND
024406  052716  000101                    BIS     #GO!IE,(SP)       ;GET READY TO SET GO AND
                                                                    ;ENABLE INTERRUPT
024412  012677  155562                    MOV     (SP)+,@RHCS1      ;GO WITH
                                                                     ;70 IN RHCS1 FOR READ DATA
                                                                    ;WITH INTERRUPT ENABLED

024416  013700  004650                    MOV     @#TMP0,R0             ;SET UP R0 FOR WRITE
024422  012737  002006                    MOV     #BIT1!BIT2!BIT10,@(R0)+ ;ATTEMPT TO WRITE INTO
                                                                        ;REGISTERS DURING IMPLIED SEEK
024426  010037  004650                    MOV     R0,@#TMP0             ;SAVE OFF  R0

                                          ;*NOW RMR IS SET BUT THE COMPLETION OF READ MUST BE
                                          ;*WAITED ON
```

```


024432  104412                          WAT                             ;WAIT FOR RDY BIT TO SET
024434  002200                          RHCS1                           ;WAIT FOR RHCS1 REGISTER
024436  000200                          RDY                             ;WAIT FOR RDY BIT IN RHCS1 REGISTER
024440  002237                          1183.                           ;ALLOW 11830 MICRO SECONDS
024442  002237                          1183.                           ;RDY MUST SET BETWEEN
                                                                        ;00 AND 23660 MICRO SECONDS

                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE

024444  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
024450  002234                          RHCC                            ;CHANGE RHCC REGISTER

024452  000001                          1                               ;1 BIT/BITS TO BE CHANGED
024454  000001                          1                               ;NEW VALUE OF BIT0 IS 1
024456  000001                          BIT0                            ;CHANGE BIT0 BIT

024460  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
024464  002200                          RHCS1                           ;CHANGE RHCS1 REGISTER

024466  000001                          1                               ;1 BIT/BITS TO BE CHANGED
024470  000001                          1                               ;NEW VALUE OF SC IS 1
024472  100000                          SC                              ;CHANGE SC BIT

024474  004037  032706                  JSR     R0,@#FILLRE             ;MOV 1 INTO SAVED RHDST
024500  002204                          RHDST                           ;SAVED REGISTER TO CHANGE
024502  000001                          1                               ;DATA


024504  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
024510  002222                          RHDS1                           ;CHANGE RHDS1 REGISTER

024512  000002                          2                               ;2 BIT/BITS TO BE CHANGED
024514  000001                          1                               ;NEW VALUE OF ATA IS 1
024516  100000                          ATA                             ;CHANGE ATA BIT
024520  000001                          1                               ;NEW VALUE OF ERR IS 1
024522  040000                          ERR                             ;CHANGE ERR BIT

024524  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                        ;FOR WORKING DRIVE IN
                                                                        ;SAVED RHAS LOCATION

024532  004037  033674                  JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
024536  002202                          RHER1                           ;CHANGE RHER1 REGISTER

024540  000001                          1                               ;1 BIT/BITS TO BE CHANGED
024542  000001                          1                               ;NEW VALUE OF RMR IS 1
024544  000004                          RMR                             ;CHANGE RMR BIT

024546  004037  032706                  JSR     R0,@#FILLRE             ;MOV REINTO+<150.*2> INTO SAVED RHBA
024552  002174                          RHBA                            ;SAVED REGISTER TO CHANGE
024554  004110                          REINTO+<150.*2>                 ;DATA

```

```
        024556  004037  032706                  JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
        024562  002172                          RHWC                    ;SAVED REGISTER TO CHANGE
        024564  000000                          0                       ;DATA


                                                ;*COMPARE REGISTERS BEFORE READ DATA WITH REGISTERS
                                                ;*AFTER READ AND ATTEMPTED MODIFICATION OF REGISTER

        024566  004037  034002                  JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                                        ;PRESENT VALUE
        024572  004512                          SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
        024574  002254                          WC                      ;TEST DATA STARTING FROM 'RHWC'
        024576  000022                          18.                     ;18. REGISTERS TO BE COMPARED
        024600  024604                          2$                      ;RETURN TO 2$ ON ERROR
        024602  024624                          3$                      ;RETURN TO 3$ ON NO ERROR


        024604                          2$:
        024604  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
        024606  013700  004650                  MOV     @#TMP0,R0       ;GET REGISTER BEEING MODIFYED + 2 POINTER
        024612  014037  001122                  MOV     -(R0),@#$BDADR  ;GET ADDRESS OF REGISTER BEING MODIFYED
        024616  104060                          ERROR   60              ;ATTEMPTING TO MODIFY REGISTER
        024620  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
        024622  000207                          RTS     PC              ;DURING A READ COMMAND CAUSED
                                                                        ;IMPROPER REGISTER CHANGE
                                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                                        ;BE THERE
                                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                                        ;THERE AFTER READ
                                                ;*COMPARE DATA READ
        024624                          3$:

        024624  004037  035032                  JSR     R0,@#COMPAR     ;COMPARE TWO BLOCKS OF MEMORY
        024630  002370                          WRFROM                  ;GOOD DATA STARTS FROM WRFROM
        024632  003434                          REINTO                  ;TEST DATA STARTS FROM REINTO
        024634  024640                          4$                      ;4$, WORDS TO BE COMPARED
        024636  024644                          ST23                    ;RETURN TO ST23 ON ERROR
                                                                        ;RETURN TO  ON NO ERROR


        024640  104034                  4$:     ERROR   34              ;DATA READ WITH AN ATTEMPTED
        024642  000207                          RTS     PC              ;MODIFICATION OF REGISTER
                                                                        ;DURING READ CAUSED ERROR
        024644  005337  004656          ST23:   DEC     @#TMP5          ;COUNT DOWN
        024650  001002                          BNE     1$              ;BRANCH IF 7 NOT DONE
        024652  000137  024662                  JMP     TST30           ;JUMP TO NEXT TEST
        024656  000137  024066          1$:     JMP     @#ST22          ;JUMP TO BEGINING OF TEST
```

```
                                  ;;*************************************************************
                                  ;*TEST 30       REGISTER MODIFICATION REFUSED - RHER1 (BIT #2),'RMR'

                                  ;*      A WRITE HEADER AND DATA COMMAND WILL BE GIVEN TO
                                  ;*      CYLINDER 1 SECTOR 0 TRACK 0 DATA WORDS
                                  ;*      OF 070707
                                  ;*
                                  ;*      A WRITE DATA COMMAND WILL BE GIVEN TO CYLINDER 1

                                  ;*      SECTOR 0, TRACK 0, 256 WORDS OF 2000
                                  ;*      AND 4 WORDS OF 2001. IMMEDIATELY AFTER GO
                                  ;*      AN ATTEMPT WILL BE MADE TO MODIFY A REGISTER
                                  ;*      RMR BIT #2 IN RHER1 SHOULD SET
                                  ;*
                                  ;*      AFTER THE WRITE IS COMPLETE ALL REGISTERS WILL
                                  ;*      BE CHECKED
                                  ;*
                                  ;*      THE DATA WRITTEN WILL BE READ BACK AND CHECKED
                                  ;*
                                  ;*      THIS WILL BE REPEATED FOR RHCS1, RHER1, RHDST,
                                  ;*      RHER2, RHOF, RHCA, RHER3

                                  ;;*************************************************************
024662  000004                    TST30:  SCOPE
024664  012706  001000                    MOV     #STACK,SP       ;RESET STACK
024670  012737  000030  004504            MOV     #30,@#TSTNM     ;SAVE TEST NUMBER

024676  004737  033004                    JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                  ;R3-RHDS1, R4-RHER1
                                                                  ;GIVE RH-11 INITIALIZE
                                                                  ;SETUP UNIT NUMBER

024702  012737  002200  004650            MOV     #RHCS1,@#TMP0   ;FILL REGISTER TO BE MODIFIED
024710  012737  000007  004656            MOV     #7,@#TMP5               ;NUMBER OF REGISTERS TO BE TESTED

                                          ;*PREPARE TO WRITE HEADER AND DATA

024716                            ST24:

024716  004737  033004                    JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                  ;R3-RHDS1, R4-RHER1
                                                                  ;GIVE RH-11 INITIALIZE
                                                                  ;SETUP UNIT NUMBER


                                          ;*FILL WRITE FROM BUFFER WITH HEADER

024722  004037  032630                    JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
024726  002370                            WRFROM                  ;LOCATION WHERE SAVED
024730  000004                            4                       ;NUMBER OF WORDS SAVED
024732  010001                            10001                   ;FIRST DATA WORD
024734  000000                            0                       ;SECOND DATA WORD
024736  000000                            0                       ;THIRD DATA WORD
024740  000000                            0                       ;FOURTH DATA WORD
```

```

                                               ;*FILL WRITE FROM BUFFER WITH DATA

 024742  004037  032654                        JSR     R0,@#CLAREA       ;CLEAR 256. WORDS, FROM WRFROM+<4*2>
 024746  002400                                WRFROM+<4*2>                          ;STARTING FROM WRFROM+<4*2>
 024750  000400                                256.                      ;256. WORDS
 024752  070707                                070707                    ;FILL WITH 070707


                                               ;*FILL WRITE FROM BUFFER WITH NEXT SECTOR HEADER

 024754  004037  032630                        JSR     R0,@#FLHEAD       ;SAVE HEADER DATA IN WRFROM+<260.*2>
 024760  003400                                WRFROM+<260.*2>                       ;LOCATION WHERE SAVED
 024762  000004                                4                         ;NUMBER OF WORDS SAVED
 024764  010001                                10001                     ;FIRST DATA WORD
 024766  000001                                1                         ;SECOND DATA WORD
 024770  000000                                0                         ;THIRD DATA WORD
 024772  000000                                0                         ;FOURTH DATA WORD

                                               ;*FILL WRITE FROM BUFFER WITH WITH NEXT SECTOR DATA

 024754  004037  032654                        JSR     R0,@#CLAREA       ;CLEAR 4 WORDS, FROM WRFROM+<248.*2<
 025000  003420                                WRFROM+<268.*2>                       ;STARTING FROM WRFROM+<268.*2>
 025002  000004                                4                         ;4 WORDS
 025004  070707                                70707                     ;FILL WITH 70707


                                               ;*NOW THE WRITE HEADER AND DATA COMMAND WILL BE FILLED

 025006  004037  034766                        JSR     R0,@#RUN          ;SETUP TO RUN FOR DATA COMMAND
 025012  000001                                1                         ;CYLINDER 1
 025014     000                                .BYTE   0                 ;SECTOR 0
 025015     000                                .BYTE   0                 ;TRACK 0
 025016  177364                                -264.-4                   ;WORD COUNT (DATA) = 264. +
                                                                         ;4 HEADER WORDS
 025020  002370                                WRFROM                    ;BUS ADDRESS
                                                                         ;STARTING ADDRESS OF DATA
                                                                         ;BUFFER = WRFROM
 025022  000000                                0                         ;DO NOT INHIBIT BUS ADDRESS INCREMENT
 025024  010000                                FMT22                     ;16 BITS PER WORD FORMAT
                                                                         ;DO NOT INHIBIT ECC CORRECTION
                                                                         ;DO NOT INHIBIT HEADER COMPARE
 025026  002344                                WRIFOR                    ;GET READY TO DO A WRIFOR
                                                             ;WRITE HEADER AND DATA WITH 62 IN RHCS1


 025030  004737  033064                        JSR     PC,@#CHECKT       ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                         ;AND THAT ALL STATUS BITS ARE = 0
 025034  104400  056662                        TYPE    ,CPHALT           ;CANNOT CONTINUE TESTING IF NOT
 025040  000000                                HALT                      ;STOP TEST

 025042  013777  004506  155116                MOV     @#RP4VEC,@RPVEC   ;SET RP04 VECTOR ADDRESS
                                                                         ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                         ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
```

```
                                                          ;'TIME' WILL ONLY SAVE
                                                          ;CURRENT CYLINDER ADDRESS
                                                          ;AND LOOK AHEAD REGISTERS
 025050  013746  002344          MOV     @#WRIFOR,-(SP)   ;GET READY TO MOVE COMMAND
 025054  052716  000101          BIS     #GO!IE,(SP)      ;GET READY TO SET GO AND
                                                          ;ENABLE INTERRUPT
 025060  012677  155114          MOV     (SP)+,@RHCS1     ;GO WITH
                                                           ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                          ;WITH INTERRUPT ENABLED
                                 ;*ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR=760 MICRO SEC
 025064  104412                  WAT                      ;WAIT FOR RDY BIT TO SET
 025066  002200                  RHCS1                    ;WAIT FOR RHCS1 REGISTER
 025070  000200                  RDY                      ;WAIT FOR RDY BIT IN RHCS1 REGISTER
 025072  001725                  981.                     ;ALLOW 9810 MICRO SECONDS
 025074  001502                  834.                     ;RDY MUST SET BETWEEN
                                                          ;1470 AND 18150 MICRO SECONDS
                                 ;*NOW PREPARE FOR THE WRITE DATA COMMAND
                                 ;*FILL WRITE FROM BUFFER WITH 256 OF 2000 AND 4 OF 2001
 025076  004037  032654          JSR     R0,@#CLAREA      ;CLEAR 256. WORDS, FROM WRFROM
 025102  002370                  WRFROM                   ;STARTING FROM WRFROM
 025104  000400                  256.                     ;256. WORDS
 025106  002000                  2000                     ;FILL WITH 2000
 025110  004037  032654          JSR     R0,@#CLAREA      ;CLEAR 4 WORDS, FROM WRFROM+<256.*2>
 025114  003370                  WRFROM+<256.*2>                  ;STARTING FROM WRFROM+<256.*2>
 025116  000004                  4                        ;4 WORDS
 025120  002001                  2001                     ;FILL WITH 2001
                                 ;*FILL WRITE DATA COMMAND
 025122  004037  034766          JSR     R0,@#RUN         ;SETUP TO RUN FOR DATA COMMAND
 025126  000001                  1                        ;CYLINDER 1
 025130     000                  .BYTE   0                ;SECTOR 0
 025131     000                  .BYTE   0                ;TRACK 0
 025132  177400                  -256.                    ;WORD COUNT = 256.
 025134  002370                  WRFROM                   ;BUS ADDRESS
                                                          ;STARTING ADDRESS OF DATA
                                                          ;BUFFER = WRFROM
 025136  000000                  0                        ;DO NOT INHIBIT BUS ADDRESS INCREMENT
 025140  010000                  FMT22                    ;16 BITS PER WORD FORMAT
                                                          ;DO NOT INHIBIT ECC CORRECTION
                                                          ;DO NOT INHIBIT HEADER COMPARE
 025142  002342                  WRIDAT                   ;GET READY TO DO A WRIDAT
                                                ;WRITE DATA WITH 60 IN RHCS1
```

```
                                         ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED
                                         ;*REGISTER MODIFICATION DURING A WRITE DATA
025144  004037  033152                   JSR     R0,@#SAVER       ;SAVE REGISTERS
025150  002172                           RHWC                     ;RHWC IS THE FIRST REGISTER SAVED
025152  004512                           SAVERE                   ;STARTING ADDRES OF WHERE
                                                                  ;THE REGISTERS ARE SAVED
025154  000022                           18.                      ;NUMBER OF REGISTERS
                                                                  ;SAVED = 18.

025156  004737  033064                   JSR     PC,@#CHECKT      ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                  ;AND THAT ALL STATUS BITS ARE = 0
025162  104400  056662                   TYPE    ,CPHALT          ;CANNOT CONTINUE TESTING IF NOT
025166  000000                           HALT                     ;STOP TEST

025170  013777  004506  154770           MOV     @#RP4VEC,@RPVEC  ;SET RP04 VECTOR ADDRESS
                                                                  ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                  ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                  ;'TIME' WILL ONLY SAVE
                                                                  ;CURRENT CYLINDER ADDRESS
                                                                  ;AND LOOK AHEAD REGISTERS


025176  013746  002342                   MOV     @#WRIDAT,-(SP)   ;GET READY TO MOVE COMMAND
025202  052716  000101                   BIS     #GO!IE,(SP)      ;GET READY TO SET GO AND
                                                                  ;ENABLE INTERRUPT
025206  012677  154766                   MOV     (SP)+,@RHCS1     ;GO WITH
                                                                  ;GO IN RHCS1 FOR WRITE DATA
                                                                  ;WITH INTERRUPT ENABLED

025212  013700  004650                   MOV     @#TMP0,R0              ;SET R0 TO REG ADDRESS
025216  012730  002002                   MOV     #BIT1!BIT10,@(R0)+     ;ATTEMPT TO WRITE INTO A REGISTER
                                                                        ;DURING WRITE DATA
025222  010037  004650                   MOV     R0,@#TMP0              ;SAVE OFF NEW REG ADDRESS

                                         ;*NOW RMR MUST BE SET BUT THE COMPLETION OF
                                         ;*WRITE DATA MUST BE WAITED ON


025226  104412                           WAT                      ;WAIT FOR RDY BIT TO SET
025230  002200                           RHCS1                    ;WAIT FOR RHCS1 REGISTER
025232  000200                           RDY                      ;WAIT FOR RDY BIT IN RHCS1 REGISTER
025234  001725                           981.                     ;ALLOW 9810 MICRO SECONDS
025236  001502                           834.                     ;RDY MUST SET BETWEEN
                                                                  ;1470 AND 18150 MICRO SECONDS

                                         ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE

025240  004037  033674                   JSR     R0,@#CHREG       ;CHANGE BITS IN SAVED REGISTER
025244  002234                           RHCC                     ;CHANGE RHCC REGISTER

025246  000001                           1                        ;1 BIT/BITS TO BE CHANGED
025250  000001                           1                        ;NEW VALUE OF BIT0 IS 1
025252  000001                           BIT0                     ;CHANGE BIT0 BIT
```

```
025254  004037  033674                  JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
025260  002200                          RHCS1                   ;CHANGE RHCS1 REGISTER

025262  000001                          1                       ;1 BIT/BITS TO BE CHANGED
025264  000001                          1                       ;NEW VALUE OF SC IS 1
025266  100000                          SC                      ;CHANGE SC BIT

025270  004037  033674                  JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
025274  002222                          RHDS1                   ;CHANGE RHDS1 REGISTER

025276  000002                          2                       ;2 BIT/BITS TO BE CHANGED
025300  000001                          1                       ;NEW VALUE OF ATA IS 1
025302  100000                          ATA                     ;CHANGE ATA BIT
025304  000001                          1                       ;NEW VALUE OF ERR IS 1
025306  040000                          ERR                     ;CHANGE ERR BIT

025310  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                ;FOR WORKING DRIVE IN
                                                                ;SAVED RHAS LOCATION

025316  004037  033674                  JSR     R0,@#CHREG      ;CHANGE BITS IN SAVED REGISTER
025322  002202                          RHER1                   ;CHANGE RHER1 REGISTER

025324  000001                          1                       ;1 BIT/BITS TO BE CHANGED
025326  000001                          1                       ;NEW VALUE OF RMR IS 1
025330  000004                          RMR                     ;CHANGE RMR BIT

025332  004037  032706                  JSR     R0,@#FILLRE     ;MOV 1 INTO SAVED RHDST
025336  002204                          RHDST                   ;SAVED REGISTER TO CHANGE
025340  000001                          1                       ;DATA


025342  004037  032706                  JSR     R0,@#FILLRE     ;MOV WRFROM+<256.*2> INTO SAVED RHBA
025346  002174                          RHBA                    ;SAVED REGISTER TO CHANGE
025350  003370                          WRFROM+<256.*2>                 ;DATA

025352  004037  032706                  JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
025356  002172                          RHWC                    ;SAVED REGISTER TO CHANGE
025360  000000                          0                       ;DATA


                                        ;*COMPARE REGISTERS BEFORE WRITE DATA WITH REGISTERS
                                        ;*AFTER WRITE AND ATTEMPTED MODIFICATION OF REGISTER

025362  004037  034002                  JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                                ;PRESENT VALUE
025366  004512                          SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
025370  002254                          WC                      ;TEST DATA STARTING FROM 'RHWC'
025372  000022                          18.                     ;18. REGISTERS TO BE COMPARED
025374  025400                          2$                      ;RETURN TO 2$ ON ERROR
025376  025420                          3$                      ;RETURN TO 3$ ON NO ERROR
```

```
025400                          2$:
025400  010046                          MOV     R0,-(SP)            ;;PUSH R0 ON STACK
025402  013700  004650                  MOV     @#TMP0,R0           ;GET REGISTER BEEING MODIFYED + 2 POINTER
025406  014037  001122                  MOV     -(R0),@#$BDADR      ;GET ADDRESS OF REGISTER BEING MODIFYED
025412  104060                          ERROR   60                  ;ATTEMPTING TO MODIFY REGISTER
025414  012600                          MOV     (SP)+,R0            ;;POP STACK INTO R0
025416  000207                          RTS     PC                  ;DURING A WRITE COMMAND CAUSED
                                                                    ;IMPROPER REGISTER GIVES WHAT SHOULD
                                                                    ;GOOD DATA GIVES WHAT SHOULD
                                                                    ;BE THERE
                                                                    ;RECEIVED DATA GIVES WHAT WAS
                                                                    ;THERE AFTER READ
                                        ;*CLEAR ALL ERROR FLAGS
025420                          3$:

025420  004737  033004                  JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                    ;R3-RHDS1, R4-RHER1
                                                                    ;GIVE RH-11 INITIALIZE
                                                                    ;SETUP UNIT NUMBER

                                        ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA

025424  004037  032654                  JSR     R0,@#CLAREA         ;CLEAR 256. WORDS, FROM WRFROM
025430  002370                          WRFROM                      ;STARTING FROM WRFROM
025432  000400                          256.                        ;256. WORDS
025434  002000                          2000                        ;FILL WITH 2000


025436  004037  032654                  JSR     R0,@#CLAREA         ;CLEAR 4 WORDS, FROM WRFROM+<256.*2>
025442  003370                          WRFROM+<256.*2>                     ;STARTING FROM WRFROM+<256.*2>
025444  000004                          4                           ;4 WORDS
025446  002001                          2001                        ;FILL WITH 2001


                                        ;*NOW THE READ DATA COMMAND WILL BE FILLED

025450  004037  034766                  JSR     R0,@#RUN            ;SETUP TO RUN FOR DATA COMMAND
025454  000001                          1                           ;CYLINDER 1
025456     000                          .BYTE   0                   ;SECTOR 0
025457     000                          .BYTE   0                   ;TRACK 0
025460  177374                          -260.                       ;WORD COUNT = 260.
025462  003434                          REINTO                      ;BUS ADDRESS
                                                                    ;STARTING ADDRESS OF DATA
                                                                    ;BUFFER = REINTO
025464  000000                          0                           ;DO NOT INHIBIT BUS ADDRESS INCREMENT
025466  014000                          ECI!FMT22                           ;16 BITS PER WORD FORMAT
                                                                    ;INHIBIT ECC CORRECTION
                                                                    ;DO NOT INHIBIT HEADER COMPARE
025470  002346                          READAT                      ;GET READY TO DO A READAT
                                                          ;READ DATA WITH 70 IN RHCS1



                                        ;*NOW SAVE REGISTERS FOR COMPARISON AFTER READ DATA COMMAND
```

```
025472  004037  033152                 JSR     R0,@#SAVER       ;SAVE REGISTERS
025476  002172                         RHWC                     ;RHWC IS THE FIRST REGISTER SAVED
025500  004512                         SAVERE                   ;STARTING ADDRES OF WHERE
                                                                ;THE REGISTERS ARE SAVED
025502  000022                         18.                      ;NUMBER OF REGISTERS
                                                                ;SAVED = 18.

025504  004737  033064                 JSR     PC,@#CHECKT      ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                ;AND THAT ALL STATUS BITS ARE = 0
025510  104400  056662                 TYPE    ,CPHALT          ;CANNOT CONTINUE TESTING IF NOT
025514  000000                         HALT                     ;STOP TEST

025516  013777  004506  154442         MOV     @#RP4VEC,@RPVEC  ;SET RP04 VECTOR ADDRESS
                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                ;'TIME' WILL ONLY SAVE
                                                                ;CURRENT CYLINDER ADDRESS
                                                                ;AND LOOK AHEAD REGISTERS


025524  013746  002346                 MOV     @#READAT,-(SP)   ;GET READY TO MOVE COMMAND
025530  052716  000101                 BIS     #GO!IE,(SP)      ;GET READY TO SET GO AND
                                                                ;ENABLE INTERRUPT
025534  012677  154440                 MOV     (SP)+,@RHCS1     ;GO WITH
                                                                ;70 IN RHCS1 FOR READ DATA
                                                                ;WITH INTERRUPT ENABLED
025540  011100                         MOV     @R1,R0           ;SAVE RHCS1 DURING ABOVE OPERATION
025542  011305                         MOV     @R3,R5           ;SAVE RHDS1 DURING ABOVE OPERATION


025544  104412                         WAT                      ;WAIT FOR RDY BIT TO SET
025546  002200                         RHCS1                    ;WAIT FOR RHCS1 REGISTER
025550  000200                         RDY                      ;WAIT FOR RDY BIT IN RHCS1 REGISTER
025552  001725                         981.                     ;ALLOW 9810 MICRO SECONDS
025554  001502                         834.                     ;RDY MUST SET BETWEEN
                                                                ;1470 AND 18150 MICRO SECONDS


                                       ;*COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
                                       ;*R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

025556  013746  002346                 MOV     @#READAT,-(SP)   ;SAVE COMMAND
025562  052716  004101                 BIS     #IE!DVA!GO,(SP)  ;INCLUDE IE!DVA!GO
025566  011637  001124                 MOV     (SP),@#$GDDAT    ;SAVE FOR PRINTOUT
025572  022600                         CMP     (SP)+,R0         ;DURING ABOVE OPERATION ONLY IE!DVA!GO
                                                                ;AND COMMAND SHOULD BE SET
025574  001405                         BEQ     70$              ;BRANCH IF GOOD
025576  010037  001126                 MOV     R0,@#$BDDAT      ;BAD DATA
025602  010137  004500                 MOV     R1,@#REGADR      ;FAILING REGISTER RHCS1
025606  104021                         ERROR   21               ;DURING ABOVE OPERATION ONLY
                                                                ;COMMAND AND IE!DVA!GO SHOULD BE SET
025610  012746  010500          70$:   MOV     #MOL!DPR!VV,-(SP)     ;SAVE BITS SET DURING OPERATION IN RHDS1
025614  011637  001124                 MOV     (SP),@#$GDDAT    ;SAVE FOR PRINTOUT
025620  022605                         CMP     (SP)+,R5         ;DURING ABOVE OPERATION ONLY MOL!DPR!VV
                                                                ;SHOULD BE SET
```

```
025622  001405                          BEQ     72$             ;BRANCH IF GOOD
025624  010537  001126                  MOV     R5,@#$BDDAT     ;BAD DATA
025630  010337  004500                  MOV     R3,@#REGADR     ;FAILING REGISTER RHDS1
025634  104063                          ERROR   63              ;DURING ABOVE OPERATION ONLY
                                                                ;MOL!DPR!VV SHOULD BE SET
025636                          72$:

                                        ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUES

025636  004037  032706                  JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
025642  002172                          RHWC                    ;SAVED REGISTER TO CHANGE
025644  000000                          0                       ;DATA



025646  004037  032706                  JSR     R0,@#FILLRE     ;MOV REINTO+<260.*2> INTO SAVED RHBA
025652  002174                          RHBA                    ;SAVED REGISTER TO CHANGE
025654  004444                          REINTO+<260.*2>                 ;DATA


025656  004037  032706                  JSR     R0,@#FILLRE     ;MOV 2 INTO SAVED RHDST
025662  002204                          RHDST                   ;SAVED REGISTER TO CHANGE
025664  000002                          2                       ;DATA


                                        ;*NOW COMPARE REGISTERS BEFORE READ DATA WITH
                                        ;*AFTER COMMAND

025666  004037  034002                  JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                                ;PRESENT VALUE
025672  004512                          SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
025674  002254                          WC                      ;TEST DATA STARTING FROM 'RHWC'
025676  000022                          18.                     ;18. REGISTERS TO BE COMPARED
025700  025704                          4$                      ;RETURN TO 4$ ON ERROR
025702  025710                          5$                      ;RETURN TO 5$ ON NO ERROR


025704  104033                  4$:     ERROR   33              ;READ DATA CAUSED IMPROPER REGISTER
025706  000207                          RTS     PC              ;CHANGE
                                                                ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                                                ;RECEIVED DATA GIVES WHAT WAS THERE AFTER COMMAND
                                        ;*NOW READ INTO BUFFER WILL BE CHECKED TO SEE THAT READ
                                        ;*WAS GOOD
025710                          5$:

025710  004037  035032                  JSR     R0,@#COMPAR     ;COMPARE TWO BLOCKS OF MEMORY
025714  002370                          WRFROM                  ;GOOD DATA STARTS FROM WRFROM
025716  003434                          REINTO                  ;TEST DATA STARTS FROM REINTO
025720  000400                          256.                    ;256., WORDS TO BE COMPARED
025722  025726                          6$                      ;RETURN TO 6$ ON ERROR
025724  025732                          ST28                    ;RETURN TO ST28 ON NO ERROR


025726  104034                  6$:     ERROR   34              ;READ DATA ERROR AFTER A WRITE DATA
```

```
025730  000207                          RTS     PC              ;WITH REGISTER MODIFICATION
                                                                ;WITHIN THE WRITE DATA
                                        ;*IF ALL 7 REGISTERS NOT COMPLETE THEN REPEAT
025732  005337  004656          ST28:   DEC     @#TMP5          ;COUNT DOWN
025736  001002                          BNE     1$              ;BRANCH IF 7 NOT DONE
025740  000137  025750                  JMP     TST31           ;JUMP TO NEXT TEST
025744  000137  024716          1$:     JMP     ST24            ;JUMP TO BEGINING OF TEST
```

```

                                            ;;*****************************************************************
                                            ;*TEST 31        REGISTER MODIFICATION REFUSED - RHER1  (BIT #2)RMR

                                            ;*       A READ DATA COMMAND IS GIVEN TO CYLINDER 0, SECTOR 0
                                            ;*       TRACK 0. IMMEDIATELY AFTER GO RHAS IS WRITTEN INTO
                                            ;*       WITH ALL ONES RMR BIT #2 IN RHER SHOULS NOT SET

                                            ;;*****************************************************************
 025750  000004                             TST31:  SCOPE
 025752  012706  001000                             MOV     #STACK,SP           ;RESET STACK
 025756  012737  000031  004504                     MOV     #31,@#TSTNM         ;SAVE TEST NUMBER

 025764  004737  033004                             JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                                ;R3-RHDS1, R4-RHER1
                                                                                ;GIVE RH-11 INITIALIZE
                                                                                ;SETUP UNIT NUMBER

                                                    ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA

 025770  004037  032654                             JSR     R0,@#CLAREA         ;CLEAR 256. WORDS, FROM WRFROM
 025774  002370                                     WRFROM                      ;STARTING FROM WRFROM
 025776  000400                                     256.                        ;256. WORDS
 026000  000000                                     0                           ;FILL WITH 0

                                                    ;*FILL READ INTM BUFFER WITH ALL ONES

 026002  004037  032654                             JSR     R0,@#CLAREA         ;CLEAR 256. WORDS, FROM REINTO
 026006  003434                                     REINTO                      ;STARTING FROM REINTO
 026010  000400                                     256.                        ;256. WORDS
 026012  177777                                     -1                          ;FILL WITH -1

                                                    ;*NOW THE READ DATA COMMAND WILL BE FILLED

 026014  004037  034766                             JSR     R0,@#RUN            ;SETUP TO RUN FOR DATA COMMAND
 026020  000000                                     0                           ;CYLINDER 0
 026022     000                                     .BYTE   0                   ;SECTOR 0
 026023     000                                     .BYTE   0                   ;TRACK 0
 026024  177400                                     -256.                       ;WORD COUNT = 256.
 026026  003434                                     REINTO                      ;BUS ADDRESS
                                                                                ;STARTING ADDRESS OF DATA
                                                                                ;BUFFER = REINTO
 026030  000000                                     0                           ;DO NOT INHIBIT BUS ADDRESS INCREMENT
 026032  014000                                     ECI!FMT22                           ;16 BITS PER WORD FORMAT
                                                                                ;INHIBIT ECC CORRECTION
                                                                                ;DO NOT INHIBIT HEADER COMPARE
 026034  002346                                     READAT                      ;GET READY TO DO A READAT
                                                                    ;READ DATA WITH 70 IN RHCS1

                                                    ;*NOW SAVE REGISTERS FOR COMPARISON AFTER READ DATA COMMAND
 026036  004037  033152                             JSR     R0,@#SAVER          ;SAVE REGISTERS
 026042  002172                                     RHWC                        ;RHWC IS THE FIRST REGISTER SAVED
 026044  004512                                     SAVERE                      ;STARTING ADDRES OF WHERE
                                                                                ;THE REGISTERS ARE SAVED
```

```
 026046  000022                               18.                          ;NUMBER OF REGISTERS
                                                                           ;SAVED = 18.

 026050  004737  033064                       JSR     PC,@#CHECKT          ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                           ;AND THAT ALL STATUS BITS ARE = 0
 026054  104400  056662                       TYPE    ,CPHALT              ;CANNOT CONTINUE TESTING IF NOT
 026060  000000                               HALT                         ;STOP TEST

 026062  013777  004506  154076               MOV     @#RP4VEC,@RPVEC      ;SET RP04 VECTOR ADDRESS
                                                                           ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                           ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                           ;'TIME' WILL ONLY SAVE
                                                                           ;CURRENT CYLINDER ADDRESS
                                                                           ;AND LOOK AHEAD REGISTERS



 026070  013746  002346                       MOV     @#READAT,-(SP)       ;GET READY TO MOVE COMMAND
 026074  052716  000101                       BIS     #GO!IE,(SP)          ;GET READY TO SET GO AND
                                                                           ;ENABLE INTERRUPT
 026100  012677  154074                       MOV     (SP)+,@RHCS1         ;GO WITH
                                                                            ;70 IN RHCS1 FOR READ DATA
                                                                           ;WITH INTERRUPT ENABLED
 026104  011100                               MOV     @R1,R0               ;SAVE RHCS1 DURING ABOVE OPERATION
 026106  011305                               MOV     @R3,R5               ;SAVE RHDS1 DURING ABOVE OPERATION

 026110  012777  177777  154100               MOV     #-1,@RHAS            ;WRITE INTO RHAS THIS SHOULD
                                                                           ;NOT SET RMR

                                              ;*TIME IS NOT IMPORTANT

 026116  104412                               WAT                          ;WAIT FOR RDY BIT TO SET
 026120  002200                               RHCS1                        ;WAIT FOR RHCS1 REGISTER
 026122  000200                               RDY                          ;WAIT FOR RDY BIT IN RHCS1 REGISTER
 026124  003326                               1750.                        ;ALLOW 17500 MICRO SECONDS
 026126  000175                               125.                         ;RDY MUST SET BETWEEN
                                                                           ;16250 AND 18750 MICRO SECONDS

                                              ;*COMPARE CONTENTS OF RHCS1 AND RHDS1 ALREADY SAVED IN
                                              ;*R0 AND R5 IMMEDIATELY AFTER GO IS ISSUED

 026130  013746  002346                       MOV     @#READAT,-(SP)       ;SAVE COMMAND
 026134  052716  004101                       BIS     #IE!DVA!GO,(SP)      ;INCLUDE IE!DVA!GO
 026140  011637  001124                       MOV     (SP),@#$GDDAT        ;SAVE FOR PRINTOUT
 026144  022600                               CMP     (SP)+,R0             ;DURING ABOVE OPERATION ONLY IE!DVA!GO
                                                                           ;AND COMMAND SHOULD BE SET
 026146  001405                               BEQ     64$                  ;BRANCH IF GOOD
 026150  010037  001126                       MOV     R0,@#$BDDAT          ;BAD DATA
 026154  010137  004500                       MOV     R1,@#REGADR          ;FAILING REGISTER RHCS1
 026160  104021                               ERROR   21                   ;DURING ABOVE OPERATION ONLY
                                                                           ;COMMAND AND IE!DVA!GO SHOULD BE SET
 026162  012746  010500             64$:      MOV     #MOL!DPR!VV,-(SP)            ;SAVE BITS SET DURING OPERATION IN RHDS1
 026166  011637  001124                       MOV     (SP),@#$GDDAT        ;SAVE FOR PRINTOUT
 026172  022605                               CMP     (SP)+,R5             ;DURING ABOVE OPERATION ONLY MOL!DPR!VV
```

```
                                                      ;SHOULD BE SET
026174  001405                       BEQ     66$      ;BRANCH IF GOOD
026176  010537  001126               MOV     R5,@#$BDDAT   ;BAD DATA
026202  010337  004500               MOV     R3,@#REGADR   ;FAILING REGISTER RHDS1
026206  104063                       ERROR   63       ;DURING ABOVE OPERATION ONLY
                                                      ;MOL!DPR!VV SHOULD BE SET
026210                       66$:

                                     ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUES

026210  004037  032706               JSR     R0,@#FILLRE   ;MOV 0 INTO SAVED RHWC
026214  002172                       RHWC                  ;SAVED REGISTER TO CHANGE
026216  000000                       0                     ;DATA


026220  004037  032706               JSR     R0,@#FILLRE   ;MOV REINTO+<256.*2> INTO SAVED RHBA
026224  002174                       RHBA                  ;SAVED REGISTER TO CHANGE
026226  004434                       REINTO+<256.*2>               ;DATA


026230  004037  032706               JSR     R0,@#FILLRE   ;MOV 1 INTO SAVED RHDST
026234  002204                       RHDST                 ;SAVED REGISTER TO CHANGE
026236  000001                       1                     ;DATA


026240  004037  032706               JSR     R0,@#FILLRE   ;MOV 0 INTO SAVED RHCC
026244  002234                       RHCC                  ;SAVED REGISTER TO CHANGE
026246  000000                       0                     ;DATA



                                     ;*NOW COMPARE REGISTERS BEFORE READ DATA WITH
                                     ;*AFTER COMMAND

026250  004037  034002               JSR     R0,@#COMREG   ;COMPARE SAVED REGISTERS WITH
                                                           ;PRESENT VALUE
026254  004512                       SAVERE                ;GOOD DATA SAVED IN 'SAVERE'
026256  002254                       WC                    ;TEST DATA STARTING FROM 'RHWC'
026260  000022                       18.                   ;18. REGISTERS TO BE COMPARED
026262  026266                       1$                    ;RETURN TO 1$ ON ERROR
026264  026272                       2$                    ;RETURN TO 2$ ON NO ERROR


026266  104033               1$:     ERROR   33            ;READ DATA CAUSED IMPROPER REGISTER
026270  000207                       RTS     PC            ;CHANGE
                                                           ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                                           ;RECEIVED DATA GIVES WHAT WAS THERE AFTER COMMAND.
                                     ;*NOW READ INTO BUFFER WILL BE CHECKED TO SEE THAT READ
                                     ;*WAS GOOD
026272                       2$:

026272  004037  035032               JSR     R0,@#COMPAR   ;COMPARE TWO BLOCKS OF MEMORY
026276  002370                       WRFROM                ;GOOD DATA STARTS FROM WRFROM
026300  003434                       REINTO                ;TEST DATA STARTS FROM REINTO
026302  000400                       256.                  ;256., WORDS TO BE COMPARED
```

C01


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 7538  026304  026310                  3$                  ;RETURN TO 3$ ON ERROR
 7539  026306  026314                  4$                  ;RETURN TO 4$ ON NO ERROR
 7540
 7541
 7542  026310  104034          3$:     ERROR   34          ;READ DATA ERROR AFTER WRITING INTO
 7543  026312  000207                  RTS     PC          ;RHAS DURING READ
 7544
 7545  026314                  4$:
```

```
                                        ;;*************************************************************
                                        ;*TEST 32        ILLEGAL FUNCTION RHER1 - (BIT #0,ILF)

                                        ;*       THIS WILL CALCULATE EVERY ILLEGAL FUNCTION
                                        ;*       BETWEEN 0 AND 77. EACH TIME AN ILLEGAL FUNCTION
                                        ;*       IS FORMED IT WILL BE STORED IN ILLEGAL THEN
                                        ;*       EXECUTION OF ILLEGAL
                                        ;*       WILL BE ATTEMPTED AND RESULTS CHECKED

                                        ;;*************************************************************
026314  000004                          TST32:  SCOPE
026316  012706  001000                          MOV     #STACK,SP           ;RESET STACK
026322  012737  000032  004504                  MOV     #32,@#TSTNM         ;SAVE TEST NUMBER

026330  004737  033004                          JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                            ;R3-RHDS1, R4-RHER1
                                                                            ;GIVE RH-11 INITIALIZE
                                                                            ;SETUP UNIT NUMBER

026334  005737  004640                          TST     @#RH70              ;RH70 CONTROLLER ?
026340  001402                                  BEQ     30$                 ;SKIP NEXT IF NOT = 1
026342  000137  027142                          JMP     TST33               ;IF SO SKIP THIS TEST -----------------)
026346                                  30$:

                                                ;*GENERATE ILLEGAL FUNCTION

026346  005037  001200                          CLR     @#$TMP1             ;GET READY TO MAKE ILLEGAL FUNCTION
026352  012700  002322                  1$:     MOV     #FUTABL,R0          ;GET POINTER TO BEGINNING OF COMMANDS
026356  012705  000021                          MOV     #17.,R5             ;COUNTER (17 GOOD FUNCTIONS)
026362  023720  001200                  2$:     CMP     @#$TMP1,(R0)+       ;IS THIS A LEGAL FUNCTION
026366  001004                                  BNE     3$                  ;BRANCH IF NOT LEGAL
026370  062737  000002  001200                  ADD     #2,@#$TMP1          ;MAKE ANOTHER FUNCTION
026376  000765                                  BR      1$                  ;GET READY TO TEST NEW FUNCTION
026400  005305                          3$:     DEC     R5                  ;NOT LEGAL SO DECREMENT COUNTER
026402  001367                                  BNE     2$                  ;BRANCH IF 17 NOT DONE
026404  032737  000100  001200                  BIT     #100,@#$TMP1        ;ALL BITS UP TO BIT #5 COMPARED?
026412  001001                                  BNE     20$                 ;BRANCH OUT IF DONE
026414  000402                                  BR      19$                 ;BRANCH TO CONTINUE
026416  000137  027142                  20$:    JMP     @#7$                ; DONE
026422  013737  001200  002364          19$:    MOV     @#$TMP1,@#ILLEGL    ;AN ILLEGAL FUNCTION IS FOUND
026430  062737  000002  001200                  ADD     #2,@#$TMP1          ;GET READY FOR NEW FUNCTION NEXT TIME

                                                ;*ILLEGAL FUNCTION HAS BEEN FOUND
                                                ;*IT IS IN 'ILLEGL'
026436  012737  026444  001110                  MOV     #4$,@#$LPERR        ;ERROR RETURN POINT

                                                ;*SAVE REGISTERS FOR COMPARISON AFTER GO
026444                                  4$:

026444  004737  033004                          JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                            ;R3-RHDS1, R4-RHER1
                                                                            ;GIVE RH-11 INITIALIZE
                                                                            ;SETUP UNIT NUMBER
```

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026450  005077  153516                  CLR     @RHWC                   ;CLEAR WORD COUNT
026454  005077  153514                  CLR     @RHBA                   ;CLEAR BUS ADDRESS
026460  023727  002364  000050          CMP     @#ILLEGL,#50            ;50 AND HIGHER FUNCTIONS ARE DATA
                                                                        ;FUNCTIONS WHICH WILL SET MXF AND TRE
026466  103014                          BHIS    13$                     ;BRANCH IF ILLEGL IS HIGHER THAN 50
026470  012737  100000  027044          MOV     #SC,@#11$+12            ;EXPECTED VALUE OF RHCS1 SHOULD HAVE
                                                                        ;ONLY SC ADDED
026476  005037  027066                  CLR @#12$+12                    ;EXPECTED VALUE OF RHCS2 SHOULD HAVE
                                                                        ;NOTHING ADDED
026502  005037  027072                  CLR     @#12$+16                ;NO BITS TO BE CLEARED IN RHCS2
026506  005037  027102                  CLR     @#15$+6                 ;RHBA SHOULD BE 0
026512  005037  027112                  CLR     @#16$+6                 ;CLEAR SAVED RHWC
026516  000500                          BR      14$                     ;BRANCH
026520  022737  000064  002364  13$:    CMP     #64,@#ILLEGL            ;IS FUNCTION 64
026526  001020                          BNE     17$                     ;BRANCH IF NOT
026530  012737  140000  027044          MOV     #SC!TRE,@#11$+12;SAVED RHCS1 SHOULD HAVE SC AND TRE
026536  012737  000204  027102          MOV     #204,@#15$+6            ;RHBA SHOULD HAVE 204
026544  012737  000102  027112          MOV     #102,@#16$+6            ;RHWC SHOULD HAVE 102
026552  012737  001200  027066          MOV     #MXF!OR,@#12$+12;RHCS2 SHOULD HAVE MXF AND OR
026560  012737  000100  027072          MOV     #IR,@#12$+16            ;RHCS2 SHOULD HAVE IR CLEARED
026566  000454                          BR      14$                     ;BRANCH
026570  022737  000066  002364  17$:    CMP     #66,@#ILLEGL            ;IS FUNCTION 66
026576  001030                          BNE     18$                     ;BRANCH IF NOT
026600  012777  177672  153364          MOV     #-70.,@RHWC             ; MOVE 70 INTO RHWC
026606  012777  002370  153360          MOV     #WRFROM,@RHBA           ;FILL RHBA WITH WRFROM
026614  012737  140000  027044          MOV     #SC!TRE,@#11$+12;SAVED RHCS1
026622  012737  002164  027102          MOV     #WRFROM-<66.*2>,15$+6;RHBA
026630  012737  177774  027112          MOV     #-4.,16$+6              ;SAVED RHWC
026636  012737  001200  027066          MOV     #MXF!OR,@#12$+12        ;SAVED RHCS2
026644  005037  027072                  CLR     @#12$+16                ;RHCS2
026650  012737  000100  027072          MOV     #IR,@#12$+16            ;RHCS2 SHOULD HAVE IR CLEARED
026656  000420                          BR      14$                     ;BRANCH
026660  005077  153306          18$:    CLR     @RHWC                   ;CLEAR RHWC
026664  005077  153304                  CLR     @RHBA                   ;CLEAR RHBA
026670  012737  140000  027044          MOV     #SC!TRE,@#11$+12;RHCS1 SHOULD HAVE SC AND TRE
026676  005037  027102                  CLR     @#15$+6                 ;RHBA
026702  005037  027112                  CLR     @#16$+6                 ;RHWC
026706  012737  001000  027066          MOV     #MXF,@#12$+12           ;RHCS2
026714  005037  027072                  CLR     @#12$+16                ;RHCS2
026720                          14$:
026720  004037  033152                  JSR     R0,@#SAVER              ;SAVE REGISTERS
026724  002172                          RHWC                            ;RHWC IS THE FIRST REGISTER SAVED
026726  004512                          SAVERE                          ;STARTING ADDRES OF WHERE
                                                                        ;THE REGISTERS ARE SAVED
026730  000022                          18.                             ;NUMBER OF REGISTERS
                                                                        ;SAVED = 18.
026732  004737  033064                  JSR     PC,@#CHECKT             ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                        ;AND THAT ALL STATUS BITS ARE = 0
026736  104400  056662                  TYPE    ,CPHALT                 ;CANNOT CONTINUE TESTING IF NOT
026742  000000                          HALT                            ;STOP TEST
026744  013746  002364                  MOV     @#ILLEGL,-(SP)          ;GET ILLEGAL FUNCTION
026750  052716  000101                  BIS     #GO!IE,(SP)             ;INCLUDE IE AND GO
026754  012611                          MOV     (SP)+,@R1               ;GO TO RHCS1 WITH ILLEGAL FUNCTION
```

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 026756  104412                          WAT                                 ;WAIT FOR RDY BIT TO SET
 026760  002200                          RHCS1                               ;WAIT FOR RHCS1 REGISTER
 026762  000200                          RDY                                 ;WAIT FOR RDY BIT IN RHCS1 REGISTER
 026764  001614                          908.                                ;ALLOW 9080 MICRO SECONDS
 026766  001613                          907.                                ;RDY MUST SET BETWEEN
                                                                             ;10 AND 18150 MICRO SECONDS

                                         ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE

 026770  004037  033674                  JSR     R0,@#CHREG                  ;CHANGE BITS IN SAVED REGISTER
 026774  002202                          RHER1                               ;CHANGE RHER1 REGISTER

 026776  000001                          1                                   ;1 BIT/BITS TO BE CHANGED
 027000  000001                          1                                   ;NEW VALUE OF ILF IS 1
 027002  000001                          ILF                                 ;CHANGE ILF BIT

 027004  004037  033674                  JSR     R0,@#CHREG                  ;CHANGE BITS IN SAVED REGISTER
 027010  002222                          RHDS1                               ;CHANGE RHDS1 REGISTER

 027012  000002                          2                                   ;2 BIT/BITS TO BE CHANGED
 027014  000001                          1                                   ;NEW VALUE OF ATA IS 1
 027016  100000                          ATA                                 ;CHANGE ATA BIT
 027020  000001                          1                                   ;NEW VALUE OF ERR IS 1
 027022  040000                          ERR                                 ;CHANGE ERR BIT

 027024  053737  004644  004536          BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                             ;FOR WORKING DRIVE IN
                                                                             ;SAVED RHAS LOCATION

                                         ;*RHCS1 WILL HAVE SC AND TRE ADDED IF FUNCTION IS GREATER THAN 50
 027032                          11$:

 027032  004037  033674                  JSR     R0,@#CHREG                  ;CHANGE BITS IN SAVED REGISTER
 027036  002200                          RHCS1                               ;CHANGE RHCS1 REGISTER

 027040  000001                          1                                   ;1 BIT/BITS TO BE CHANGED
 027042  000001                          1                                   ;NEW VALUE OF SC IS 1
 027044  100000                          SC                                  ;CHANGE SC BIT
 027046  053737  002364  004520          BIS     @#ILLEGL,@#SAVERE+6;INCLUDE ILLEGAL FUNCTION
                                                                             ;IN RHCS1
                                         ;*RHCS2 WILL HAVE NOTHING ADDED IF FUNCTION IS LESS THAN 50
 027054                          12$:

 027054  004037  033674                  JSR     R0,@#CHREG                  ;CHANGE BITS IN SAVED REGISTER
 027060  002176                          RHCS2                               ;CHANGE RHCS2 REGISTER

 027062  000002                          2                                   ;2 BIT/BITS TO BE CHANGED
 027064  000001                          1                                   ;NEW VALUE OF MXF IS 1
 027066  001000                          MXF                                 ;CHANGE MXF BIT
 027070  000000                          0                                   ;NEW VALUE OF IR IS 0
 027072  000100                          IR                                  ;CHANGE IR BIT
 027074                          15$:

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```
027074  004037  032706          JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHBA
027100  002174                  RHBA                    ;SAVED REGISTER TO CHANGE
027102  000000                  0                       ;DATA

027104                  16$:

027104  004037  032706          JSR     R0,@#FILLRE     ;MOV 0 INTO SAVED RHWC
027110  002172                  RHWC                    ;SAVED REGISTER TO CHANGE
027112  000000                  0                       ;DATA


                                ;*NOW COMPARE REGISTERS AFTER GIVING AN ILLEGAL COMMAND

027114  004037  034002          JSR     R0,@#COMREG     ;COMPARE SAVED REGISTERS WITH
                                                        ;PRESENT VALUE
027120  004512                  SAVERE                  ;GOOD DATA SAVED IN 'SAVERE'
027122  002254                  WC                      ;TEST DATA STARTING FROM 'RHWC'
027124  000022                  18.                     ;18. REGISTERS TO BE COMPARED
027126  027132                  5$                      ;RETURN TO 5$ ON ERROR
027130  027136                  6$                      ;RETURN TO 6$ ON NO ERROR


027132  104051          5$:     ERROR   51              ;GIVING ILLEGAL FUNCTION CAUSED
027134  000207                  RTS     PC              ;IMPROPER REGISTER CHANGE
                                                        ;GOOD DATA GIVES WHAT
                                                        ;SHOULD BE THERE
                                                        ;RECEIVED DATA GIVES REGISTER
                                                        ;CONTENTS AFTER ILLEGAL
                                                        ;FUNCTION WA GIVEN
027136  000137  026352  6$:     JMP     @#1$            ;BRANCH FOR NEXT FUNCTION
027142                  7$:

027142                  10$:
```

```

                                        ;;*******************************************************
                                        ;*TEST 33        OPERATION INCOMPLETE - RHER1(BIT #12)OPI
                                        ;*       A WRITE HEADER AND DATA COMMAND IS GIVEN
                                        ;*       CYLINDER 0 SECTOR 1 TRACK 0 KEYS 0 DATA 177777
                                        ;*       WORDCOUNT 260
                                        ;*
                                        ;*       AFTER GO IS GIVEN THEN THREE INDEX PULSES ARE
                                        ;*       GIVEN. THIS SHOULD BRING OPI HIGH
                                        ;;*******************************************************
 027142  000004                         TST33:  SCOPE
 027144  012706  001000                         MOV     #STACK,SP       ;RESET STACK
 027150  012737  000033  004504                 MOV     #33,@#TSTNM     ;SAVE TEST NUMBER

 027156  004737  033004                         JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                        ;R3-RHDS1, R4-RHER1
                                                                        ;GIVE RH-11 INITIALIZE
                                                                        ;SETUP UNIT NUMBER

                                                ;*THESE ARE REGULAR SETUPS
 027162  012777  177374  153002                 MOV     #-260.,@RHWC    ;256 DATA WORDS 4 HEADER WORDS
 027170  012700  002370                         MOV     #WRFROM,R0      ;THESE TWO INSTRUCTIONS GETS
 027174  010077  152774                         MOV     R0,@RHBA        ;ADDR. OF WRFROM BUFFER INTO R0 AND
                                                                        ;BUS ADDRESS REGISTER
 027200  012710  010000                         MOV     #FMT22,(R0);    ;FORMAT=16 BIT WORDS
                                                                        ;CYLINDER=0
 027204  012720  000001                         MOV     #1,(R0)+        ;TRACK=0, SECTOR=1, KEYS=0
 027210  005020                                 CLR     (R0)+           ;KEY1=0
 027212  005020                                 CLR     (R0)+           ;KEY2=0
 027214  012705  000400                         MOV     #256.,R5        ;COUNTER

                                                ;*SETUP DATA, WRITE HEADER & DATA, AND FORMAT OF THE WRITE
 027220  012720  177777                 1$:     MOV     #-1,(R0)+       ;MOVE ALL ONES FOR DATA
 027224  005305                                 DEC     R5
 027226  001374                                 BNE     1$              ;BRANCH IF DATA NOT COMPLETE
 027230  012777  000001  152746                 MOV     #1,@RHDST       ;TRACK=0 SECTOR=1
 027236  004737  033064                         JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                        ;AND THAT ALL STATUS BITS ARE = 0
 027242  104400  056662                         TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
 027246  000000                                 HALT                    ;STOP TEST
 027250  013711  002344                         MOV     @#WRIFOR,@R1    ;GET READY FOR WRITE HEADER AND
                                                                        ;DATA WITH 62 IN RHCS1
 027254  005037  004632                         CLR     @#ERFLG$        ;CLEAR ERROR FLAG
 027260  012777  010000  152722                 MOV     #FMT22,@RHOF    ;FORMAT BIT=1 (16 BIT WORDS)
 027266  005077  152720                         CLR     @RHCA           ;CYLINDER =0

                                                ;*SAVE REGISTERS FOR COMPARISON AFTER READ
 027272  004037  033152                         JSR     R0,@#SAVER      ;SAVE REGISTERS
 027276  002172                                 RHWC                    ;RHWC IS THE FIRST REGISTER SAVED
 027300  004512                                 SAVERE                  ;STARTING ADDRES OF WHERE
                                                                        ;THE REGISTERS ARE SAVED
 027302  000023                                 19.                     ;NUMBER OF REGISTERS
                                                                        ;SAVED = 19.
```

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                                                ;*GO TO WRITE HEADER AND DATA
                                                ;*BUT BEFORE GO, ONE INDEX PULSE IS GIVEN
                                                ;*TO CLEAR OUT THE SECTOR CLOCK COUNTER IN THE RH11
                                                ;*SO THAT NO SECTOR PULSES COME DURING THIS TEST

027304  013700  002220                          MOV     @#RHMR,R0           ;NOW R0 HAS MAINTENANCE REG. ADDR.
027310  012710  000001                          MOV     #DMD,@R0            ;SET DIAGNOSTIC MODE
027314  052710  000004                          BIS     #MINX,@R0           ;SET INDEX
027320  042710  000004                          BIC     #MINX,@R0           ;CLEAR INDEX THIS GIVES
                                                                            ;ONE INDEX PULSE

027324  052777  000001  152646                  BIS     #GO,@RHCS1          ;ISSUE THE 'GO' BIT TO THE RH11
027332  012737  000113  004642  RUNWAT: MOV     #75.,@#RUNCTR       ;LOAD 'RUN' LINE DELAY COUNTER
                                                                            ;= APPROX 450 US ON 11/50 CPU WITH CORE
                                                                            ;AND PROVIDES FOR TIME TO FILL THE SILO
027340  005337  004642          1$:     DEC     @#RUNCTR            ;COUNT DOWN ONCE
027344  001375                                  BNE     1$                  ;CONTINUE UNTIL = 0

                                                ;*ISSUE THE FIRST DIAGNOSTIC INDEX PULSE
027346  052710  000004                          BIS     #MINX,@R0           ;SET INDEX PULSE
027352  042710  000004                          BIC     #MINX,@R0           ;RESET INDEX

                                                ;*SECOND INDEX PULSE
027356  052710  000004                          BIS     #MINX,@R0           ;SET INDEX
027362  042710  000004                          BIC     #MINX,@R0           ;CLEAR INDEX

                                                ;*THIRD INDEX PULSE
027366  052710  000004                          BIS     #MINX,@R0           ;SET INDEX
027372  042710  000004                          BIC     #MINX,@R0           ;CLEAR INDEX


                                                ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE

027376  004037  033674                          JSR     R0,@#CHREG          ;CHANGE BITS IN SAVED REGISTER
027402  002200                                  RHCS1                       ;CHANGE RHCS1 REGISTER

027404  000002                                  2                           ;2 BIT/BITS TO BE CHANGED
027406  000001                                  1                           ;NEW VALUE OF SC IS 1
027410  100000                                  SC                          ;CHANGE SC BIT
027412  000001                                  1                           ;NEW VALUE OF TRE IS 1
027414  040000                                  TRE                         ;CHANGE TRE BIT

027416  004037  033674                          JSR     R0,@#CHREG          ;CHANGE BITS IN SAVED REGISTER
027422  002222                                  RHDS1                       ;CHANGE RHDS1 REGISTER

027424  000002                                  2                           ;2 BIT/BITS TO BE CHANGED
027426  000001                                  1                           ;NEW VALUE OF ATA IS 1
027430  100000                                  ATA                         ;CHANGE ATA BIT
027432  000001                                  1                           ;NEW VALUE OF ERR IS 1
027434  040000                                  ERR                         ;CHANGE ERR BIT

027436  004037  032706                          JSR     R0,@#FILLRE         ;MOV 2 INTO SAVED RHDST
027442  002204                                  RHDST                       ;SAVED REGISTER TO CHANGE
```

```
027444  000002                                  2                               ;DATA

027446  004037  033674                          JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
027452  002202                                  RHER1                           ;CHANGE RHER1 REGISTER

027454  000001                                  1                               ;1 BIT/BITS TO BE CHANGED
027456  000001                                  1                               ;NEW VALUE OF OPI IS 1
027460  020000                                  OPI                             ;CHANGE OPI BIT

027462  053737  004644  004536                  BIS     @#ATTENT,@#SAVERE+24 ;SET APPROPIATE 'ATA' BITS
                                                                                ;FOR WORKING DRIVE IN
                                                                                ;SAVED RHAS LOCATION

027470  004037  033674                          JSR     R0,@#CHREG              ;CHANGE BITS IN SAVED REGISTER
027474  002220                                  RHMR                            ;CHANGE RHMR REGISTER

027476  000001                                  1                               ;1 BIT/BITS TO BE CHANGED
027500  000001                                  1                               ;NEW VALUE OF DMD IS 1
027502  000001                                  DMD                             ;CHANGE DMD BIT


                                                ;*RHWC,RHBA AND OR AND IR BITS OF RHCS2 WILL NOT BE CHECKED
027504  017737  152462  004512                  MOV     @RHWC,@#SAVERE  ;SAVED RHWC
027512  017737  152456  004514                  MOV     @RHBA,@#SAVERE+2;SAVED RHBA
027520  017746  152452                          MOV     @RHCS2,-(SP)    ;GET RHCS2
027524  042716  177477                          BIC     #^C<IR!OR>,(SP) ;GET 'IR' & 'OR' STATES
027530  042737  000300  004516                  BIC     #IR!OR,@#SAVERE+4;CLEAR 'IR' & 'OR' BITS
027536  052637  004516                          BIS     (SP)+,@#SAVERE+4;SET 'OR' & 'IR' AS REQUIRED


                                                ;*COMPARE REGISTERS BEFORE WRITE WITH RESULTS AFTER WRITE

027542  004037  034002                          JSR     R0,@#COMREG             ;COMPARE SAVED REGISTERS WITH
                                                                                ;PRESENT VALUE
027546  004512                                  SAVERE                          ;GOOD DATA SAVED IN 'SAVERE'
027550  002254                                  WC                              ;TEST DATA STARTING FROM 'RHWC'
027552  000021                                  17.                             ;17. REGISTERS TO BE COMPARED
027554  027560                                  2$                              ;RETURN TO 2$ ON ERROR
027556  027564                                  3$                              ;RETURN TO 3$ ON NO ERROR


027560  104071                          2$:     ERROR   71                      ;FORCING OPI CAUSED
027562  000207                                  RTS     PC                      ;IMPROPER REGISTER CHANGE
                                                                                ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                                                                ;RECEIVED DATA GIVES WHAT WAS THERE
                                                                                ;AFTER 3 INDEX PULSES WERE ISSUED


027564  004737  033004                  3$:     JSR     PC,@#CLDISK             ;CLEAR THE 'GO' BIT
```

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                                          ;;*************************************************************
                                          ;*TEST 34        CONSECUTIVE SECTOR FORMATTING

                                          ;*       46 CONSECUTIVE SECTORS WILL BE FORMATTED
                                          ;*       STARTING FROM CYLINDER 0 TRACK 0 SECTOR 21.
                                          ;*       FORMATTING WILL BE DONE BY A WRITE HEADER AND
                                          ;*       DATA COMMAND FOR 4 WORDS, ONE SECTOR
                                          ;*       AT A TIME.
                                          ;*
                                          ;*       AFTER EACH SECTOR IS WRITTEN, 'SC' WILL BE CHECKED
                                          ;*       TO INSURE THAT THERE WERE NO ERRORS

                                          ;;*************************************************************
 027570  000004                           TST34:  SCOPE
 027572  012706  001000                           MOV     #STACK,SP          ;RESET STACK
 027576  012737  000034  004504                   MOV     #34,@#TSTNM        ;SAVE TEST NUMBER

 027604  004737  033004                           JSR     PC,@#CLDISK        ;SET R1-RHCS1, R2-RHCS2
                                                                             ;R3-RHDS1, R4-RHER1
                                                                             ;GIVE RH-11 INITIALIZE
                                                                             ;SETUP UNIT NUMBER
 027610  012737  000025  027644                   MOV     #21.,@#1$+12       ;SET UP TO START FROM
 027616  012737  000025  027660                   MOV     #21.,@#2$+6        ;SECTOR 21.
 027624  012737  000056  004652                   MOV     #46.,@#TMP1        ;46 SECTORS TO COVER 3 TRACKS

                                                  ;*FILL WRITE FROM BUFFER WITH THE HEADER
 027632                                   1$:

 027632  004037  032630                           JSR     R0,@#FLHEAD        ;SAVE HEADER DATA IN WRFROM
 027636  002370                                   WRFROM                     ;LOCATION WHERE SAVED
 027640  000004                                   4                          ;NUMBER OF WORDS SAVED
 027642  010000                                   10000                      ;FIRST DATA WORD
 027644  000025                                   21.                        ;SECOND DATA WORD
 027646  000000                                   0                          ;THIRD DATA WORD
 027650  000000                                   0                          ;FOURTH DATA WORD

                                                  ;*NOW THE WRITE HEADER AND DATA COMMAND WILL BE SETUP
 027652                                   2$:

 027652  004037  034766                           JSR     R0,@#RUN           ;SETUP TO RUN FOR DATA COMMAND
 027656  000000                                   0                          ;CYLINDER 0
 027660     025                                   .BYTE   21.                ;SECTOR 21.
 027661     000                                   .BYTE   0                  ;TRACK 0
 027662  177774                                   -0-4                       ;WORD COUNT (DATA) = 0 +
                                                                             ;4 HEADER WORDS
 027664  002370                                   WRFROM                     ;BUS ADDRESS
                                                                             ;STARTING ADDRESS OF DATA
                                                                             ;BUFFER = WRFROM
 027666  000000                                   0                          ;DO NOT INHIBIT BUS ADDRESS INCREMENT
 027670  010000                                   FMT22                      ;16 BITS PER WORD FORMAT
                                                                             ;DO NOT INHIBIT ECC CORRECTION
                                                                             ;DO NOT INHIBIT HEADER COMPARE
 027672  002344                                   WRIFOR                     ;GET READY TO DO A WRIFOR
```

```
                                                        ;WRITE HEADER AND DATA WITH 62 IN RHCS1


027674  004737  033064                  JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                ;AND THAT ALL STATUS BITS ARE = 0
027700  104400  056662                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
027704  000000                          HALT                    ;STOP TEST

027706  013777  004506  152252          MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                ;'TIME' WILL ONLY SAVE
                                                                ;CURRENT CYLINDER ADDRESS
                                                                ;AND LOOK AHEAD REGISTERS


027714  013746  002344                  MOV     @#WRIFOR,-(SP)  ;GET READY TO MOVE COMMAND
027720  052716  000101                  BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                ;ENABLE INTERRUPT
027724  012677  152250                  MOV     (SP)+,@RHCS1    ;GO WITH
                                                                ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                                ;WITH INTERRUPT ENABLED
027730  011100                          MOV     @R1,R0          ;SAVE RHCS1 DURING ABOVE OPERATION
027732  011305                          MOV     @R3,R5          ;SAVE RHDS1 DURING ABOVE OPERATION

                                        ;*ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR=760 MICRO SEC

027734  104412                          WAT                     ;WAIT FOR RDY BIT TO SET
027736  002200                          RHCS1                   ;WAIT FOR RHCS1 REGISTER
027740  000200                          RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
027742  003237                          1695.                   ;ALLOW 16950 MICRO SECONDS
027744  001515                          845.                    ;RDY MUST SET BETWEEN
                                                                ;8500 AND 25400 MICRO SECONDS

                                        ;*NOW ONE MORE SECTOR HAS BEEN WRITTEN
                                        ;*'SC' WILL BE CHECKED TO MAKE SURE
                                        ;*NO ERRORS OCCURED

027746  017737  152226  002262          MOV     @RHCS1,@#CS1    ;GET RHCS1
027754  032737  100000  002262          BIT     #SC,@#CS1       ;IS 'SC' SET ?
027762  001403                          BEQ     3$              ;BRANCH IF "SPECIAL CONDITION" NOT SET
027764  004737  034726                  JSR     PC,@#PUTREG     ;READ & SAVE  ALL RH11 & RP04 REGISTERS
027770  104072                          ERROR   72              ;THERE WAS AN UNDEFINED ERROR AFTER
                                                                ;A WRITE HEADER AND DATA

                                        ;*A SECTOR HAS BEEN FORMATTED NOW,
                                        ;*THE HARDWARE WILL BE CLEARED AND
                                        ;*CHANGES WILL BE MADE TO FORMAT NEXT SECTOR.

027772                          3$:

027772  004737  033004                  JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                ;R3-RHDS1, R4-RHER1
                                                                ;GIVE RH-11 INITIALIZE
```

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8010                                                              ;SETUP UNIT NUMBER
8011  027776  013705  027644          MOV     @#1$+12,R5           ;GET SECTOR TRACK WORD
8012  030002  005205                  INC     R5                   ;+ 1
8013  030004  122705  000026          CMPB    #22.,R5              ;IS IT 22 SECTORS (WHOLE TRACK DONE) ?
8014  030010  001405                  BEQ     4$                   ;YES...DO NEXT TRACK
8015  030012  010537  027644          MOV     R5,@#1$+12           ;NO...RESTORE SECTOR TRACK FOR DATA
8016  030016  010537  027660          MOV     R5,@#2$+6            ;RESTORE SECTOR TRACK FOR "RUN" ROUTINE
8017  030022  000410                  BR      5$                   ;CHECK FOR 46 SECTORS COMPLETED
8018
8019  030024  105037  027644  4$:     CLRB    @#1$+12              ;SET SECTOR = 0 FOR DATA WRITTEN
8020  030030  105237  027645          INCB    @#1$+13              ;INCR TRACK FOR DATA WRITTEN
8021  030034  105037  027660          CLRB    @#2$+6               ;SET SECTOR = 0 FOR "RUN" ROUTINE
8022  030040  105237  027661          INCB    @#2$+7               ;INCR TRACK FOR THE "RUN" ROUTINE
8023
8024  030044  005337  004652  5$:     DEC     @#TMP1               ;ARE 46 SECTORS DONE ?
8025  030050  001270                  BNE     1$                   ;CONTINUE FORMATTING IF NOT
8026
8027  030052                  6$:                                  ;GO ON TO NEXT TEST IF SO
```

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                                        ;;*************************************************************
                                        ;*TEST 35        OPERATION INCOMPLETE - RHER1 (BIT #13)OPI

                                        ;*      THIS WILL TEST THAT OPI DOES NOT SET WHEN THREE NORMAL
                                        ;*      INDEX PULSES ARE ENCOUNTERED IN A READ COMMAND

                                        ;*      FIRST 46 CONSECUTIVE SECTORS WILL BE FORMATTED
                                        ;*      STARTING FROM CYLINDER 0 TRACK 0 SECTOR 21.
                                        ;*      FORMATTING WILL BE DONE BY A WRITE HEADER AND
                                        ;*      DATA COMMAND FOR 4 WORDS, ONE SECTOR
                                        ;*      AT A TIME
                                        ;*
                                        ;*      THEN A READ HEADER AND DATA WILL BE DONE
                                        ;*      FOR CYLINDER 0 TRACK 0 SECTOR 21 FOR
                                        ;*      11960 WORDS (260.X22X2+260+260) WITH BUS
                                        ;*      ADDRESS INHIBIT SET.
                                        ;*
                                        ;*      AT THE END ALL REGISTERS WILL BE CHECKED.

                                        ;;*************************************************************
030052  000004                          TST35:  SCOPE
030054  012706  001000                          MOV     #STACK,SP               ;RESET STACK
030060  012737  000035  004504                  MOV     #35,@#TSTNM             ;SAVE TEST NUMBER

030066  004737  033004                          JSR     PC,@#CLDISK             ;SET R1-RHCS1, R2-RHCS2
                                                                                ;R3-RHDS1, R4-RHER1
                                                                                ;GIVE RH-11 INITIALIZE
                                                                                ;SETUP UNIT NUMBER
030072  012737  000025  030126                  MOV     #21.,@#1$+12            ;SET UP TO START FROM
030100  012737  000025  030142                  MOV     #21.,@#2$+6             ;SECTOR 21.
030106  012737  000056  004652                  MOV     #46.,@#TMP1             ;46 SECTORS TO COVER 3 TRACKS

                                                ;*FILL WRITE FROM BUFFER WITH HEADER
030114                                  1$:

030114  004037  032630                          JSR     R0,@#FLHEAD             ;SAVE HEADER DATA IN WRFROM
030120  002370                                  WRFROM                          ;LOCATION WHERE SAVED
030122  000004                                  4                               ;NUMBER OF WORDS SAVED
030124  010000                                  10000                           ;FIRST DATA WORD
030126  000025                                  21.                             ;SECOND DATA WORD
030130  000000                                  0                               ;THIRD DATA WORD
030132  000000                                  0                               ;FOURTH DATA WORD

                                                ;*NOW THE WRITE HEADER AND DATA COMMAND WILL BE FILLED
030134                                  2$:

030134  004037  034766                          JSR     R0,@#RUN                ;SETUP TO RUN FOR DATA COMMAND
030140  000000                                  0                               ;CYLINDER 0
030142     025                                  .BYTE   21.                     ;SECTOR 21.
030143     000                                  .BYTE   0                       ;TRACK 0
030144  177774                                  -0-4                            ;WORD COUNT (DATA) = 0 +
                                                                                ;4 HEADER WORDS
```

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 030146  002370                          WRFROM                         ;BUS ADDRESS
                                                                        ;STARTING ADDRESS OF DATA
                                                                        ;BUFFER = WRFROM
 030150  000000                          0                              ;DO NOT INHIBIT BUS ADDRESS INCREMENT
 030152  010000                          FMT22                          ;16 BITS PER WORD FORMAT
                                                                        ;DO NOT INHIBIT ECC CORRECTION
                                                                        ;DO NOT INHIBIT HEADER COMPARE
 030154  002344                          WRIFOR                         ;GET READY TO DO A WRIFOR
                                                            ;WRITE HEADER AND DATA WITH 62 IN RHCS1


 030156  004737  033064                  JSR     PC,@#CHECKT            ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                        ;AND THAT ALL STATUS BITS ARE = 0
 030162  104400  056662                  TYPE    ,CPHALT                ;CANNOT CONTINUE TESTING IF NOT
 030166  000000                          HALT                           ;STOP TEST

 030170  013777  004506  151770          MOV     @#RP4VEC,@RPVEC        ;SET RP04 VECTOR ADDRESS
                                                                        ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                        ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                        ;'TIME' WILL ONLY SAVE
                                                                        ;CURRENT CYLINDER ADDRESS
                                                                        ;AND LOOK AHEAD REGISTERS


 030176  013746  002344                  MOV     @#WRIFOR,-(SP)         ;GET READY TO MOVE COMMAND
 030202  052716  000101                  BIS     #GO!IE,(SP)            ;GET READY TO SET GO AND
                                                                        ;ENABLE INTERRUPT
 030206  012677  151766                  MOV     (SP)+,@RHCS1           ;GO WITH
                                                                        ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                                        ;WITH INTERRUPT ENABLED
 030212  011100                          MOV     @R1,R0                 ;SAVE RHCS1 DURING ABOVE OPERATION
 030214  011305                          MOV     @R3,R5                 ;SAVE RHDS1 DURING ABOVE OPERATION

                                         ;*ONE REVOLUTION=16670 MICRO SEC. ONE SECTOR=760 MICRO SEC

 030216  104412                          WAT                            ;WAIT FOR RDY BIT TO SET
 030220  002200                          RHCS1                          ;WAIT FOR RHCS1 REGISTER
 030222  000200                          RDY                            ;WAIT FOR RDY BIT IN RHCS1 REGISTER
 030224  003237                          1695.                          ;ALLOW 16950 MICRO SECONDS
 030226  001515                          845.                           ;RDY MUST SET BETWEEN
                                                                        ;8500 AND 25400 MICRO SECONDS

                                         ;*NOW ONE MORE SECTOR HAS BEEN WRITTEN
                                         ;*'SC' WILL BE CHECKED TO MAKE SURE
                                         ;*NO ERRORS OCCURED

 030230  017737  151744  002262          MOV     @RHCS1,@#CS1           ;GET RHCS1
 030236  032737  100000  002262          BIT     #SC,@#CS1              ;IS 'SC' SET ?
 030244  001405                          BEQ     3$                     ;BRANCH IF "SPECIAL CONDITION" NOT SET
 030246  004737  034726                  JSR     PC,@#PUTREG            ;READ & SAVE  ALL RH11 & RP04 REGISTERS
 030252  104072                          ERROR   72                     ;THERE WAS AN UNDEFINED ERROR AFTER
                                                                        ;A WRITE HEADER AND DATA

 030254  000137  030510                  JMP     TST36                  ;        THIS IS A SETUP ERROR AND 'OPI' TEST CAN'T CONTI
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                                                        ;GO ON TO NEXT TEST

                                        ;*ONE SECTOR HAS BEEN FORMATTED NOW,
                                        ;*THE HARDWARE WILL BE CLEARED AND
                                        ;*CHANGES WILL BE MADE TO FORMAT NEXT SECTOR.

030260                          3$:

030260  004737  033004                  JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                ;R3-RHDS1, R4-RHER1
                                                                ;GIVE RH-11 INITIALIZE
                                                                ;SETUP UNIT NUMBER
030264  013705  030126                  MOV     @#1$+12,R5      ;GET SECTOR TRACK WORD
030270  005205                          INC     R5              ;+ 1
030272  122705  000026                  CMPB    #22.,R5         ;IS IT 22 (WHOLE TRACK) ?
030276  001405                          BEQ     4$              ;YES...DO NEXT TRACK
030300  010537  030126                  MOV     R5,@#1$+12      ;NO...RESTORE SECTOR TRACK FOR DATA WRITTEN
030304  010537  030142                  MOV     R5,@#2$+6       ;RESTORE SECTOR TRACK FOR "RUN" ROUTINE
030310  000410                          BR      5$              ;CHECK FOR 46 SECTORS COMPLETED

030312  105037  030126          4$:     CLRB    @#1$+12         ;SET SECTOR = 0 FOR DATA WRITTEN
030316  105237  030127                  INCB    @#1$+13         ;INCR TRACK FOR THE "RUN" ROUTINE
030322  105037  030142                  CLRB    @#2$+6          ;SET SECTOR = 0 FOR DATA WRITTEN
030326  105237  030143                  INCB    @#2$+7          ;INCR TRACK FOR THE "RUN" ROUTINE

030332  005337  004652          5$:     DEC     @#TMP1          ;ARE 46 SECTORS DONE ?
030336  001266                          BNE     1$              ;CONTINUE IF NOT


                                        ;*NOW 46 SECTORS HAVE BEEN FORMATTED

                                        ;*READ HEADER AND DATA FOR 46 SECTORS=11960 WORDS
                                        ;*WITH BUS ADDRESS INHIBITED


030340  004737  033004                  JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                ;R3-RHDS1, R4-RHER1
                                                                ;GIVE RH-11 INITIALIZE
                                                                ;SETUP UNIT NUMBER

                                        ;*FILL READ HEADER AND DATA COMMAND


030344  004037  034766                  JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
030350  000000                          0                       ;CYLINDER 0
030352     025                          .BYTE   21.             ;SECTOR 21.
030353     000                          .BYTE   0               ;TRACK 0
030354  150510                          -11956.-4                       ;WORD COUNT (DATA) = 11956. +
                                                                ;4 HEADER WORDS
030356  003434                          REINTO                  ;BUS ADDRESS
                                                                ;STARTING ADDRESS OF DATA
                                                                ;BUFFER = REINTO
030360  000010                          BAI                     ;INHIBIT BUS ADDRESS INCREMENT
030362  014000                          FMT22!ECI                       ;16 BITS PER WORD FORMAT
```

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                                                                ;INHIBIT ECC CORRECTION
                                                                ;DO NOT INHIBIT HEADER COMPARE
030364  002350                          REFOR                   ;GET READY TO DO A REFOR
                                                                ;READ HEADER AND DATA WITH 72 IN RHCS1

030366  004737  033064                  JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                ;AND THAT ALL STATUS BITS ARE = 0
030372  104400  056662                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
030376  000000                          HALT                    ;STOP TEST
030400  013777  004506  151560          MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                ;'TIME' WILL ONLY SAVE
                                                                ;CURRENT CYLINDER ADDRESS
                                                                ;AND LOOK AHEAD REGISTERS

030406  013746  002350                  MOV     @#REFOR,-(SP)   ;GET READY TO MOVE COMMAND
030412  052716  000101                  BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                ;ENABLE INTERRUPT
030416  012677  151556                  MOV     (SP)+,@RHCS1    ;GO WITH
                                                                ; 72 IN RHCS1 FOR READ DATA
                                                                ;WITH INTERRUPT ENABLED
030422  011100                          MOV     @R1,R0          ;SAVE RHCS1 DURING ABOVE OPERATION
030424  011305                          MOV     @R3,R5          ;SAVE RHDS1 DURING ABOVE OPERATION

                                        ;*TIME IS NOT IMPORTANT


030426  104412                          WAT                     ;WAIT FOR RDY BIT TO SET
030430  002200                          RHCS1                   ;WAIT FOR RHCS1 REGISTER
030432  000200                          RDY                     ;WAIT FOR RDY BIT IN RHCS1 REGISTER
030434  121320                          41680.                  ;ALLOW 416800 MICRO SECONDS
030436  121320                          41680.                  ;RDY MUST SET BETWEEN
                                                                ;00 AND 178240 MICRO SECONDS

                                        ;*NOW THAT ALL 11960 WORDS HAVE BEEN READ
                                        ;*'OPI' WILL BE CHECKED TO BE NOT SET

030440  017737  151536  002264          MOV     @RHER1,@#ER1    ;GET RHER1
030446  032737  020000  002264          BIT     #OPI,@#ER1      ;IS 'OPI' SET ?
030454  001403                          BEQ     6$              ;CHECK 'SC' IF NOT
030456  004737  034726                  JSR     PC,@#PUTREG     ;READ & SAVE ALL RH11 & RP04 REGISTERS
030462  104074                          ERROR   74              ;READ HEADER AND DATA
                                                                ;OVER 3 INDEX PULSES
                                                                ;CAUSED 'OPI' TO SET

                                        ;*'SC' WILL BE CHECKED

030464  017737  151510  002262  6$:     MOV     @RHCS1,@#CS1    ;GET RHCS1
030472  032737  100000  002262          BIT     #SC,@#CS1       ;IS 'SC' SET ?
030500  001403                          BEQ     7$              ;CONTINUE TESTING IF NOT
030502  004737  034726                  JSR     PC,@#PUTREG     ;READ & SAVE ALL RH11 & RP04 REGISTERS
030506  104072                          ERROR   72              ;READ HEADER AND DATA
                                                                ;FOR 11960 WORDS, THAT IS OVER THREE
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E02


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8244                                            ;INDEX PULSES, CAUSED AN UNDEFINED ERROR
8245
8246  030510                   7$:              ;CONTINUE WITH THE NEXT TEST
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                                       ;;***************************************************************
                                       ;*TEST 36       HEAD SELECTION TEST ERR & TRE
                                       ;*       THIS TESTS HEAD SELECTION LOGIC ONLY. A WRITE HEADER AND
                                       ;*       DATA COMMAND IS GIVEN TO EACH TRACK FROM 0 TO 18 ON
                                       ;*       CYLINDER 0, SECTOR 0.
                                       ;*       THE DATA ON EACH SECTOR IS UNIQUE. THE LEAST SIGNIFICANT
                                       ;*       5 BITS GIVE SECTOR THE NEXT LEAST SIGNIFICANT 5 BITS
                                       ;*       GIVE TRACK THE NEXT 6 BITS GIVE CYLINDER
                                       ;*
                                       ;*       THEN READ HEADER AND DATA IS DONE FOR THE ABOVE AND DATA
                                       ;*       CHECKED
                                       ;*
                                       ;*       BETWEEN THE WRITE AND READ ONLY "ERR" AND "TRE" ARE CHECKED
                                       ;*
                                       ;*
                                       ;*       ON AN ERROR IN THE READ HEADER AND DATA LOOPING WILL BE
                                       ;*       ONLY ON THE ERROR SECTOR READ
                                       ;*
                                       ;;***************************************************************
 030510  000004                        TST36:  SCOPE
 030512  012706  001000                        MOV     #STACK,SP       ;RESET STACK
 030516  012737  000036  004504                MOV     #36,@#TSTNM     ;SAVE TEST NUMBER

 030524  004737  033004                        JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                       ;R3-RHDS1, R4-RHER1
                                                                       ;GIVE RH-11 INITIALIZE
                                                                       ;SETUP UNIT NUMBER

                                               ;*THE FOLLOWING CLEARS ARE TO INITIALIZE TEST FROM CYLINDER 0
 030530  005037  030636                        CLR     @#1$+12         ;START WITH SECTOR/TRACK = 0
 030534  005037  030654                        CLR     @#2$+10         ;START WITH DATA = 0
 030540  005037  030664                        CLR     @#3$+6          ;START WITH 0 FOR COMMAND

 030544  012737  000023  001200                MOV     #19.,@#$TMP1    ;19 TRACKS TO BE WRITTEN

                                               ;*THIS GETS THE HEADS TO CYLINDER 0

 030552  004737  033064                        JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                       ;AND THAT ALL STATUS BITS ARE = 0
 030556  104400  056662                        TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
 030562  000000                                HALT                    ;STOP TEST

 030564  013777  004506  151374                MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                       ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                       ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                       ;'TIME' WILL ONLY SAVE
                                                                       ;CURRENT CYLINDER ADDRESS
                                                                       ;AND LOOK AHEAD REGISTERS


 030572  013746  002326                        MOV     @#RECALI,-(SP)  ;GET READY TO MOVE COMMAND
 030576  052716  000101                        BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
```

```
                                                          ;ENABLE INTERRUPT
030602  012677  151372            MOV     (SP)+,@RHCS1    ;GO WITH
                                                          ;6 IN RHCS1 FOR RECALIBRATE
                                                          ;WITH INTERRUPT ENABLED


030606  104412                    WAT                     ;WAIT FOR DRY BIT TO SET
030610  002222                    RHDS1                   ;WAIT FOR RHDS1 REGISTER
030612  000200                    DRY                     ;WAIT FOR DRY BIT IN RHDS1 REGISTER
030614  060650                    25000.                  ;ALLOW 250000 MICRO SECONDS
030616  060650                    25000.                  ;DRY MUST SET BETWEEN
                                                          ;00 AND 500000 MICRO SECONDS


030620  004737  033004            JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                          ;R3-RHDS1, R4-RHER1
                                                          ;GIVE RH-11 INITIALIZE
                                                          ;SETUP UNIT NUMBER


                                  ;*FILL WRITE FROM BUFFER WITH HEADER
030624                    1$:

030624  004037  032630            JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
030630  002370                    WRFROM                  ;LOCATION WHERE SAVED
030632  000004                    4                       ;NUMBER OF WORDS SAVED
030634  010000                    10000                   ;FIRST DATA WORD
030636  000000                    <0*400>!0                       ;SECOND DATA WORD
030640  000000                    0                       ;THIRD DATA WORD
030642  000000                    0                       ;FOURTH DATA WORD

                                  ;*FILL WRITE FROM BUFFER WITH DATA
030644                    2$:

030644  004037  032654            JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM+10
030650  002400                    WRFROM+10                       ;STARTING FROM WRFROM+10
030652  000400                    256.                    ;256. WORDS
030654  000000                    <0.*2000>!<0.*40>!0                     ;FILL WITH <0.*2000>!<0.*40>!0


                                  ;*THE WRITE HEADER AND DATA COMMAND WILL BE FILLED
030656                    3$:

030656  004037  034766            JSR     R0,@#RUN        ;SETUP TO RUN FOR DATA COMMAND
030662  000000                    0                       ;CYLINDER 0
030664     000                    .BYTE   0               ;SECTOR 0
030665     000                    .BYTE   0               ;TRACK 0
030666  177374                    -256.-4                 ;WORD COUNT (DATA) = 256. +
                                                          ;4 HEADER WORDS
030670  002370                    WRFROM                  ;BUS ADDRESS
                                                          ;STARTING ADDRESS OF DATA
                                                          ;BUFFER = WRFROM
030672  000000                    0                       ;DO NOT INHIBIT BUS ADDRESS INCREMENT
030674  010000                    FMT22                   ;16 BITS PER WORD FORMAT
```

```
                                                      ;DO NOT INHIBIT ECC CORRECTION
                                                      ;DO NOT INHIBIT HEADER COMPARE
030676  002344                   WRIFOR               ;GET READY TO DO A WRIFOR
                                              ;WRITE HEADER AND DATA WITH 62 IN RHCS1
030700  004737  033064           JSR     PC,@#CHECKT  ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                      ;AND THAT ALL STATUS BITS ARE = 0
030704  104400  056662           TYPE    ,CPHALT      ;CANNOT CONTINUE TESTING IF NOT
030710  000000                   HALT                 ;STOP TEST
030712  013777  004506  151246   MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                      ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                      ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                      ;'TIME' WILL ONLY SAVE
                                                      ;CURRENT CYLINDER ADDRESS
                                                      ;AND LOOK AHEAD REGISTERS
030720  013746  002344           MOV     @#WRIFOR,-(SP) ;GET READY TO MOVE COMMAND
030724  052716  000101           BIS     #GO!IE,(SP)  ;GET READY TO SET GO AND
                                                      ;ENABLE INTERRUPT
030730  012677  151244           MOV     (SP)+,@RHCS1 ;GO WITH
                                                      ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                      ;WITH INTERRUPT ENABLED
                                 ;*ONE REVOLUTION = 16670 MICRO SEC., ONE SECTOR = 760
                                 ;*MICRO SEC. MAX TIME ALLOWED = ONE REVOLUTION + HEAD
                                 ;*SWITCH + 2 SECTORS, MIN TIME ALLOWED = SECTOR (FIRST CASE)
                                 ;*IF THERE IS A FAILURE HERE HALT PROGRAM AFTER ERROR WITH
                                 ;*SWITCH 15 AND SEE CURRENT CYLINDER REGISTER TO DETERMINE
                                 ;*WHAT CYLINDER IS FAILING
030734  104412                   WAT                  ;WAIT FOR RDY BIT TO SET
030736  002200                   RHCS1                ;WAIT FOR RHCS1 REGISTER
030740  000200                   RDY                  ;WAIT FOR RDY BIT IN RHCS1 REGISTER
030742  003162                   1650.                ;ALLOW 16500 MICRO SECONDS
030744  001572                   890.                 ;RDY MUST SET BETWEEN
                                                      ;7600 AND 25400 MICRO SECONDS
                                 ;*NOW SECTOR 0 OF ONE TRACK HAS BEEN WRITTEN CHECK COMPOSIT
                                 ;*ERROR BIT TO BE SURE NO ERRORS HAPPENED
                                 ;*SAVE REGISTERS IN SAVE TABLE
030746  004737  034726           JSR     PC,@#PUTREG
030752  032737  040000  002304   BIT     #ERR,@#DS1   ;ANY DISK ERRORS
030760  001004                   BNE     9$           ;BRANCH IF YES
030762  032737  040000  002262   BIT     #TRE,@#CS1   ;ANY RH ERRORS
030770  001401                   BEQ     4$           ;BRANCH IF NO
030772  104066           9$:     ERROR   66           ;SOME ERRORS OCCURRED
                                                      ;WHILE DOING WRITE HEADER
```

```
                                                                        ;AND DATA

                                                        ;*THE FOLLOWING 3 ADDS SETS UP FOR NEXT TRACK WRITING

030774  062737  000400  030636  4$:     ADD     #400,@#1$+12    ;NEXT TRACK FOR HEADER
031002  062737  000040  030654          ADD     #40,@#2$+10     ;NEXT TRACK FOR DATA
031010  062737  000400  030664          ADD     #400,@#3$+6     ;NEXT TRACK FOR COMMAND

031016  005337  001200                  DEC     @#$TMP1         ;COUNT 19 TRACKS
031022  001300                          BNE     1$

                                        ;*THE FOLLOWING CLEARS SETS UP FOR READ HEADER AND DATA
031024  005037  031104                  CLR     @#SST3+12       ;START WITH SECTOR/TRACK = 0
031030  005037  031122                  CLR     @#SST4+10       ;START WITH DATA = 0
031034  005037  031132                  CLR     @#SST5+6        ;START WITH 0 FOR COMMAND


031040  004737  033004                  JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                ;R3-RHDS1, R4-RHER1
                                                                ;GIVE RH-11 INITIALIZE
                                                                ;SETUP UNIT NUMBER

                                        ;*SET UP FOR READ HEADER AND DATA
031044  012737  000023  001200  SST1:   MOV     #19.,@#$TMP1    ;19 TRACKS TO BE READ

                                        ;*FILL READ INTO BUFFER WITH ALL ONES
031052                          SST2:

031052  004037  032654                  JSR     R0,@#CLAREA     ;CLEAR 260. WORDS, FROM REINTO
031056  003434                          REINTO                  ;STARTING FROM REINTO
031060  000404                          260.                    ;260. WORDS
031062  177777                          -1                      ;FILL WITH -1

031064  013737  031052  001110          MOV     @#SST2,@#$LPERR ;SET LOOP POINT

                                        ;*FILL WRITE FROM BUFFER WITH EXPECTED HEADER
031072                          SST3:

031072  004037  032630                  JSR     R0,@#FLHEAD     ;SAVE HEADER DATA IN WRFROM
031076  002370                          WRFROM                  ;LOCATION WHERE SAVED
031100  000004                          4                       ;NUMBER OF WORDS SAVED
031102  010000                          10000                   ;FIRST DATA WORD
031104  000000                          0                       ;SECOND DATA WORD
031106  000000                          0                       ;THIRD DATA WORD
031110  000000                          0                       ;FOURTH DATA WORD


                                        ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA
031112                          SST4:

031112  004037  032654                  JSR     R0,@#CLAREA     ;CLEAR 256. WORDS, FROM WRFROM+<4*2>
031116  002400                          WRFROM+<4*2>                    ;STARTING FROM WRFROM+<4*2>
031120  000400                          256.                    ;256. WORDS
031122  000000                          <0.*2000>!<0*40>!0                      ;FILL WITH <0.*2000>!<0*40>!0
```

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                                                ;*FILL COMMAND FOR READ HEADER AND DATA
031124                                  SST5:

031124  004037  034766                          JSR     R0,@#RUN                ;SETUP TO RUN FOR DATA COMMAND
031130  000000                                  0                               ;CYLINDER 0
031132     000                                  .BYTE   0                       ;SECTOR 0
031133     000                                  .BYTE   0                       ;TRACK 0
031134  177374                                  -256.-4                         ;WORD COUNT (DATA) = 256. +
                                                                                ;4 HEADER WORDS
031136  003434                                  REINTO                          ;BUS ADDRESS
                                                                                ;STARTING ADDRESS OF DATA
                                                                                ;BUFFER = REINTO
031140  000000                                  0                               ;DO NOT INHIBIT BUS ADDRESS INCREMENT
031142  014000                                  ECI!FMT22                               ;16 BITS PER WORD FORMAT
                                                                                ;INHIBIT ECC CORRECTION
                                                                                ;DO NOT INHIBIT HEADER COMPARE
031144  002350                                  REFOR                           ;GET READY TO DO A REFOR
                                                                                ;READ HEADER AND DATA WITH 72 IN RHCS1


031146  004737  033064                          JSR     PC,@#CHECKT             ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                                ;AND THAT ALL STATUS BITS ARE = 0
031152  104400  056662                          TYPE    ,CPHALT                 ;CANNOT CONTINUE TESTING IF NOT
031156  000000                                  HALT                            ;STOP TEST

031160  013777  004506  151000                  MOV     @#RP4VEC,@RPVEC         ;SET RP04 VECTOR ADDRESS
                                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                                ;'TIME' WILL ONLY SAVE
                                                                                ;CURRENT CYLINDER ADDRESS
                                                                                ;AND LOOK AHEAD REGISTERS


031166  013746  002350                          MOV     @#REFOR,-(SP)           ;GET READY TO MOVE COMMAND
031172  052716  000101                          BIS     #GO!IE,(SP)             ;GET READY TO SET GO AND
                                                                                ;ENABLE INTERRUPT
031176  012677  150776                          MOV     (SP)+,@RHCS1            ;GO WITH
                                                                                  ;72 IN RHCS1 FOR READ DATA
                                                                                ;WITH INTERRUPT ENABLED


031202  104412                                  WAT                             ;WAIT FOR RDY BIT TO SET
031204  002200                                  RHCS1                           ;WAIT FOR RHCS1 REGISTER
031206  000200                                  RDY                             ;WAIT FOR RDY BIT IN RHCS1 REGISTER
031210  003162                                  1650.                           ;ALLOW 16500 MICRO SECONDS
031212  001572                                  890.                            ;RDY MUST SET BETWEEN
                                                                                ;7600 AND 25400 MICRO SECONDS

                                                ;*NOW SECTOR 0 OF ONE TRACK HAS BEEN READ CHECK COMPOSIT
                                                ;*ERROR BIT TO BE SURE NO ERROR HAPPENED

                                                ;*SAVE REGISTERS IN SAVE TABLE
031214  004737  034726                          JSR     PC,@#PUTREG
```

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031220  032737  040000  002304          BIT     #ERR,@#DS1      ;ANY DISK ERRORS
031226  001004                          BNE     10$             ;BRANCH IF YES
031230  032737  040000  002262          BIT     #TRE,@#CS1      ;ANY RH ERRORS
031236  001401                          BEQ     11$             ;BRANCH IF NO

031240  104066                  10$:    ERROR   66              ;SOME ERRORS OCCURRED
                                                                ;WHILE DOING READ
                                                                ;HEADER AND DATA

                                        ;*NOW THE READ DATA WILL BE COMPARED DATA IN EACH SECTOR
                                        ;*IS UNIQUE IF PROGRAM IS HALTED ON ERROR THEN LOOK AT
                                        ;*RHDST TO GET WHAT TRACK IS IN ERROR. LOOKING AT THE DATA
                                        ;*BITS NO 4,5,6,7,8 IN GOOD DATA ALSO GIVES TRACK NUMBER
                                        ;*IN GOOD DATA ALSO GIVES TRACK NUMBER

031242                          11$:

031242  004037  035032                  JSR     R0,@#COMPAR     ;COMPARE TWO BLOCKS OF MEMORY
031246  002370                          WRFROM                  ;GOOD DATA STARTS FROM WRFROM
031250  003434                          REINTO                  ;TEST DATA STARTS FROM REINTO
031252  000404                          260.                    ;260., WORDS TO BE COMPARED
031254  031260                          12$                     ;RETURN TO 12$ ON ERROR
031256  031264                          13$                     ;RETURN TO 13$ ON NO ERROR



                                                                ;BITS 4,5,6,7,8
031260  104067                  12$:    ERROR   67              ;READ HEADER AND DATA
031262  000207                          RTS     PC              ;ERROR
                                                                ;HEAD SELECTION ERROR
                                                                ;DATA READ GIVES NATURE
                                                                ;OF ERROR
                                                                ;EXCEPT FOR THE
                                                                ;FOUR  HEADER WORDS
                                                                ;THE BITS 4,5,6,7,8
                                                                ;GIVE THE TRACK NUMBER

                                        ;*NOW INCREMENT TO READ NEXT TRACK

031264  062737  000400  031104  13$:    ADD     #400,@#SST3+12  ;NEXT TRACK FOR HEADER
031272  062737  000040  031122          ADD     #40,@#SST4+10   ;NEXT TRACK FOR DATA
031300  062737  000400  031132          ADD     #400,@#SST5+6   ;NEXT TRACK FOR COMMAND

031306  005337  001200                  DEC     @#$TMP1         ;COUNT 19 TRACKS
031312  001001                          BNE     5$

031314  000402                          BR      TST37           ;TO NEXT TEST

031316  000137  031052          5$:     JMP     @#SST2          ;JUMP BACK
```

```

                                        ;;*****************************************************************
                                        ;*TEST 37        DIFFERENCE LINES

                                        ;*      A WRITE HEADER AND DATA WILL BE DONE ON ALL CYLINDERS
                                        ;*      UP TO 256./512. ON SECTOR ZERO, TRACK ZERO. THE DATA WILL
                                        ;*      BE THE CYLINDER NUMBER
                                        ;*
                                        ;*      THEN A RECALIBRATE AND READ HEADER AND DATA WILL BE DONE
                                        ;*      ON CYLINDERS 0,1,2,4,8,16,32,64,128,256 & 512.
                                        ;*
                                        ;*      DATA WILL BE CHECKED.
                                        ;*      ON AN ERROR, LOOPING WILL BE DONE ON THE
                                        ;*      READ ONLY
                                        ;*
                                        ;;*****************************************************************
 031322  000004                         TST37:  SCOPE
 031324  012706  001000                         MOV     #STACK,SP       ;RESET STACK
 031330  012737  000037  004504                 MOV     #37,@#TSTNM     ;SAVE TEST NUMBER

 031336  004737  033004                         JSR     PC,@#CLDISK     ;SET R1-RHCS1, R2-RHCS2
                                                                        ;R3-RHDS1, R4-RHER1
                                                                        ;GIVE RH-11 INITIALIZE
                                                                        ;SETUP UNIT NUMBER
 031342  004737  033064                         JSR     PC,@#CHECKT     ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                        ;AND THAT ALL STATUS BITS ARE = 0
 031346  104400  056662                         TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF NOT
 031352  000000                                 HALT                    ;STOP TEST


                                                ;*SET UP TO INITIALIZE TEST FROM CYLINDER 0, TRACK 0,
                                                ;*SECTOR 0
 031354  012737  010000  031466                 MOV     #10000,@#1$+10  ;CYLINDER HEADER DATA
 031362  005037  031506                         CLR     @#2$+10         ;DATA
 031366  005037  031514                         CLR     @#3$+4          ;CYLINDER COMMAND RHCA

                                                ;*THIS IS TO GET THE HEADS TO CYLINDER ZERO
 031372  013777  004506  150566                 MOV     @#RP4VEC,@RPVEC ;SET RP04 VECTOR ADDRESS
                                                                        ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                        ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                        ;'TIME' WILL ONLY SAVE
                                                                        ;CURRENT CYLINDER ADDRESS
                                                                        ;AND LOOK AHEAD REGISTERS


 031400  013746  002326                         MOV     @#RECALI,-(SP)  ;GET READY TO MOVE COMMAND
 031404  052716  000101                         BIS     #GO!IE,(SP)     ;GET READY TO SET GO AND
                                                                        ;ENABLE INTERRUPT
 031410  012677  150564                         MOV     (SP)+,@RHCS1    ;GO WITH
                                                                        ;6 IN RHCS1 FOR RECALIBRATE
                                                                        ;WITH INTERRUPT ENABLED


 031414  104412                                 WAT                     ;WAIT FOR DRY BIT TO SET
```

```
031416  002222                          RHDS1                       ;WAIT FOR RHDS1 REGISTER
031420  000200                          DRY                         ;WAIT FOR DRY BIT IN RHDS1 REGISTER
031422  060650                          25000.                      ;ALLOW 250000 MICRO SECONDS
031424  060650                          25000.                      ;DRY MUST SET BETWEEN
                                                                    ;00 AND 500000 MICRO SECONDS

                                        ;*THE DRIVE TYPE IS CHECKED AND THE APPROPRIATE MAX.
                                        ;*CYLINDER DIFFERENCE IS SET UP

                                ;;**********************************************************
031426  005737  004636                  TST     @#RP06  ;TEST FOR RP06 DRIVE
031432  001404                          BEQ     14$                 ;TREAT UNIT AS AN RP04
                                                                    ;TREAT AS AN RP06
                                ;;**********************************************************

031434  012737  001001  001200          MOV     #513.,@#$TMP1       ;513 CYLINDERS
031442  000403                          BR      15$                 ;CONTINUE

031444  012737  000401  001200  14$:    MOV     #257.,@#$TMP1       ;257 CYLINDERS
031452                          15$:                                ;CONTINUE WITH TEST


031452  004737  033004                  JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                    ;R3-RHDS1, R4-RHER1
                                                                    ;GIVE RH-11 INITIALIZE
                                                                    ;SETUP UNIT NUMBER

                                        ;*FILL WRITE FROM BUFFER WITH HEADER
031456                          1$:

031456  004037  032630                  JSR     R0,@#FLHEAD         ;SAVE HEADER DATA IN WRFROM
031462  002370                          WRFROM                      ;LOCATION WHERE SAVED
031464  000004                          4                           ;NUMBER OF WORDS SAVED
031466  010000                          10000                       ;FIRST DATA WORD
031470  000000                          0                           ;SECOND DATA WORD
031472  000000                          0                           ;THIRD DATA WORD
031474  000000                          0                           ;FOURTH DATA WORD

                                        ;*FILL WRITE FROM BUFFER WITH DATA
031476                          2$:

031476  004037  032654                  JSR     R0,@#CLAREA         ;CLEAR 256. WORDS, FROM WRFROM+10
031502  002400                          WRFROM+10                      ;STARTING FROM WRFROM+10
031504  000400                          256.                        ;256. WORDS
031506  000000                          0                           ;FILL WITH 0


                                        ;*THE WRITE HEADER AND DATA COMMAND WILL BE LOADED
031510                          3$:

031510  004037  034766                  JSR     R0,@#RUN            ;SETUP TO RUN FOR DATA COMMAND
031514  000000                          0                           ;CYLINDER 0
031516     000                          .BYTE   0                   ;SECTOR 0
031517     000                          .BYTE   0                   ;TRACK 0
```

```
031520  177374                          -256.-4                         ;WORD COUNT (DATA) = 256. +
                                                                        ;4 HEADER WORDS
031522  002370                          WRFROM                          ;BUS ADDRESS
                                                                        ;STARTING ADDRESS OF DATA
                                                                        ;BUFFER = WRFROM
031524  000000                          0                               ;DO NOT INHIBIT BUS ADDRESS INCREMENT
031526  010000                          FMT22                           ;16 BITS PER WORD FORMAT
                                                                        ;DO NOT INHIBIT ECC CORRECTION
                                                                        ;DO NOT INHIBIT HEADER COMPARE
031530  002344                          WRIFOR                          ;GET READY TO DO A WRIFOR
                                                                ;WRITE HEADER AND DATA WITH 62 IN RHCS1


031532  004737  033064                  JSR     PC,@#CHECKT             ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                        ;AND THAT ALL STATUS BITS ARE = 0
031536  104400  056662.                 TYPE    ,CPHALT                 ;CANNOT CONTINUE TESTING IF NOT
031542  000000                          HALT                            ;STOP TEST

031544  013777  004506  150414          MOV     @#RP4VEC,@RPVEC         ;SET RP04 VECTOR ADDRESS
                                                                        ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                        ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                        ;'TIME' WILL ONLY SAVE
                                                                        ;CURRENT CYLINDER ADDRESS
                                                                        ;AND LOOK AHEAD REGISTERS


031552  013746  002344                  MOV     @#WRIFOR,-(SP)          ;GET READY TO MOVE COMMAND
031556  052716  000101                  BIS     #GO!IE,(SP)             ;GET READY TO SET GO AND
                                                                        ;ENABLE INTERRUPT
031562  012677  150412                  MOV     (SP)+,@RHCS1            ;GO WITH
                                                                         ;62 IN RHCS1 FOR WRITE HEADER AND DATA
                                                                        ;WITH INTERRUPT ENABLED

                                        ;*ONE REVOLUTION = 16670 MICRO SECONDS, ONE SECTOR = 760
                                        ;*MICRO SECONDS, ONE SEEK = 7000 MICRO SECONDS.
                                        ;*MAX TIME = 1 REVOLUTION + 1 SEEK + 2 SECTORS
                                        ;*MIN TIME = 1 SECTOR


031566  104412                          WAT                             ;WAIT FOR RDY BIT TO SET
031570  002200                          RHCS1                           ;WAIT FOR RHCS1 REGISTER
031572  000200                          RDY                             ;WAIT FOR RDY BIT IN RHCS1 REGISTER
031574  002354                          1260.                           ;ALLOW 12600 MICRO SECONDS
031576  002354                          1260.                           ;RDY MUST SET BETWEEN
                                                                        ;00 AND 25200 MICRO SECONDS

                                        ;*NOW ONE SECTOR WRITE IS COMPLETE.  CHANGES WILL BE MADE
                                        ;*FOR THE NEXT SECTOR, THEN THE ABOVE WILL BE REPEATED
                                        ;*UNTIL CYLINDER 256./512. IS REACHED
031600  005237  031466                  INC     @#1$+10                 ;CYLINDER HEADER DATA
031604  005237  031506                  INC     @#2$+10                 ;DATA
031610  005237  031514                  INC     @#3$+4                  ;CYLINDER COMMAND (RHCA)
031614  005337  001200                  DEC     @#$TMP1                 ;COUNT DOWN FOR 256./512. CYLINDERS
031620  001316                          BNE     1$                      ;DO NEXT WRITE IF 256./512. NOT DONE
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                                                 ;*NOW ALL 256./512. CYLINDERS HAVE CYLINDER NUMBER WRITTEN
                                                 ;*AS DATA ON SECTOR 0, TRACK 0. NOW A RECALIBRATE, FOLLOWED
                                                 ;*BY READ HEADER AND DATA, THEN A CHECK WILL BE DONE ON
                                                 ;*CYLINDER 0,1,2,4,8,16,32,64,128,256,512, AND 0

031622  013737  031652  001110          MOV     @#4$,@#$LPERR   ;LOOP ON ERROR
031630  005037  001200                  CLR     @#$TMP1         ;CYLINDER COUNTER
```

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                                                    ;*INITIALIZE, RECALIBRATE, AND READ CYLINDERS
                                            ;;*************************************************************

                                                    ;*SETUP FOR CYLINDER 0
031634  012737  010000  031734                      MOV     #10000,@#5$+10      ;CYLINDER HEADER (DATA)
031642  005037  031754                              CLR     @#6$+10             ;DATA
031646  005037  031762                              CLR     @#7$+4              ;CYLINDER COMMAND (RHCA)
031652                                      4$:

031652  004737  033004                              JSR     PC,@#CLDISK         ;SET R1-RHCS1, R2-RHCS2
                                                                                ;R3-RHDS1, R4-RHER1
                                                                                ;GIVE RH-11 INITIALIZE
                                                                                ;SETUP UNIT NUMBER

031656  013777  004506  150302                      MOV     @#RP4VEC,@RPVEC     ;SET RP04 VECTOR ADDRESS
                                                                                ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                                ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                                ;'TIME' WILL ONLY SAVE
                                                                                ;CURRENT CYLINDER ADDRESS
                                                                                ;AND LOOK AHEAD REGISTERS


031664  013746  002326                              MOV     @#RECALI,-(SP)      ;GET READY TO MOVE COMMAND
031670  052716  000101                              BIS     #GO!IE,(SP)         ;GET READY TO SET GO AND
                                                                                ;ENABLE INTERRUPT
031674  012677  150300                              MOV     (SP)+,@RHCS1        ;GO WITH
                                                                                ;6 IN RHCS1 FOR RECALIBRATE
                                                                                ;WITH INTERRUPT ENABLED


031700  104412                                      WAT                         ;WAIT FOR DRY BIT TO SET
031702  002222                                      RHDS1                       ;WAIT FOR RHDS1 REGISTER
031704  000200                                      DRY                         ;WAIT FOR DRY BIT IN RHDS1 REGISTER
031706  060650                                      25000.                      ;ALLOW 250000 MICRO SECONDS
031710  060650                                      25000.                      ;DRY MUST SET BETWEEN
                                                                                ;00 AND 500000 MICRO SECONDS

                                                    ;*CLEAR READ INTO BUFFER WITH ALL ONES

031712  004037  032654                              JSR     R0,@#CLAREA         ;CLEAR 260. WORDS, FROM REINTO
031716  003434                                      REINTO                      ;STARTING FROM REINTO
031720  000404                                      260.                        ;260. WORDS
031722  177777                                      -1                          ;FILL WITH -1


                                                    ;*FILL WRITE FROM BUFFER WITH EXPECTED HEADER
031724                                      5$:

031724  004037  032630                              JSR     R0,@#FLHEAD         ;SAVE HEADER DATA IN WRFROM
031730  002370                                      WRFROM                      ;LOCATION WHERE SAVED
031732  000004                                      4                           ;NUMBER OF WORDS SAVED
031734  010000                                      10000                       ;FIRST DATA WORD
031736  000000                                      0                           ;SECOND DATA WORD
```

```
031740  000000                        0                              ;THIRD DATA WORD
031742  000000                        0                              ;FOURTH DATA WORD
031744                        6$:
        
031744  004037  032654                JSR     R0,@#CLAREA            ;CLEAR 256. WORDS, FROM WRFROM+10
031750  002400                        WRFROM+10                              ;STARTING FROM WRFROM+10
031752  000400                        256.                           ;256. WORDS
031754  000000                        0                              ;FILL WITH 0


                                      ;*FILL READ HEADER AND DATA COMMAND
031756                        7$:

031756  004037  034766                JSR     R0,@#RUN               ;SETUP TO RUN FOR DATA COMMAND
031762  000000                        0                              ;CYLINDER 0
031764     000                        .BYTE   0                      ;SECTOR 0
031765     000                        .BYTE   0                      ;TRACK 0
031766  177374                        -256.-4                        ;WORD COUNT (DATA) = 256. +
                                                                     ;4 HEADER WORDS
031770  003434                        REINTO                         ;BUS ADDRESS
                                                                     ;STARTING ADDRESS OF DATA
                                                                     ;BUFFER = REINTO
031772  000000                        0                              ;DO NOT INHIBIT BUS ADDRESS INCREMENT
031774  014000                        ECI!FMT22                              ;16 BITS PER WORD FORMAT
                                                                     ;INHIBIT ECC CORRECTION
                                                                     ;DO NOT INHIBIT HEADER COMPARE
031776  002350                        REFOR                          ;GET READY TO DO A REFOR
                                                                     ;READ HEADER AND DATA WITH 72 IN RHCS1


032000  004737  033064                JSR     PC,@#CHECKT            ;CHECKS DVA,RDY,MOL,DPR,DRY AND VV = 1
                                                                     ;AND THAT ALL STATUS BITS ARE = 0
032004  104400  056662                TYPE    ,CPHALT                ;CANNOT CONTINUE TESTING IF NOT
032010  000000                        HALT                           ;STOP TEST

032012  013777  004506  150146        MOV     @#RP4VEC,@RPVEC        ;SET RP04 VECTOR ADDRESS
                                                                     ;TO 'TIME1' IF P-CLOCK IS PRESENT
                                                                     ;OR TO 'TIME2' IF P-CLOCK IS NOT THERE
                                                                     ;'TIME' WILL ONLY SAVE
                                                                     ;CURRENT CYLINDER ADDRESS
                                                                     ;AND LOOK AHEAD REGISTERS

                                      ;*ONE SECTOR = 760 MICRO SECONDS, ONE REVOLUTION =
                                      ;*16670 MICRO SECONDS, MAX SEEK = 52000 MICRO SECONDS
                                      ;*MAX TIME = ONE REV + 1 SEEK + 1 SECTOR
                                      ;*MIN TIME = 1 SECTOR


032020  013746  002350                MOV     @#REFOR,-(SP)          ;GET READY TO MOVE COMMAND
032024  052716  000101                BIS     #GO!IE,(SP)            ;GET READY TO SET GO AND
                                                                     ;ENABLE INTERRUPT
032030  012677  150144                MOV     (SP)+,@RHCS1           ;GO WITH
                                                                       ;72 IN RHCS1 FOR READ DATA
                                                                     ;WITH INTERRUPT ENABLED
```

```
032034  104412                          WAT                             ;WAIT FOR RDY BIT TO SET
032036  002200                          RHCS1                           ;WAIT FOR RHCS1 REGISTER
032040  000200                          RDY                             ;WAIT FOR RDY BIT IN RHCS1 REGISTER
032042  006620                          3472.                           ;ALLOW 34720 MICRO SECONDS
032044  006620                          3472.                           ;RDY MUST SET BETWEEN
                                                                        ;00 AND 69440 MICRO SECONDS

                                        ;*CHECK READ WORDS AS ALL READ COMMANDS HAVE BEEN CHECKED

                                        ;*(DATA ERRORS MAY IMPLY "IMPLIED SEEK" ERRORS)


032046  004037  035032                  JSR     R0,@#COMPAR             ;COMPARE TWO BLOCKS OF MEMORY
032052  002370                          WRFROM                          ;GOOD DATA STARTS FROM WRFROM
032054  003434                          REINTO                          ;TEST DATA STARTS FROM REINTO
032056  000404                          260.                            ;260., WORDS TO BE COMPARED
032060  032064                          8$                              ;RETURN TO 8$ ON ERROR
032062  032070                          9$                              ;RETURN TO 9$ ON NO ERROR


032064  104070                  8$:     ERROR   70                      ;READ HEADER AND DATA ERROR
032066  000207                          RTS     PC                      ;DATA GIVES EXPECTED CYLINDER

                                        ;*NOW ONE CYLINDER HAS BEEN CHECKED.  CHANGES WILL BE MADE
                                        ;*TO READ THE NEXT CYLINDER AND THE ABOVE SECTOR READ WILL BE
                                        ;*REPEATED

032070  005737  001200          9$:     TST     @#$TMP1                 ;IS IT ZERO ?
032074  001003                          BNE     10$                     ;BRANCH IF NOT ZERO
032076  005237  001200                  INC     @#$TMP1                 ;ADD ONE IF = 0
032102  000416                          BR      11$                     ;PUT ONE IN CYLINDER

                                ;;*************************************************************
032104  005737  004636          10$:    TST     @#RP06  ;TEST FOR RP06 DRIVE
032110  001404                          BEQ     16$                     ;TREAT UNIT AS AN RP04
                                                                        ;TREAT AS AN RP06
                                ;;*************************************************************

032112  022737  001000  001200          CMP     #512.,@#$TMP1           ;IS IT PASSED 512 CYLINDERS YET ?
032120  000403                          BR      17$                     ;CONTINUE
032122  022737  000400  001200  16$:    CMP     #256.,@#$TMP1           ;IS IT PASSED 256 CYLINDERS YET ?
032130                          17$:                                    ;CONTINUE

032130  101421                          BLOS    12$                     ;YES, SO GO TO ZERO
032132  063737  001200  001200          ADD     @#$TMP1,@#$TMP1         ;DOUBLE THE CYLINDER
032140  013737  001200  031754  11$:    MOV     @#$TMP1,@#6$+10         ;MAKE CYLINDER ADDRESS THE DATA
032146  013746  001200                  MOV     @#$TMP1,-(SP)           ;GET CYLINDER NUMBER
032152  052716  010000                  BIS     #FMT22,(SP)             ;INCLUDE FORMAT BIT
032156  012637  031734                  MOV     (SP)+,@#5$+10           ;HEADER DATA (CYLINDER)
032162  013737  001200  031762          MOV     @#$TMP1,@#7$+4          ;CYLINDER COMMAND (RHCA)
032170  000137  031652                  JMP     @#4$                    ;RETURN TO RECALIBRATE
```

```
                                ;;************************************************************
032174  005737  004636          12$:    TST     @#RP06  ;TEST FOR RP06 DRIVE
032200  001405                          BEQ     18$                     ;TREAT UNIT AS AN RP04
                                                                        ;TREAT AS AN RP06
                                ;;************************************************************

032202  022737  002000  001200          CMP     #1024.,@#$TMP1  ;512 DONE YET ?
032210  001421                          BEQ     13$             ;OUT ----------------------------->
032212  000404                          BR      19$             ;CONTINUE
032214  022737  001000  001200  18$:    CMP     #512.,@#$TMP1   ;256 DONE YET ?
032222  001414                          BEQ     13$             ;OUT ----------------------------->
032224                          19$:                            ;CONTINUE

032224  063737  001200  001200          ADD     @#$TMP1,@#$TMP1 ;DOUBLE THE CYLINDER
032232  012737  010000  031734          MOV     #10000,@#5$+10  ;CYLINDER HEADER DATA
032240  005037  031754                  CLR     @#6$+10         ;DATA
032244  005037  031762                  CLR     @#7$+4          ;CYLINDER COMMAND (RHCA)
032250  000137  031652                  JMP     @#4$            ;RETURN TO THE RECALIBRATE

032254                          13$:                            ;END OF TEST
```

```

                                                ;;*******************************************************
                                                ;;*******************************************************
                                                ;*TEST 40        END OF DRIVE

                                                ;*       THIS IS THE END OF TEST FOR ONE DRIVE
                                                ;*       IF THERE ARE MORE DRIVES, THEN THE PROGRAM
                                                ;*       JUMPS TO TEST 5 FOR NEXT DRIVE TEST

                                                ;*       END OF PASS IS REACHED ONLY AFTER ALL DRIVES ARE COMPLETE

                                                ;;*******************************************************
 032254  000004                                 TST40:  SCOPE
 032256  012737  000001  001212                         MOV     #1,$TIMES       ;;DO 1 ITERATION
 032264  012737  000000  177776                         MOV     #0,PS           ;REINSTATE PS TO 0
 032272  104400  032300                                 TYPE    ,65$            ;;TYPE ASCIZ STRING
 032276  000425                                         BR      64$             ;;GET OVER THE ASCIZ
                                                ;;65$:  .ASCIZ  <15><12>/TOTAL ERRORS ON THIS PASS ON  UNIT NO./
 032352                                         64$:
 032352  013746  004616                                 MOV     @#UNIT,-(SP)    ;GET READY TO TYPE UNIT NUMBER
 032356  104404                                         TYPDS
 032360  104400  032366                                 TYPE    ,67$            ;;TYPE ASCIZ STRING
 032364  000402                                         BR      66$             ;;GET OVER THE ASCIZ
                                                ;;67$: .ASCIZ  / =/
 032372                                         66$:
 032372  013746  001112                                 MOV     @#$ERTTL,-(SP)  ;GET READY TO TYPE NUMBER OF ERRORS
 032376  104404                                         TYPDS
 032400  005037  001112                                 CLR     @#$ERTTL        ;CLEAR TOTAL NUMBER OF ERRORS
 032404  005037  001102                                 CLR     @#$TSTNM        ;CLEAR TEST NUMBER
 032410  005737  004626                                 TST     @#SELECT        ;STARTING FROM 200 ?
 032414  001413                                         BEQ     3$              ;TEST NEXT DRIVE IF SO
                                                                                ;CONTINUE TESTING THIS ONE IF NOT

 032416  005237  001100                                 INC     @#$PASS         ;INCREASE PASS COUNT
 032422  104400  032613                                 TYPE    ,$ENDMG         ;TYPE END PASS #
 032426  013746  001100                                 MOV     @#$PASS,-(SP)   ;GET PASS NO.
 032432  104404                                         TYPDS                   ;TYPE IT OUT
 032434  104400  032610                                 TYPE    ,$ENULL
 032440  000137  007632                                 JMP     @#TST4          ;JUMP TEST 4 ----------------------->

 032444  012737  177777  040434                 3$:     MOV     #-1,@#PRITEM    ;CLEAR PREVIOUS ITEM NUMBER
 032452  005337  004620                                 DEC     @#NOUNITS       ;NO. OF UNITS PRESENT DECREMENTED
 032456  001413                                         BEQ     $EOP            ;BRANCH IF ALL DRIVES COMPLETE
 032460  013700  004616                                 MOV     @#UNIT,R0       ;UNIT UNDER TEST
 032464  012701  004576                                 MOV     #UNITS,R1       ;TABLE
 032470  022100                                 1$:     CMP     (R1)+,R0        ;IS THIS UNIT JUST TESTED ?
 032472  001401                                         BEQ     2$              ;CONTINUE IF YES
 032474  000775                                         BR      1$              ;INCREMENT IF NO
 032476  011137  004616                         2$:     MOV     (R1),@#UNIT     ;THIS IS NEXT UNIT
 032502  000137  007632                                 JMP     @#TST4          ;TEST THE NEXT DRIVE --------------->

```

```

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




                                        .SBTTL  END OF PASS ROUTINE

                                        ;;*************************************************************
                                        ;*INCREMENT THE PASS NUMBER ($PASS)
                                        ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
                                        ;*IF THERES A MONITOR GO TO IT
                                        ;*IF THERE ISN'T JUMP TO TST1

 032506                                 $EOP:
 032506  000004                                 SCOPE
 032510  005037  001102                         CLR     $TSTNM                  ;;ZERO THE TEST NUMBER
 032514  005037  001212                         CLR     $TIMES                  ;;ZERO THE NUMBER OF ITERATIONS
 032520  005237  001100                         INC     $PASS                   ;;INCREMENT THE PASS NUMBER
 032524  042737  100000  001100                 BIC     #100000,$PASS           ;;DON'T ALLOW A NEG. NUMBER
 032532  005327                                 DEC     (PC)+                   ;;LOOP?
 032534  000001                         $EOPCT: .WORD   1
 032536  003022                                 BGT     $DOAGN                  ;;YES
 032540  012737                                 MOV     (PC)+,@(PC)+            ;;RESTORE COUNTER
 032542  000001                         $ENDCT: .WORD   1
 032544  032534                                 $EOPCT
 032546  104400  032613                         TYPE    ,$ENDMG                 ;;TYPE "END PASS #"
 032552  013746  001100                         MOV     $PASS,-(SP)             ;;SAVE $PASS FOR TYPEOUT
 032556  104404                                 TYPDS                           ;;GO TYPE--DECIMAL ASCII WITH SIGN
 032560  104400  032610                         TYPE    ,$ENULL                 ;;TYPE A NULL CHARACTER
 032564  013700  000042                 $GET42: MOV     @#42,R0                 ;;GET MONITOR ADDRESS
 032570  001405                                 BEQ     $DOAGN                  ;;BRANCH IF NO MONITOR
 032572  000005                                 RESET                           ;;CLEAR THE WORLD
 032574  004710                         $ENDAD: JSR     PC,(R0)                 ;;GO TO MONITOR
 032576  000240                                 NOP                             ;;SAVE ROOM
 032600  000240                                 NOP                             ;;FOR
 032602  000240                                 NOP                             ;;ACT11
 032604                                 $DOAGN:
 032604  000137                                 JMP     @(PC)+                  ;;RETURN
 032606  006176                         $RTNAD: .WORD   TST1
 032610     377     377     000         $ENULL: .BYTE   -1,-1,0                 ;;NULL CHARACTER STRING
 032613     015  042412  042116         $ENDMG: .ASCIZ  <15><12>/END PASS #/
 032620  050040  051501  020123
 032626  000043

```

```
                                ;THIS FILLS MEMORY WITH GIVEN DATA
                                ;USED CHIEFLY FOR HEADER INFORMATION
                                ;CALL IS
                                ;       JSR     R0,@#FLHEAD             ;FILL HEADER
                                ;       LOC                             ;LOCATION WHERE SAVED
                                ;       XN                              ;NUMBER OF WORDS
                                ;       XD1                             ;DATA REPEATED XN TIMES
                                ;       XD2                             ;DATA REPEATED XN TIMES
                                ;
                                ;
                                ;
                                ;
 032630                         FLHEAD:
 032630 010146                          MOV     R1,-(SP)                ;;PUSH R1 ON STACK
 032632 010246                          MOV     R2,-(SP)                ;;PUSH R2 ON STACK
 032634 012001                          MOV     (R0)+,R1                ;R1 HAS ADDRESS OF WHERE TO SAVE
 032636 012002                          MOV     (R0)+,R2                ;R2 HAS NUMBER OF WORDS
                                        ;*NOW FILL DATA
 032640 012021                  1$:     MOV     (R0)+,(R1)+             ;SAVE DATA
 032642 005302                          DEC     R2                      ;DECREMENT COUNT
 032644 001375                          BNE     1$                      ;BRANCH IF INCOMPLETE
 032646 012602                          MOV     (SP)+,R2                ;;POP STACK INTO R2
 032650 012601                          MOV     (SP)+,R1                ;;POP STACK INTO R1
 032652 000200                          RTS     R0
                                ;THIS CLEARS ANY BLOCK OF MEMORY.
                                ;FILLING IT WITH ANY DATA
                                ;CALL IS
                                ;       JSR     R0,@#CLAREA
                                ;       F                       ;FROM
                                ;       N                       ;NUMBER OF WORDS
                                ;       D                       ;DATA  TO BE FILLED
                                ;
                                ;R1 WILL HAVE STARTING ADDRESS OF BLOCK TO BE FILLED
                                ;R2 WILL HAVE NUMBER OF WORDS
                                ;R3 WILL HAVE DATA
 032654                         CLAREA:
 032654 010146                          MOV     R1,-(SP)                ;;PUSH R1 ON STACK
 032656 010246                          MOV     R2,-(SP)                ;;PUSH R2 ON STACK
 032660 010346                          MOV     R3,-(SP)                ;;PUSH R3 ON STACK
 032662 012001                          MOV     (R0)+,R1                ;FROM
 032664 012002                          MOV     (R0)+,R2                ;NUMBER
 032666 012003                          MOV     (R0)+,R3                ;DATA
 032670 010321                  1$:     MOV     R3,(R1)+                ;MOVE DATA
 032672 005302                          DEC     R2                      ;COUNT
 032674 001375                          BNE     1$                      ;BRANCH IF NOT COMPLETE
 032676 012603                          MOV     (SP)+,R3                ;;POP STACK INTO R3
```

```
032700  012602                  MOV     (SP)+,R2                ;;POP STACK INTO R2
032702  012601                  MOV     (SP)+,R1                ;;POP STACK INTO R1
032704  000200                  RTS     R0                      ;RETURN TO MAIN PROGRAM






                        ;THIS IS A SUBROUTINE TO FILL SAVED REGISTER LOCATION
                        ;WITH GIVEN VALUE
                        ;CALL IS
                        ;       JSR     R0,@#FILLRE
                        ;       RHXX            ;REGISTER NAME
                        ;       D               ;DATA
                        ;

032706                  FILLRE:
032706  010146                  MOV     R1,-(SP)                ;;PUSH R1 ON STACK
032710  010246                  MOV     R2,-(SP)                ;;PUSH R2 ON STACK
032712  012001                  MOV     (R0)+,R1                ;ADDRESS OF ADDRESS OF REGISTER
032714  012002                  MOV     (R0)+,R2                ;DATA
032716  162701  002172          SUB     #RHWC,R1                ;OFSET
032722  010261  004512          MOV     R2,SAVERE(R1)           ;DATA IS MOVED IN
032726  012602                  MOV     (SP)+,R2                ;;POP STACK INTO R2
032730  012601                  MOV     (SP)+,R1                ;;POP STACK INTO R1
032732  000200                  RTS     R0                      ;RETURN TO MAIN PROGRAM
```

```
                                    ;THIS SUBROUTINE SETS UP FOR SEARCH
                                    ;CALL IS
                                    ;           JSR     R0,@#SRCH
                                    ;           C                       ;CYLINDER
                                    ;.BYTE      S                       ;SECTOR
                                    ;.BYTE      T                       ;TRACK

032734  012077  147252              SRCH:   MOV     (R0)+,@RHCA         ;SET DESIRED CYLINDER ADDRESS
032740  012077  147240                      MOV     (R0)+,@RHDST        ;SET DESIRED SECTOR/TRACK ADDRESS
032744  013777  002334  147226              MOV     @#SERCH,@RHCS1      ;GET READY FOR SEARCH
                                                                        ;WITH 30 IN RHCS1
032752  000200                              RTS     R0








                                    ;THIS SUBROUTINE SETS UP FOR SEEK COMMANDS
                                    ;CALL IS
                                    ;           JSR     R0,@#SEEKCY
                                    ;           C                       ;CYLINDER
                                    ;

032754  012077  147232              SEEKCY: MOV     (R0)+,@RHCA         ;SET DESIRED CYLINDER ADDRESS
032760  013777  002352  147212              MOV     @#SEECOM,@RHCS1     ;MOV 4 INTO RHCS1
032766  000200                              RTS     R0                  ;RETURN TO MAIN PROGRAM
```

```

                                        ;THIS SUBROUTINE SETS UP FOR OFFSET COMMANDS
                                        ;CALL IS
                                        ;       JSR     R0,@#OFSET
                                        ;       0                       ;MICRO INCHES OFFSET

032770  052077  147214                  OFSET:  BIS     (R0)+,@RHOF     ;SET OFFSET REGISTER
032774  013777  002354  147176                  MOV     @#OFSETC,@RHCS1 ;MOV14 INTO RHCS1
033002  000200                                  RTS     R0              ;RETURN TO MAIN PROGRAM


033004  013701  002200                  CLDISK: MOV     @#RHCS1,R1      ;R1 WILL BE CONTROL AND STATUS1
033010  013702  002176                          MOV     @#RHCS2,R2      ;R2 WILL BE CONTROL AND STATUS2
033014  013703  002222                          MOV     @#RHDS1,R3      ;R3 WILL BE DISK STATUS REGISTER1
033020  013704  002202                          MOV     @#RHER1,R4      ;R4 WILL BE ERROR REGISTER #1

033024  012712  000040                          MOV     #CLR,@R2        ;CLEAR ALL REG.
033030  013712  004616                          MOV     @#UNIT,@R2      ;REINSTATE UNIT NO.
033034  005011                                  CLR     @R1             ;CLEAR FUNCTION BITS
033036  000207                                  RTS     PC
```

```




                                         ;THIS CHECKS DEVICE AVAILABLE (DVA) AND READY (RDY) IN RHCS1
                                         ;AND CHECKS MEDIUM ON LINE (MOL), DEVICE PRESENT (DPR), DEVICE READY (DRY) IN RHDS1

                                         ;IT MAY CHECK VOLUME VALID (VV) IN RHDS1, DEPENDING ON ENTRY POINT


 033040  000000                          PCJSR:  0                           ;PC OF JSR

 033042  011637  033040                  CHECK:  MOV     (SP),@#PCJSR        ;SAVE PC OF JSR+4
 033046  162737  000004  033040                  SUB     #4,@#PCJSR          ;GET PC OF JSR
 033054  011346                                  MOV     @R3,-(SP)           ;GET RHDS1
 033056  052716  000100                          BIS     #VV,(SP)            ;DONT CHECK VV BIT
 033062  000406                                  BR      CHECKC              ;GOTO COMMON CHECK ROUTINE

 033064  011637  033040                  CHECKT: MOV     (SP),@#PCJSR        ;SAVE PC OF JSR+4
 033070  162737  000004  033040                  SUB     #4,@#PCJSR          ;GET PC OF JSR
 033076  011346                                  MOV     @R3,-(SP)           ;GET RHDS1 & DO VV CHECK AT 3$

 033100  011146                          CHECKC: MOV     @R1,-(SP)           ;GET CS1
 033102  042716  173577                          BIC     #173577,(SP)        ;CLEAR UNWANTED BITS
 033106  022726  004200                          CMP     #DVA!RDY,(SP)+      ;RHCS1 SHOULD HAVE DEVICE AVAILABLE
                                                                             ;AND BE READY
 033112  001403                                  BEQ     3$                  ;BRANCH IF GOOD
 033114  011137  001122                          MOV     @R1,@#$BDADR        ;BAD DATA REGISTER (RHCS1)
 033120  104062                                  ERROR   62                  ;RHCS1 DID NOT HAVE DEVICE
                                                                             ;AVAILABLE RIGHT AT THE START
                                                                             ;ALL OTHER BITS SHOULD BE 0
 033122  042716  102000                  3$:     BIC     #ATA!LBT,(SP)       ;CLEAR UNWANTED BITS
 033126  022726  010700                          CMP     #MOL!DPR!DRY!VV,(SP)+ ;RHDS1 SHOULD HAVE THESE SET
 033132  001404                                  BEQ     7$                  ;BRANCH IF GOOD
 033134  011337  001122                          MOV     @R3,@#$BDADR        ;BAD DATA IN REGISTER (RHDS1)
 033140  104061                                  ERROR   61                  ;RHDS1 HAS SOME BITS OTHER
                                                                             ;THAN MOL, DRY, DPR,VV SET
                                                                             ;ALL OTHER BITS SHOULD BE 0
 033142  000207                                  RTS     PC                  ;RETURN TO TEST AND HALT

 033144  062716  000006                  7$:     ADD     #6,(SP)             ;ADJUST STACK TO JUMP OVER HALT IN TEST
 033150  000207                                  RTS     PC                  ;RETURN TO TEST AND CONTINUE
```

```
                                        ;*THIS IS A SUBROUTINE TO SAVE REGISTERS
                                        ;*IN THE REGISTER TABLE TO ANY LOCATION
                                        ;*THE CALL IS
                                        ;*JSR    R0,@#SAVER
                                        ;*       F       ;FROM
                                        ;*       T       ;TO
                                        ;*       N       ;NUMBER OF WORDS SAVED
                                        ;*F MUST ALWAYS BE RHCS1
                                        ;*T MUST ALWAYS BE SAVRE

033152                          SAVER:
033152  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
033154  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
033156  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
033160  012001                          MOV     (R0)+,R1        ;FROM
033162  012002                          MOV     (R0)+,R2        ;TO
033164  012003                          MOV     (R0)+,R3        ;NUMBER
033166  013122                  1$:     MOV     @(R1)+,(R2)+    ;SAVE REGISTER CONTENTS
033170  005303                          DEC     R3              ;COUNT
033172  001375                          BNE     1$              ;BRANCH IF NOT DONE
033174  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
033176  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
033200  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
033202  000200                          RTS     R0

                                ;WHEN AN EVENT IS TO BE TIMED THE RP04 VECTORS TO "TIME 1"
                                ;PRIORITY OF PROCESS OR IS 4
                                ;PRIORITY OF TRAPS MUST BE 6
                                ;PRIORITY OF RP04 INTERRUPTS IS 7
                                ;

033204  005077  147034          TIME1:  CLR     @PCLCSR                 ;STOP THE CLOCK
033210  017737  147034  033242          MOV     @PCLCTR,@#WAITTM        ;GET TIME ON CLOCK
033216  017737  147012  004564  TIME2:  MOV     @RHCC,@#FINACC          ;GET CURRENT CYLINDER
033224  017737  147006  004562          MOV     @RHLA,@#FINALA          ;GET LOOK AHEAD
033232  000002                          RTI                             ;RETURN TO WAIT P OR WAIT.T
```

```
                                   ;THIS IS A WAIT LOOP WHEN AN EVENT IS TO BE TIMED
                                   ;THE CALL IS
                                   ;        WAT
                                   ;        A        ;ABSOLUTE REGISTER ADDRESS
                                   ;        B        ;BIT WAITED FOR
                                   ;        TA       ;TIME ALLOWED GIVEN IN 10 MICROSEC
                                   ;        TO       ;TOLERANCE PLUS/MINUS IN 10 MICROSEC
                                   ;
                                   ;R1-WILL HAVE TIME ALLOWED IN 10 MICRO SECONDS
                                   ;R2-WILL HAVE TOLERANCE PLUS/MINUS IN 10 MICRO SECONDS
                                   ;MINIMUM TIME THAT CAN BE MEASURED IS ABOUT 12 MICRO SECONDS
                                   ;FOR THE SLOWEST PROCESSOR

033234  000000                     WAITPC: 0                                 ;WAT PC
033236  000000                     WAITRE: 0                                 ;WAIT ON REGISTER ADDRESS
033240  000000                     WAITBT: 0                                 ;WAIT ON BIT
033242  000000                     WAITTM: 0                                 ;WAITED TIME
033244  005037  033242             WAIT.P: CLR    @#WAITTM                   ;CLEAR WAITED TIME
033250  005077  146772                     CLR    @PCLBUF ;CLEAR COUNT SET BUFFER
033254  012777  000021  146762             MOV    #GO!BIT4,@PCLCSR  ;COUNT UP, 100 KHZ, START CLOCK
033262  010046                             MOV    R0,-(SP)          ;;PUSH R0 ON STACK
033264  010146                             MOV    R1,-(SP)          ;;PUSH R1 ON STACK
033266  010246                             MOV    R2,-(SP)          ;;PUSH R2 ON STACK
033270  010346                             MOV    R3,-(SP)          ;;PUSH R3 ON STACK
033272  016600  000010                     MOV    10(SP),R0         ;R0 HAS ADDRESS OF NEXT LOCATION
033276  010037  033234                     MOV    R0,@#WAITPC       ;NOW WAITPC HAS WAT PC + 2
033302  162737  000002  033234             SUB    #2,@#WAITPC       ;WAT PC IS IN WAITPC
033310  013037  033236                     MOV    @(R0)+,@#WAITRE   ;WAIT ON REGISTER ADDRESS
033314  012037  033240                     MOV    (R0)+,@#WAITBT    ;WAIT ON BIT
033320  012001                             MOV    (R0)+,R1          ;R1 HAS TIME IN 10 MSEC
033322  012002                             MOV    (R0)+,R2          ;R2 HAS TOLERANCE IN 10 MSEC
033324  010066  000010                     MOV    R0,10(SP)         ;RESTORE RETURN ON STACK

                                           ;*THIS SECTION WAITS FOR BIT, THROUGH TWO COUNT DOWNS

033330  013703  033502                     MOV    @#TIMCNT,R3       ;R3 IS A TEMPORARY COUNTER
033334  033777  033240  177674  1$:        BIT    @#WAITBT,@WAITRE  ;IS REQUIRED BIT THERE
033342  001025                             BNE    4$                ;BRANCH IF YES
033344  005303                             DEC    R3                ;COUNT IF REQUIRED BIT NOT THERE
033346  001372                             BNE    1$
033350  013703  033502                     MOV    @#TIMCNT,R3       ;TEMPORARY COUNTER
033354  033777  033240  177654  2$:        BIT    @#WAITBT,@WAITRE  ;IS REQUIRED BIT THERE
033362  001015                             BNE    4$                ;BRANCH IF YES
033364  005303                             DEC    R3                ;COUNT IF REQUIRED BIT NOT THERE
033366  001372                             BNE    2$
033370  017737  177642  001126             MOV    @WAITRE,@#$BDDAT  ;REGISTER CONTENTS FOR TYPEOUT
033376  032777  000100  146574             BIT    #IE,@RHCS1        ;DID ANY INTERRUPT OCCUR
033404  001402                             BEQ    3$                ;BRANCH IF YES
033406  104001                             ERROR  1                 ;RP04 DID NOT INTERRUPT
033410  000427                             BR     7$                ;OUT
033412  104002                     3$:     ERROR  2                 ;RP04 INTERRUPTED BUT WAITED
                                                                     ;ON BIT DID NOT OCCUR
                                                                     ;EVEN AFTER TWO COUNT DOWNS
                                                                     ;FROM 177777 TO 0
```

```
033414  000425                          BR      7$                   ;OUT

                                        ;*NOW TIME AND TOLERANCE WILL BE CHECKED
033416  017737  177614  001126  4$:     MOV     @WAITRE,@#$BDDAT     ;REGISTER CONTENTS FOR TYPEOUT
033424  032777  000100  146546          BIT     #IE,@RHCS1           ;DID ANY INTERRUPT OCCUR
033432  001402                          BEQ     5$                   ;BRANCH IF YES
033434  104003                          ERROR   3                    ;INTERRUPT DID NOT OCCUR EVEN
                                                                     ;AFTER ONE BNE AND ONE MOV
                                                                     ;OF THE WAITED ON BIT SETTING
033436  000414                          BR      7$                   ;OUT
033440  160201                  5$:     SUB     R2,R1                ;R1 NOW HAS LOWER LIMIT OF TIME
033442  023701  033242                  CMP     @#WAITTM,R1          ;FOR GOOD RESULTS, WAITTM
                                                                     ;MUST BE GREATER OR EQUAL
                                                                     ;TORI
033446  103002                          BHIS    6$                   ;BRANCH IF GOOD
033450  104004                          ERROR   4                    ;BIT DID OCCUR BUT TIME
                                                                     ;TAKEN IS BELOW LOWER LIMIT
033452  000406                          BR      7$                   ;OUT

033454  060202                  6$:     ADD     R2,R2                ;DOUBLE TOLERANCE
033456  060201                          ADD     R2,R1                ;R1 NOW HAS UPPER LIMIT OF TIME
033460  020137  033242                  CMP     R1,@#WAITTM          ;FOR GOOD RESULTS, WAITTM
                                                                     ;MUST BE LESS OR EQUAL TO R1
033464  103001                          BHIS    7$                   ;BRANCH IF GOOD
033466  104004                          ERROR   4                    ;BIT DID OCCUR BUT TIME TAKEN
                                                                     ;IS ABOVE UPPER LIMIT
033470                          7$:
033470  012603                          MOV     (SP)+,R3             ;;POP STACK INTO R3
033472  012602                          MOV     (SP)+,R2             ;;POP STACK INTO R2
033474  012601                          MOV     (SP)+,R1             ;;POP STACK INTO R1
033476  012600                          MOV     (SP)+,R0             ;;POP STACK INTO R0
033500  000002                          RTI                          ;RETURN TO MAIN TEST






                                ;THIS IS A WAIT LOOP WHEN NO P-CLOCK IS AVAILABLE
                                ;NO TIMING IS DONE
                                ;CALL IS
                                ;       WAT
                                ;       A       ;ABSOLUTE REGISTER ADDRESS
                                ;       B       ;BIT WAITED FOR
                                ;       TA      ;TIME-NOT USED HERE
                                ;       TO      ;TIME-NOT USED HERE
                                ;R3-IS A TEMPORARY COUNTER

033502  177777                  TIMCNT: 177777                       ;COUNT FOR WAIT LOOP
033504  000025                  RPTCTR: 25                           ;COUNT FOR INTERRUPT WAIT (11/70 CPU)


033506                          WAIT.T:
033506  010046                          MOV     R0,-(SP)             ;;PUSH R0 ON STACK
```

```
033510  010346                          MOV     R3,-(SP)            ;;PUSH R3 ON STACK

033512  016600  000004                  MOV     4(SP),R0            ;R0 HAS ADDRESS OF NEXT LOCATION
033516  010037  033234                  MOV     R0,@#WAITPC         ;WAT PC +2 IS IN WAITPC
033522  162737  000002  033234          SUB     #2,@#WAITPC         ;WAT PC IS IN WAITPC
033530  013037  033236                  MOV     @(R0)+,@#WAITRE     ;WAIT ON REGISTER ADDRESS
033534  012037  033240                  MOV     (R0)+,@#WAITBT      ;WAIT ON BIT
033540  022020                          CMP     (R0)+,(R0)+         ;DUMP NEXT TWO WORDS-TA, TO
033542  010066  000004                  MOV     R0,4(SP)            ;RESTORE RETURN ON STACK

                                        ;*THIS HAS THE TWO COUNT DOWNS FROM 177777

033546  013703  033502                  MOV     @#TIMCNT,R3         ;R3 HAS TEMPORARY COUNT
033552  033777  033240  177456  1$:     BIT     @#WAITBT,@WAITRE    ;IS REQUIRED BIT THERE ?
033560  001025                          BNE     4$                  ;CHECK FOR THE INTERRUPT
033562  005303                          DEC     R3                  ;COUNT IF REQUIRED BIT NOT THERE
033564  001372                          BNE     1$
033566  013703  033502                  MOV     @#TIMCNT,R3         ;SECOND COUNT DOWN FROM 177777
033572  033777  033240  177436  2$:     BIT     @#WAITBT,@WAITRE    ;IS REQUIRED BIT THERE ?
033600  001015                          BNE     4$                  ;CHECK FOR INTERRUPT
033602  005303                          DEC     R3                  ;COUNT IF REQUIRED BIT NOT THERE
033604  001372                          BNE     2$
033606  017737  177424  001126          MOV     @WAITRE,@#$BDDAT    ;REGISTER CONTENTS FOR TYPEOUT
033614  032777  000100  146356          BIT     #IE,@RHCS1          ;DID ANY INTERRUPT OCCUR ?
033622  001402                          BEQ     3$                  ;BRANCH IF YES

033624  104001                          ERROR   1                   ;RP04 DID NOT INTERRUPT
                                                                    ;BIT DID NOT OCCUR
033626  000417                          R       5$                  ;NUT --------------------------------)

033630  104002                  3$:     ERROR   2                   ;RP04 INTERRUPTED BUT
                                                                    ;WAITED ON BIT DID NOT OCCUR
                                                                    ;EVEN AFTER TWO COUNT DOWNS
                                                                    ;FROM 177777 TO 0
033632  000415                          BR      5$                  ;OUT --------------------------------)

                                        ;*BIT DID SET SO CHECK IF INTERRUPT OCCURRED

                                        ;*THE AMOUNT OF TIME ALLOWED CAN BE CHANGED BY ALTERING LOCATION
                                        ;*"RPTCTR" ABOVE

033634  013703  033504          4$:     MOV     @#RPTCTR,R3         ;LOAD COUNTER WITH COUNT
033640  005303                  6$:     DEC     R3                  ;COUNT DOWN ONE
033642  001376                          BNE     6$                  ;DO AGAIN IF NOT ZERO YET


033644  032777  000100  146326          BIT     #IE,@RHCS1          ;DID ANY INTERRUPT OCCUR ?
033652  001405                          BEQ     5$                  ;BRANCH IF YES
033654  017737  177356  001126          MOV     @WAITRE,@#$BDDAT    ;REGISTER CONTENTS FOR TYPEOUT
033662  104003                          ERROR   3                   ;INTERRUPT DID NOT OCCUR
                                                                    ;EVEN AFTER ONE BNE OF
                                                                    ;THE WAITED ON BIT OCCURING
033664  000400                          BR      5$                  ;OUT --------------------------------)
```

```
9407  033666                  5$:
9408  033666  012603                  MOV    (SP)+,R3        ;;POP STACK INTO R3
9409  033670  012600                  MOV    (SP)+,R0        ;;POP STACK INTO R0
9410  033672  000002                  RTI                    ;RETURN TO MAIN TEST
9411
```

```
                                ;THIS CHANGES REGISTER SAVED VALUE
                                ;CALL IS
                                ;       JSR     R0,@#CHREG
                                ;       R                               ;REGISTER TO BE CHANGED
                                ;       N                               ;NUMBER OF BITS TO BE CHANGED
                                ;       NEW                             ;NEW VALUE OF BIT MUST BE 0 OR1
                                ;       P                               ;POSITION OF BIT TO BE CHANGED
                                ;NEW AND P WILL BE REPEATED N NUMBER OF TIMES

 033674                         CHREG:
 033674 010146                          MOV     R1,-(SP)                ;;PUSH R1 ON STACK
 033676 010246                          MOV     R2,-(SP)                ;;PUSH R2 ON STACK
 033700 012001                          MOV     (R0)+,R1                ;R1 HAS ADDRESS OF ADDRESS OF REGISTER
 033702 012002                          MOV     (R0)+,R2                ;R2 HAS NUMBER OF CHANGES
 033704 162701 002172                   SUB     #RHWC,R1                ;R1 HAS OFSET OF REQUIRED REGISTER
 033710 005720                  1$:     TST     (R0)+                   ;IS A BIC OR A BIS TO BE DONE
 033712 001403                          BEQ     2$                      ;BRANCH IF A BIC IS REQUIRED
 033714 052061 004512                   BIS     (R0)+,SAVERE(R1)        ;SET REQUIRED BIT
 033720 000402                          BR      3$                      ;BRANCH TO DECREMENT COUNT
 033722 042061 004512           2$:     BIC     (R0)+,SAVERE(R1)        ;CLEAR REQUIRED BIT
 033726 005302                  3$:     DEC     R2                      ;DECREMENT NUMBER OF CHANGES
 033730 001367                          BNE     1$                      ;BRANCH IF NOT COMPLETE
 033732 012602                          MOV     (SP)+,R2                ;;POP STACK INTO R2
 033734 012601                          MOV     (SP)+,R1                ;;POP STACK INTO R1
 033736 000200                          RTS     R0                      ;RETURN TO MAIN PROGRAM






                                ;THIS FILLS A BLOCK WITH INCREMENTAL DATA
                                ;CALL IS
                                ;       JSR     R0,@#FILL
                                ;       F                               ;FROM
                                ;       N                               ;NUMBER OF WORDS
                                ;       S                               ;STARTING VALUE OF DATA
                                ;       I                               ;INCREMENT DATA BY

 033740                         FILL:
 033740 010146                          MOV     R1,-(SP)                ;;PUSH R1 ON STACK
 033742 010246                          MOV     R2,-(SP)                ;;PUSH R2 ON STACK
 033744 010346                          MOV     R3,-(SP)                ;;PUSH R3 ON STACK
 033746 010446                          MOV     R4,-(SP)                ;;PUSH R4 ON STACK
 033750 012001                          MOV     (R0)+,R1                ;R1 HAS ADDRESS WHERE DATA IS TO GO
 033752 012002                          MOV     (R0)+,R2                ;R2 HAS NUMBER OF WORDS TO BE FILLED
 033754 012003                          MOV     (R0)+,R3                ;STARTING VALUE OF DATA
 033756 012004                          MOV     (R0)+,R4                ;R4 HAS INCREMENT

                                        ;*NOW DATA WILL BE FILLED
 033760 010321                  1$:     MOV     R3,(R1)+                ;FILL DATA
 033762 060403                          ADD     R4,R3                   ;GET NEXT VALUE OF DATA
 033764 005302                          DEC     R2                      ;DECREMENT COUNT
```

```
034000  001374                  BNE     1$                      ;BRANCH IF ALL NOT DONE
033770  012604                  MOV     (SP)+,R4                ;;POP STACK INTO R4
033772  012603                  MOV     (SP)+,R3                ;;POP STACK INTO R3
033774  012602                  MOV     (SP)+,R2                ;;POP STACK INTO R2
033776  012601                  MOV     (SP)+,R1                ;;POP STACK INTO R1
034000  000200                  RTS     R0                      ;RETURN TO MAIN PROGRAM






                        ;THIS IS A SUBROUTINE TO COMPARE REGISTERS
                        ;GOOD DATA IS ALREADY SAVED IN 'SAVERE'
                        ;TEST DATA IS IN THE REGISTERS
                        ;CALL IS
                        ;       JSR     R0,@#COMREG
                        ;       SAVERE                          ;GOOD DATA
                        ;       RHCS1                           ;ADDRESS OF ADDRESS TEST DATA
                        ;       N.                              ;RETURN FOR ERROR
                        ;       RG                              ;RETURN FOR GOOD COMPARISON
                        ;ON RETURN WITH ERROR '$GDDAT' HAS GOOD DATA, '$BDDAT' HAS BAD DATA
                        ;'REGADR' HAS REGISTER ADDRESS

034002                  COMREG:
034002  010146                  MOV     R1,-(SP)                ;;PUSH R1 ON STACK
034004  010246                  MOV     R2,-(SP)                ;;PUSH R2 ON STACK
034006  010346                  MOV     R3,-(SP)                ;;PUSH R3 ON STACK
034010  010446                  MOV     R4,-(SP)                ;;PUSH R4 ON STACK
034012  010546                  MOV     R5,-(SP)                ;;PUSH R5 ON STACK
034014  012001                  MOV     (R0)+,R1                ;R1 HAS ADDRESS OF GOOD DATA
034016  012002                  MOV     (R0)+,R2                ;R2 HAS ADDRESS OF ADDRESS OF TEST DATA
034020  012003                  MOV     (R0)+,R3                ;R3 HAS NUMBER OF WORDS
034022  012004                  MOV     (R0)+,R4                ;R4 HAS RETURN FOR ERROR
034024  011000                  MOV     (R0),R0                 ;R0 HAS RETURN ON NO ERROR
                                ;*NOW SAVE REGISTERS
034026  004737  034726          JSR     PC,@#PUTREG             ;SAVE REGISTERS
034032  113737  004537  002301  MOVB    @#SAVERE+25,@#AS+1;MAKE UPPER BYTE OF RHAS SAME
034040  012705  177776          MOV     #-2,R5                  ;PRESET R5 TO -2
                                ;*NOW COMPARES WILL MADE
034044  062705  000002  1$:     ADD     #2,R5                   ;INCREMENT TO INDEX
034050  022122                  CMP     (R1)+,(R2)+             ;COMPARE REGISTER CONTENTS
034052  001420                  BEQ     2$                      ;BRANCH IF GOOD
034054  014137  001124          MOV     -(R1),@#$GDDAT          ;SAVE GOOD DATA
034060  014237  001126          MOV     -(R2),@#$BDDAT          ;SAVE BAD DATA
034064  016537  002172  004500  MOV     RHWC(R5),@#REGADR       ;SAVE ADDRESS OF FAILING REGISTER
034072  004714                  JSR     PC,@R4                  ;RETURN TO MAIN PROGRAM
                                                                ;TO PRINT ERROR
034074  022122                  CMP     (R1)+,(R2)+             ;UNDO -(R1) AND -(R2) FOR ERRORS
034076  017746  145036          MOV     @SWR,-(SP)              ;GET SWITCH SETTING
034102  042716  177177          BIC     #!C600,(SP)             ;KEEP ONLY SWITCH 7 AND 8
034106  022726  000200          CMP     #SW07,(SP)+             ;IS 7 SET AND 8 DOWN
034112  001402                  BEQ     3$                      ;BRANCH OUT IF YES
034114  005303          2$:     DEC     R3                      ;ARE ALL COMPARES DONE
```

```
9520 034116 001352              BNE     1$              ;BRANCH IF NOT COMPLETE
9521
9522 034120            3$:
9523 034120 012605              MOV     (SP)+,R5        ;;POP STACK INTO R5
9524 034122 012604              MOV     (SP)+,R4        ;;POP STACK INTO R4
9525 034124 012603              MOV     (SP)+,R3        ;;POP STACK INTO R3
9526 034126 012602              MOV     (SP)+,R2        ;;POP STACK INTO R2
9527 034130 012601              MOV     (SP)+,R1        ;;POP STACK INTO R1
9528 034132 000200              RTS     R0              ;RETURN TO MAIN PROGRAM
9529 034134 000000      4$:     .WORD   0               ;TEMP STORAGE
```

```

                                        ;HERE IS A DETAILED EXPLAINATION OF HOW THE LOOP ON ERROR WORKS.
                                        ;ON HITTING AN ERROR IF THE LOOP ON ERROR SWITCH IS SET, THE
                                        ;PROGRAM GOES BACK - USUALLY BACK TO THE BEGINNING OF THE TEST.

                                        ;WHEN THIS OPERATOR SELECTABLE SCOPE LOOP IS USED THEN THE POINT
                                        ;THE PROGRAM GOES BACK TO CAN BE CHANGED.
                                        ;THE RESTRICTIONS TO THE POINT WHERE THE PROGRAM CAN GO ARE: -
                                        ;1.  IT MUST BE WITHIN THE TEST UNDER CONSIDERATION
                                        ;2.  LOOP ON ERROR SWITCH MUST BE SET
                                        ;3.  THE ERROR MUST OCCUR WITHIN THE TEST UNDER CONSIDERATION
                                        ;IF THE ERROR DOES NOT OCCUR WITHIN THE TEST UNDER CONSIDERATION
                                        ;THE PROGRAM WILL REVERT TO NORMAL OPERATION.  HOWEVER, IF LOOP ON
                                        ;TEST SWITCH IS SET AND THIS OPERATOR SELECTABLE SCOPE LOOP IS USED
                                        ;THEN THE PROGRAM WILL LOOP BACK TO THE SELECTED POINT WHEN IT
                                        ;COMES TO THE END OF THE TEST UNDER CONSIDERATION.

                                        ;AFTER LOOPING FOR SOME TIME IF THE LOOP SWITCH IS PUT DOWN THEN
                                        ;NORMAL OPERATION WILL CONTINUE.

034136  000000                          TESTAD: 0                               ;FIRST ADDRESS OF TEST
034140                                  OPERSEL:
034140  005037  177776                          CLR     PS                      ;MAKE PROCESSOR STATUS ZERO
034144  012737  177777  040434                  MOV     #-1,@#PRITEM            ;CLEAR PREVIOUS ITEM NUMBER
034152  104400  034160                          TYPE    ,65$                    ;;TYPE ASCIZ STRING
034156  000421                                  BR      64$                     ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <15><12>/THE PROGRAM WAS IN TEST NUMBER /
034222                                  64$:
034222  013746  004504                          MOV     @#TSTNM,-(SP)           ;GET READY TO TYPE TEST
034226  104401                                  TYPOC                           ;NUMBER
034230  104400  034236                          TYPE    ,67$                    ;;TYPE ASCIZ STRING
034234  000414                                  BR      66$                     ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  <15><12>/THE LOOP BACK PC WAS /
034266                                  66$:
034266  013746  001110                          MOV     @#$LPERR,-(SP)  ;GET READY TO TYPE LOOP BACK PC
034272  104401                                  TYPOC
034274  104400  001223                          TYPE    ,$CRLF
034300  104400  034306                          TYPE    ,69$                    ;;TYPE ASCIZ STRING
034304  000430                                  BR      68$                     ;;GET OVER THE ASCIZ
                                        ;;69$:  .ASCIZ  <15><12>/SET SWITCH FOR LOOP ON ERROR OR LOOP ON TEST/
034366                                  68$:
034366  104400  034374                          TYPE    ,71$                    ;;TYPE ASCIZ STRING
034372  000420                                  BR      70$                     ;;GET OVER THE ASCIZ
                                        ;;71$:  .ASCIZ  <15><12>/TYPE THE FIRST PC OF THE TEST/
034434                                  70$:
034434  104400  034442                          TYPE    ,73$                    ;;TYPE ASCIZ STRING
034440  000432                                  BR      72$                     ;;GET OVER THE ASCIZ
                                        ;;73$:  .ASCIZ  <15><12>/TO BE LOOPED ON FOLLOWED BY A CARRIAGE RETURN /<15><12>
034526                                  72$:
034526  104411                                  RDOCT
034530  062716  000002                          ADD     #2,(SP)                 ;GET LPADR
034534  012637  001106                          MOV     (SP)+,@#$LPADR
034540  104400  034546                          TYPE    ,75$                    ;;TYPE ASCIZ STRING
```

```
034544  000417                          BR      74$                     ;;GET OVER THE ASCIZ
                                ;;75$:  .ASCIZ  <15><12>/TYPE THE PC WHERE YOU WANT/
034604                          74$:
034604  104400  034612                  TYPE    ,77$                    ;;TYPE ASCIZ STRING
034610  000440                          BR      76$                     ;;GET OVER THE ASCIZ
                                ;;77$:  .ASCIZ  <15><12>/ THE PROGRAM TO LOOP BACK TO FOLLOWED BY A CARRIAGE RETURN /<15
034712                          76$:
034712  104411                          RDOCT
034714  012637  001110                  MOV     (SP)+,@#$LPERR  ;GET LPERR
034720  013746  001106                  MOV     @#$LPADR,-(SP)
034724  000002                          RTI





                                        ;*THIS SAVES THE CONTENTS OF ALL HARDWARE REGISTERS
                                        ;*IN MEMORY LOCATIONS TAGED FROM "WC" TO "EC2"
                                        ;*THIS IS DONE SO THAT COMPARES ARE DONE WITH SAVED LOCATIONS
                                        ;*AND NOT THE REGISTERS THEMSELVES.   THIS WILL MAKE
                                        ;*ERROR PRINTOUTS FOR GOOD AND BAD DATA ALWAYS DIFFRENT




034726                          PUTREG:
034726  010046                          MOV     R0,-(SP)                ;;PUSH R0 ON STACK
034730  010146                          MOV     R1,-(SP)                ;;PUSH R1 ON STACK
034732  010246                          MOV     R2,-(SP)                ;;PUSH R2 ON STACK
034734  012700  002172                  MOV     #RHWC,R0                ;STARTING ADDRESS OF REGISTERS
034740  012701  002254                  MOV     #WC,R1                  ;STARTING ADDRESS OF SAVING LOCATIONS
034744  012702  000022                  MOV     #RHCC-RHWC+2/2,R2 ;NUMBER OF REG. INTO R2
034750  013021                  10$:    MOV     @(R0)+,(R1)+            ;SAVE HARDWARE REG.
034752  005302                          DEC     R2
034754  001375                          BNE     10$
034756  012602                          MOV     (SP)+,R2                ;;POP STACK INTO R2
034760  012601                          MOV     (SP)+,R1                ;;POP STACK INTO R1
034762  012600                          MOV     (SP)+,R0                ;;POP STACK INTO R0
034764  000207                          RTS     PC
```

```
                                ;THIS IS A DATA  COMMAND SETUP SUBROUTINE
                                ;THE CALL IS
                                ;       JSR     R0,@#RUN
                                ;       C                               ;CYLINDER
                                ;.BYTE  S                               ;SECTOR
                                ;.BYTE  T                               ;TRACK
                                ;       -W                              ;WORD COUNT
                                ;       B                               ;BUS ADDRESS
                                ;       BAI                             ;BUS ADDRESS INHIBIT
                                ;       FMT22!ECI!HCI                   ;FMT22=1 =16 BIT WORDS
                                ;                                       ;ECI = ECC CORRECTION INHIBIT
                                ;                                       ;HCI = HEADER COMPARE INHIBIT
                                ;       COM                             ;COMMAND ADDRESS
034766  012077  145220          RUN:    MOV     (R0)+,@RHCA             ;CYLINDER
034772  012077  145206                  MOV     (R0)+,@RHDST            ;DESIRED SECTOR/TRACK
034776  012077  145170                  MOV     (R0)+,@RHWC             ;WORD COUNT
035002  012077  145166                  MOV     (R0)+,@RHBA             ;BUS ADDRESS
035006  013746  004616                  MOV     @#UNIT,-(SP)            ;GET UNIT NO
035012  052016                          BIS     (R0)+,(SP)              ;SET BUS ADDRESS INHIBIT
035014  012677  145156                  MOV     (SP)+,@RHCS2            ;UNIT NO AND BAI TO RHCS2
035020  012077  145164                  MOV     (R0)+,@RHOF             ;FORMAT, ECC INHIBIT, HEADER
                                                                        ;COMPARE, IF THERE
035024  013077  145150                  MOV     @(R0)+,@RHCS1           ;COMMAND IN RHCS1
035030  000200                          RTS     R0                      ;RETURN TO MAIN PROGRAM




                                ;THIS IS A SUBROUTINE TO COMPARE TWO BLOCKS IN MEMORY
                                ;R1 HAS GOOD DATA BUFFER ADDRESS
                                ;R2 HAS TEST DATA BUFFER ADDRESS
                                ;R5 HAS ADDRESS OF RETURN ON ERROR
                                ;R3 HAS NUMBER OF WORDS TO BE COMPARED
                                ;R4 HAS ONE MORE THAN NUMBER OF WORDS TO BE COMPARED
                                ;CALL IS
                                ;       JSR     R0,@#COMPAR
                                ;       G               ;ADDRESS OF GOOD DATA
                                ;       T               ;ADDRESS OF TEST DATA
                                ;       N               ;NUMBER OF WORDS TO BE COMPARED
                                ;       RE              ;RETURN ON ERROR
                                ;       RG              ;RETURN ON NO ERROR



035032                          COMPAR:
035032  010146                          MOV     R1,-(SP)                ;;PUSH R1 ON STACK
035034  010246                          MOV     R2,-(SP)                ;;PUSH R2 ON STACK
035036  010346                          MOV     R3,-(SP)                ;;PUSH R3 ON STACK
035040  010446                          MOV     R4,-(SP)                ;;PUSH R4 ON STACK
035042  010546                          MOV     R5,-(SP)                ;;PUSH R5 ON STACK
035044  012001                          MOV     (R0)+,R1                ;ADDRESS OF GOOD DATA BUFFER
035046  012002                          MOV     (R0)+,R2                ;ADDRESS OF TEST DATA BUFFER
035050  012003                          MOV     (R0)+,R3                ;NO OF WORDS TO BE COMPARED
035052  012005                          MOV     (R0)+,R5                ;RETURN ON ERROR
```

```
035054  011000                    MOV     (R0),R0          ;RETURN ON NO ERROR
035056  010304                    MOV     R3,R4            ;NO OF WORDS TO BE COMPARED
035060  005204                    INC     R4
035062  010437  004502    1$:     MOV     R4,@#ERWORD      ;FOR ERROR WORD NO
035066  022122                    CMP     (R1)+,(R2)+      ;COMPARE GOOD WITH TEST DATA
035070  001417                    BEQ     2$               ;BRANCH IF GOOD

035072  014137  001124            MOV     -(R1),@#$GDDAT   ;GOOD DATA
035076  014237  001126            MOV     -(R2),@#$BDDAT   ;BAD DATA
035102  160337  004502            SUB     R3,@#ERWORD      ;ERROR WORD NO.
035106  004715                    JSR     PC,@R5   ;RETURN TO PRINT ERROR
035110  022122                    CMP     (R1)+,(R2)+      ;UNDO -(R1) AND -(R2) FOR ERRORS
035112  017746  144022            MOV     @SWR,-(SP)       ;GET SWITCH SETTING
035116  042716  177177            BIC     #↑C600,(SP)      ;KEEP ONLY SWITCH 7 AND 8
035122  022726  000200            CMP     #SW07,(SP)+      ;IS 7 SET AND 8 RESET
035126  001402                    BEQ     3$               ;BRANCH OUT IF YES
035130  005303            2$:     DEC     R3               ;COUNT
035132  001353                    BNE     1$               ;BRANCH IF ALL NOT DEVICE
035134                    3$:
035134  012605                    MOV     (SP)+,R5         ;;POP STACK INTO R5
035136  012604                    MOV     (SP)+,R4         ;;POP STACK INTO R4
035140  012603                    MOV     (SP)+,R3         ;;POP STACK INTO R3
035142  012602                    MOV     (SP)+,R2         ;;POP STACK INTO R2
035144  012601                    MOV     (SP)+,R1         ;;POP STACK INTO R1
035146  000200                    RTS     R0               ;RETURN TO MAIN PROGRAM
                          ;*      THIS ROUTINE WILL ALLOW THE CHANGE OF THE BASE
                          ;*      ADDRESS FROM 176700 TO ANY TYPED VALUE

035150                    BASECH:
035150  104400  035156            TYPE    ,65$             ;;TYPE ASCIZ STRING
035154  000425                    BR      64$              ;;GET OVER THE ASCIZ
                          ;;65$:  .ASCIZ  <15><12>/PRESENT BASE ADDRESS OF REGISTERS IS   /
035230                    64$:
035230  013746  002200            MOV     @#RHCS1,-(SP)    ;GET READY TO TYPE OLD BASE
035234  104401                    TYPOC
035236  104400  035244            TYPE    ,67$             ;;TYPE ASCIZ STRING
035242  000425                    BR      66$              ;;GET OVER THE ASCIZ
                          ;;67$:  .ASCIZ  <15><12>/TYPE NEW BASE ADDRESS FOLLOWED BY 'CR' /
035316                    66$:
035316  004737  037026            JSR     PC,@#$TKINT      ;INITIALIZE THE TTY KEYBOARD
035322  104411                    RDOCT
035324  012700  002170            MOV     #RHDB,R0         ;GET STARTING ADDRESS OF REGISTERS
035330  012701  000024            MOV     #20.,R1          ;NUMBER OF REGISTERS
035334  042710  177700    1$:     BIC     #↑C77,(R0)       ;CLEAR OLD BASE
035340  051620                    BIS     (SP),(R0)+       ;SET NEW BASE
035342  005301                    DEC     R1               ;COUNT
035344  001373                    BNE     1$               ;BRANCH IF 20 NOT DONE
035346  104400  035354            TYPE    ,69$             ;;TYPE ASCIZ STRING
035352  000417                    BR      68$              ;;GET OVER THE ASCIZ
                          ;;69$:  .ASCIZ  <15><12>/PRESENT VECTOR ADDRESS IS /
035412                    68$:
035412  013746  002166            MOV     @#RPVEC,-(SP)    ;GET READY TO TYPE OLD VECTOR ADDRESS
035416  104401                    TYPOC
035420  104400  035426            TYPE    ,71$             ;;TYPE ASCIZ STRING
```

```
035424  000437                    BR      70$             ;;GET OVER THE ASCIZ
                          ;;71$:  .ASCIZ  <15><12>/TYPE NEW VECTOR ADDRESS OR RETYPE OLD ONE FOLLOWED BY "CR" /
035524                    70$:
035524  104411                    RDOCT
035526  012637  002166            MOV     (SP)+,@#RPVEC   ;SETUP VECTOR ADDRESS
035532  104400  035540            TYPE    ,73$            ;;TYPE ASCIZ STRING
035536  000421                    BR      72$             ;;GET OVER THE ASCIZ
                          ;;73$:  .ASCIZ  <15><12>/RESTART PROGRAM FROM 200 OR 210/
035602                    72$:
035602  104400  035610            TYPE    ,75$            ;;TYPE ASCIZ STRING
035606  000416                    BR      74$             ;;GET OVER THE ASCIZ
                          ;;75$:  .ASCIZ  <15><12>/NEW BASE WILL REMAIN   - /
035644                    74$:
035644  013746  002200            MOV     @#RHCS1,-(SP)
035650  104401                    TYPOC
035652  104400  035660            TYPE    ,77$            ;;TYPE ASCIZ STRING
035656  000416                    BR      76$             ;;GET OVER THE ASCIZ
                          ;;77$:  .ASCIZ  <15><12>/NEW VECTOR WILL REMAIN - /
035714                    76$:
035714  013746  002166            MOV     @#RPVEC,-(SP)
035720  104401                    TYPOC
035722  104400  035730            TYPE    ,79$            ;;TYPE ASCIZ STRING
035726  000402                    BR      78$             ;;GET OVER THE ASCIZ
                          ;;79$:  .ASCIZ  <15><12>/ /
035734                    78$:
035734  104400  035742            TYPE    ,81$            ;;TYPE ASCIZ STRING
035740  000416                    BR      80$             ;;GET OVER THE ASCIZ
                          ;;81$:  .ASCIZ  <15><12>/UNTIL PROGRAM IS RELOADED/
035776                    80$:
035776  000000                    HALT
```

```
                                        ;;*******************************************************************
036000                                  RPVECT:
036000  104400  036006                          TYPE    ,65$                    ;;TYPE ASCIZ STRING
036004  000424                                  BR      64$                     ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  /UNEXPECTED INTERRUPT FROM RP04 @ PC = /
036056                                  64$:
036056  104401                                  TYPOC                                   ;TYPE FROM PC
036060  012777  036000  144100                  MOV     #RPVECT,@RPVEC                  ;RESTORE TRAP RP04 VECTOR
036066  000000                                  HALT                                    ;CHANGE TO CONTINUE
                                        ;;*******************************************************************
```

```
                                     .SBTTL  SYSMAC LIBRARY ROUTINES



                               .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
                               ;*SW08=1        LOOP ON TEST IN SWR<7:0>
                               ;*CALL
                               ;*      SCOPE           ;;SCOPE=IOT

036070                         $SCOPE:
036070  104406                         CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
036072  032777  040000  143040 1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
036100  001111                         BNE     $OVER           ;;YES IF SW14=1
                               ;#####START OF CODE FOR THE XOR TESTER#####
036102  000416                 $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                               ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
036104  013746  000004                 MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
036110  012737  036130  000004         MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
036116  005737  177060                 TST     @#177060        ;;TIME OUT ON XOR?
036122  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
036126  000463                         BR      $SVLAD          ;;GO TO THE NEXT TEST
036130  022626                 5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
036132  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
036136  000423                         BR      7$              ;;LOOP ON THE PRESENT TEST
036140                         6$:;#####END OF CODE FOR THE XOR TESTER#####
036140  032777  000400  142772         BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
036146  001404                         BEQ     2$              ;;BR IF NO
036150  127737  142764  001102         CMPB    @SWR,$TSTNM     ;;ON THE RIGHT TEST?    SWR<7:0>
036156  001462                         BEQ     $OVER           ;;BR IF YES
036160  105737  001103         2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
036164  001421                         BEQ     3$              ;;BR IF NO
036166  123737  001115  001103         CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
036174  101015                         BHI     3$              ;;BR IF NO
036176  032777  001000  142734         BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
036204  001404                         BEQ     4$              ;;BR IF NO
036206  013737  001110  001106 7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
036214  000443                         BR      $OVER
036216  105037  001103         4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
036222  005037  001212                 CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
036226  000415                         BR      1$              ;;ESCAPE TO THE NEXT TEST
036230  032777  004000  142702 3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
036236  001011                         BNE     1$              ;;BR IF YES
036240  005737  001100                 TST     $PASS           ;;IF FIRST PASS OF PROGRAM
036244  001406                         BEQ     1$              ;;      INHIBIT ITERATIONS
036246  005237  001104                 INC     $ICNT           ;;INCREMENT ITERATION COUNT
036252  023737  001212  001104         CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
```

```
9829 036260 002021                          BGE     $OVER             ;;BR IF MORE ITERATION REQUIRED
9830 036262 012737 000001 001104 1$:        MOV     #1,$ICNT          ;;REINITIALIZE THE ITERATION COUNTER
9831 036270 013737 036340 001212            MOV     $MXCNT,$TIMES     ;;SET NUMBER OF ITERATIONS TO DO
9832 036276 105237 001102        $SVLAD:    INCB    $TSTNM            ;;COUNT TEST NUMBERS
9833 036302 011637 001106                   MOV     (SP),$LPADR       ;;SAVE SCOPE LOOP ADDRESS
9834 036306 011637 001110                   MOV     (SP),$LPERR       ;;SAVE ERROR LOOP ADDRESS
9835 036312 005037 001214                   CLR     $ESCAPE           ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
9836 036316 112737 000001 001115            MOVB    #1,$ERMAX         ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
9837 036324 013777 001102 142610 $OVER:     MOV     $TSTNM,@DISPLAY   ;;DISPLAY TEST NUMBER
9838 036332 013716 001106                   MOV     $LPADR,(SP)       ;;FUDGE RETURN ADDRESS
9839 036336 000002                          RTI                       ;;FIXES PS
9840 036340 000004                   $MXCNT: 4                         ;;MAX. NUMBER OF ITERATIONS
```

```
                                         .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

036342                                   $TYPDS:
036342  010046                                   MOV     R0,-(SP)         ;;PUSH R0 ON STACK
036344  010146                                   MOV     R1,-(SP)         ;;PUSH R1 ON STACK
036346  010246                                   MOV     R2,-(SP)         ;;PUSH R2 ON STACK
036350  010346                                   MOV     R3,-(SP)         ;;PUSH R3 ON STACK
036352  010546                                   MOV     R5,-(SP)         ;;PUSH R5 ON STACK
036354  012746  020200                           MOV     #20200,-(SP)     ;;SET BLANK SWITCH AND SIGN
036360  016605  000020                           MOV     20(SP),R5        ;;GET THE INPUT NUMBER
036364  100004                                   BPL     1$               ;;BR IF INPUT IS POS.
036366  005405                                   NEG     R5               ;;MAKE THE BINARY NUMBER POS.
036370  112766  000055  000001                   MOVB    #'-,1(SP)        ;;MAKE THE ASCII NUMBER NEG.
036376  005000                           1$:     CLR     R0               ;;ZERO THE CONSTANTS INDEX
036400  012703  036556                           MOV     #$DBLK,R3        ;;SETUP THE OUTPUT POINTER
036404  112723  000040                           MOVB    #' ,(R3)+        ;;SET THE FIRST CHARACTER TO A BLANK
036410  005002                           2$:     CLR     R2               ;;CLEAR THE BCD NUMBER
036412  016001  036546                           MOV     $DTBL(R0),R1     ;;GET THE CONSTANT
036416  160105                           3$:     SUB     R1,R5            ;;FORM THIS BCD DIGIT
036420  002402                                   BLT     4$               ;;BR IF DONE
036422  005202                                   INC     R2               ;;INCREASE THE BCD DIGIT BY 1
036424  000774                                   BR      3$
036426  060105                           4$:     ADD     R1,R5            ;;ADD BACK THE CONSTANT
036430  005702                                   TST     R2               ;;CHECK IF BCD DIGIT=0
036432  001002                                   BNE     5$               ;;FALL THROUGH IF 0
036434  105716                                   TSTB    (SP)             ;;STILL DOING LEADING 0'S?
036436  100407                                   BMI     7$               ;;BR IF YES
036440  106316                           5$:     ASLB    (SP)             ;;MSD?
036442  103003                                   BCC     6$               ;;BR IF NO
036444  116663  000001  177777                   MOVB    1(SP),-1(R3)     ;;YES--SET THE SIGN
036452  052702  000060                   6$:     BIS     #'0,R2           ;;MAKE THE BCD DIGIT ASCII
036456  052702  000040                   7$:     BIS     #' ,R2           ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
036462  110223                                   MOVB    R2,(R3)+         ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
036464  005720                                   TST     (R0)+            ;;JUST INCREMENTING
036466  020027  000010                           CMP     R0,#10           ;;CHECK THE TABLE INDEX
036472  002746                                   BLT     2$               ;;GO DO THE NEXT DIGIT
036474  003002                                   BGT     8$               ;;GO TO EXIT
036476  010502                                   MOV     R5,R2            ;;GET THE LSD
036500  000764                                   BR      6$               ;;GO CHANGE TO ASCII
036502  105726                           8$:     TSTB    (SP)+            ;;WAS THE LSD THE FIRST NON-ZERO?
036504  100003                                   BPL     9$               ;;BR IF NO
036506  116663  177777  177776                   MOVB    -1(SP),-2(R3)    ;;YES--SET THE SIGN FOR TYPING
036514  105013                           9$:     CLRB    (R3)             ;;SET THE TERMINATOR
036516  012605                                   MOV     (SP)+,R5         ;;POP STACK INTO R5
```

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036520  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
036522  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
036524  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
036526  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
036530  104400  036556                  TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
036534  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
036542  012616                          MOV     (SP)+,(SP)
036544  000002                          RTI                     ;;RETURN TO USER
036546  023420                  $DTBL:  10000.
036550  001750                          1000.
036552  000144                          100.
036554  000012                          10.
036556  000004                  $DBLK:  .BLKW   4
```

```
                                         .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
                                         ;*

036566  105737  001157                   $TYPE:  TSTB    $TPFLG              ;;IS THERE A TERMINAL?
036572  100002                                   BPL     1$                  ;;BR IF YES
036574  000000                                   HALT                        ;;HALT HERE IF NO TERMINAL
036576  000407                                   BR      3$                  ;;LEAVE
036600  010046                           1$:     MOV     R0,-(SP)            ;;SAVE R0
036602  017600  000002                           MOV     @2(SP),R0           ;;GET ADDRESS OF ASCIZ STRING
036606  112046                           2$:     MOVB    (R0)+,-(SP)         ;;PUSH CHARACTER TO BE TYPED ONTO STACK
036610  001005                                   BNE     4$                  ;;BR IF IT ISN'T THE TERMINATOR
036612  005726                                   TST     (SP)+               ;;IF TERMINATOR POP IT OFF THE STACK
036614  012600                           60$:    MOV     (SP)+,R0            ;;RESTORE R0
036616  062716  000002                   3$:     ADD     #2,(SP)             ;;ADJUST RETURN PC
036622  000002                                   RTI                         ;;RETURN
036624  122716  000011                   4$:     CMPB    #HT,(SP)            ;;BRANCH IF <HT>
036630  001430                                   BEQ     8$
036632  122716  000200                           CMPB    #CRLF,(SP)          ;;BRANCH IF NOT <CRLF>
036636  001006                                   BNE     5$
036640  005726                                   TST     (SP)+               ;;POP  <CR><LF> EQUIV
036642  104400                                   TYPE                        ;;TYPE A CR AND LF
036644  001223                                   $CRLF
036646  105037  037002                           CLRB    $CHARCNT            ;;CLEAR CHARACTER COUNT
036652  000755                                   BR      2$                  ;;GET NEXT CHARACTER
036654  004737  036736                   5$:     JSR     PC,$TYPEC           ;;GO TYPE THIS CHARACTER
036660  123726  001156                   6$:     CMPB    $FILLC,(SP)+        ;;IS IT TIME FOR FILLER CHARS.?
036664  001350                                   BNE     2$                  ;;IF NO GO GET NEXT CHAR.
036666  013746  001154                           MOV     $NULL,-(SP)         ;;GET # OF FILLER CHARS. NEEDED
                                                                             ;;AND THE NULL CHAR.
036672  105366  000001                   7$:     DECB    1(SP)               ;;DOES A NULL NEED TO BE TYPED?
036676  002770                                   BLT     6$                  ;;BR IF NO--GO POP THE NULL OFF OF STACK
036700  004737  036736                           JSR     PC,$TYPEC           ;;GO TYPE A NULL
036704  105337  037002                           DECB    $CHARCNT            ;;DO NOT COUNT AS A COUNT
036710  000770                                   BR      7$                  ;;LOOP

                                         ;HORIZONTAL TAB PROCESSOR

036712  112716  000040                   8$:     MOVB    #' ,(SP)            ;;REPLACE TAB WITH SPACE
036716  004737  036736                   9$:     JSR     PC,$TYPEC           ;;TYPE A SPACE
036722  132737  000007  037002                   BITB    #7,$CHARCNT         ;;BRANCH IF NOT AT
```

```
 9962  036730  001372                        BNE     9$              ;;TAB STOP
 9963  036732  005726                        TST     (SP)+           ;;POP SPACE OFF STACK
 9964  036734  000724                        BR      2$              ;;GET NEXT CHARACTER
 9965  036736  105777  142206       $TYPEC:  TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
 9966  036742  100375                        BPL     $TYPEC
 9967  036744  116677  000002  142200        MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
 9968  036752  122766  000015  000002        CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
 9969  036760  001003                        BNE     1$              ;;BRANCH IF NO
 9970  036762  105037  037002                CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
 9971  036766  000406                        BR      $TYPEX          ;;EXIT
 9972  036770  122766  000012  000002 1$:    CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
 9973  036776  001402                        BEQ     $TYPEX          ;;BRANCH IF YES
 9974  037000  105227                        INCB    (PC)+           ;;COUNT THE CHARACTER
 9975  037002  000000               $CHARCNT:.WORD   0               ;;CHARACTER COUNT STORAGE
 9976  037004  000207               $TYPEX:  RTS     PC
 9977
```

```
                                                .SBTTL  TTY INPUT ROUTINE

                                                ;;*****************************************************************
                                                .ENABL  LSB
037006  000000                                  $TKCNT: .WORD   0                       ;;NUMBER OF ITEMS IN QUEUE
037010  000000                                  $TKQIN: .WORD   0                       ;;INPUT POINTER
037012  000000                                  $TKQOUT: .WORD  0                       ;;OUTPUT POINTER
037014  000011                                  $TKQSRT: .BLKB  9.                      ;;TTY KEYBOARD QUEUE
        037025                                  $TKQEND=.
        037026                                  .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
                                                ;
037026  005037  037006                          $TKINT: CLR     $TKCNT                  ;;CLEAR COUNT OF ITEMS IN QUEUE
037032  012737  037014  037010                          MOV     #$TKQSRT,$TKQIN         ;;MOVE THE STARTING ADDRESS OF THE
037040  013737  037010  037012                          MOV     $TKQIN,$TKQOUT          ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
037046  012737  037076  000060                          MOV     #$TKSRV,@#TKVEC         ;;INITIALIZE THE KEYBOARD VECTOR
037054  012737  000200  000062                          MOV     #200,@#TKVEC+2          ;;"BR" LEVEL 4
037062  005777  142060                                  TST     @$TKB                   ;;CLEAR DONE FLAG
037066  012777  000100  142050                          MOV     #100,@$TKS              ;;ENABLE TTY KEYBOARD INTERRUPT
037074  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 (OPERSEL)
                                                ;
037076  117746  142044                          $TKSRV: MOVB    @$TKB,-(SP)             ;;PICKUP THE CHARACTER
037102  042716  177600                                  BIC     #↑C177,(SP)             ;;STRIP THE JUNK
037106  021627  000003                                  CMP     (SP),#3                 ;;IS IT A CONTROL C?
037112  001007                                          BNE     1$                      ;;BRANCH IF NO
037114  104400  040065                                  TYPE    ,$CNTLC                 ;;TYPE A CONTROL-C (↑C)
037120  004737  037026                                  JSR     PC,$TKINT               ;;INIT THE KEYBOARD
037124  005726                                          TST     (SP)+                   ;;CLEAN UP STACK
037126  000137  034140                                  JMP     OPERSEL                 ;;CONTROL C RESTART
037132  021627  000007                          1$:     CMP     (SP),#7                 ;;IS IT A CONTROL G?
037136  001004                                          BNE     2$                      ;;BRANCH IF NO
037140  022737  000176  001140                          CMP     #SWREG,SWR              ;;IS SOFT-SWR SELECTED?
037146  001500                                          BEQ     6$                      ;;GO TO SWR CHANGE

037150                                          2$:
037150  022737  000011  037006                          CMP     #9.,$TKCNT              ;;IS THE QUEUE FULL?
037156  001004                                          BNE     3$                      ;;BRANCH IF NO
037160  104400  001216                                  TYPE    ,$BELL                  ;;RING THE TTY BELL
037164  005726                                          TST     (SP)+                   ;;CLEAN CHARACTER OFF OF STACK
037166  000451                                          BR      5$                      ;;EXIT
```

```
037170  021627  000023            3$:     CMP     (SP),#23            ;;IS IT A CONTROL-S?
037174  001021                            BNE     32$                 ;;BRANCH IF NO
037176  005077  141742                    CLR     @$TKS               ;;DISABLE TTY KEYBOARD INTERRUPTS
037202  005726                            TST     (SP)+               ;;CLEAN CHAR OFF STACK
037204  105777  141734            31$:    TSTB    @$TKS               ;;WAIT FOR A CHAR
037210  100375                            BPL     31$                 ;;LOOP UNTIL ITS THERE
037212  117746  141730                    MOVB    @$TKB,-(SP)         ;;GET THE CHARACTER
037216  042716  177600                    BIC     #↑C177,(SP)         ;;MAKE IT 7-BIT ASCII
037222  022627  000021                    CMP     (SP)+,#21           ;;IS IT A CONTROL-Q?
037226  001366                            BNE     31$                 ;;BRANCH IF NO
037230  012777  000100  141706            MOV     #100,@$TKS          ;;REENABLE TTY KEYBOARD INTERRUPTS
037236  000002                            RTI                         ;;RETURN
037240  005237  037006            32$:    INC     $TKCNT              ;;COUNT THIS CHARACTER
037244  021627  000140                    CMP     (SP),#140           ;;IS IT UPPER CASE?
037250  002405                            BLT     4$                  ;;BRANCH IF YES
037252  021627  000175                    CMP     (SP),#175           ;;IS IT A SPECIAL CHAR?
037256  003002                            BGT     4$                  ;;BRANCH IF YES
037260  042716  000040                    BIC     #40,(SP)            ;;MAKE IT UPPER CASE
037264  112677  177520            4$:     MOVB    (SP)+,@$TKQIN       ;;AND PUT IT IN QUEUE
037270  005237  037010                    INC     $TKQIN              ;;UPDATE THE POINTER
037274  023727  037010  037025            CMP     $TKQIN,#$TKQEND     ;;GO OFF THE END?
037302  001003                            BNE     5$                  ;;BRANCH IF NO
037304  012737  037014  037010            MOV     #$TKQSRT,$TKQIN     ;;RESET THE POINTER
037312  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.
037314  022737  000176  001140    $CKSWR: CMP     #SWREG,SWR          ;;IS THE SOFT-SWR SELECTED
037322  001124                            BNE     15$                 ;;EXIT IF NOT
037324  105777  141614                    TSTB    @$TKS               ;;IS A CHAR WAITING?
037330  100121                            BPL     15$                 ;;IF NOT, EXIT
037332  117746  141610                    MOVB    @$TKB,-(SP)         ;;YES
037336  042716  177600                    BIC     #↑C177,(SP)         ;;MAKE IT  7-BIT ASCII
037342  021627  000007                    CMP     (SP),#7             ;;IS IT A CONTROL-G?
037346  001300                            BNE     2$                  ;;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.
037350  123727  001134  000001    6$:     CMPB    $AUTOB,#1           ;;ARE WE RUNNING IN AUTO-MODE?
037356  001674                            BEQ     2$                  ;;BRANCH IF YES
037360  005726                            TST     (SP)+               ;;CLEAR CONTROL-G OFF STACK
037362  004737  037026                    JSR     PC,$TKINT           ;;FLUSH THE TTY INPUT QUEUE
037366  005077  141552                    CLR     @$TKS               ;;DISABLE TTY KEYBOARD INTERRUPTS
037372  112737  000001  001135            MOVB    #1,$INTAG           ;;SET INTERRUPT MODE INDICATOR

037400  104400  040077                    TYPE    ,$CNTLG             ;;ECHO THE CONTROL-G (↑G)
037404  104400  040104            $GTSWR: TYPE    ,$MSWR              ;;TYPE CURRENT CONTENTS
037410  013746  000176                    MOV     SWREG,-(SP)         ;;SAVE SWREG FOR TYPEOUT
```

```
037414  104401                                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
037416  104400  040115                          TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
037422  005046                          19$:    CLR     -(SP)           ;;CLEAR COUNTER
037424  005046                                  CLR     -(SP)           ;;THE NEW SWR
037426  105777  141512                  7$:     TSTB    @$TKS           ;;CHAR THERE?
037432  100375                                  BPL     7$              ;;IF NOT TRY AGAIN

037434  117746  141506                          MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
037440  042716  177600                          BIC     #↑C177,(SP)     ;;MAKE IT 7-BIT ASCII

037444  021627  000003                          CMP     (SP),#3         ;;IS IT A CONTROL-C?
037450  001015                                  BNE     9$              ;;BRANCH IF NOT
037452  104400  040065                          TYPE    ,$CNTLC         ;;YES, ECHO CONTROL-C (↑C)
037456  062706  000006                          ADD     #6,SP           ;;CLEAN UP STACK
037462  123727  001135  000001                  CMPB    $INTAG,#1       ;;REENABLE TTY KEYBOARD INTERRUPTS?
037470  001003                                  BNE     8$              ;;BRANCH IF NO
037472  012777  000100  141444                  MOV     #100,@$TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
037500  000137  034140                  8$:     JMP     OPERSEL         ;;CONTROL-C RESTART


037504  021627  000025                  9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
037510  001005                                  BNE     10$             ;;BRANCH IF NOT
037512  104400  040072                          TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (↑U)
037516  062706  000006                  20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
037522  000737                                  BR      19$             ;;LET'S TRY IT AGAIN


037524  021627  000015                  10$:    CMP     (SP),#15        ;;IS IT A <CR>?
037530  001022                                  BNE     16$             ;;BRANCH IF NO
037532  005766  000004                          TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
037536  001403                                  BEQ     11$             ;;BRANCH IF YES
037540  016677  000002  141372                  MOV     2(SP),@SWR      ;;SAVE NEW SWR
037546  062706  000006                  11$:    ADD     #6,SP           ;;CLEAR UP STACK
037552  104400  001223                  14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
037556  123727  001135  000001                  CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
037564  001003                                  BNE     15$             ;;BRANCH IF NOT
037566  012777  000100  141350                  MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
037574  000002                          15$:    RTI                     ;;RETURN
037576  004737  036736                  16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
037602  021627  000060                          CMP     (SP),#60        ;;CHAR < 0?
037606  002420                                  BLT     18$             ;;BRANCH IF YES
037610  021627  000067                          CMP     (SP),#67        ;;CHAR > 7?
037614  003015                                  BGT     18$             ;;BRANCH IF YES
037616  042726  000060                          BIC     #60,(SP)+       ;;STRIP-OFF ASCII
037622  005766  000002                          TST     2(SP)           ;;IS THIS THE FIRST CHAR
037626  001403                                  BEQ     17$             ;;BRANCH IF YES
037630  006316                                  ASL     (SP)            ;;NO, SHIFT PRESENT
037632  006316                                  ASL     (SP)            ;;   CHAR OVER TO MAKE
037634  006316                                  ASL     (SP)            ;;   ROOM FOR NEW ONE.
037636  005266  000002                  17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
037642  056616  177776                          BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
037646  000667                                  BR      7$              ;;GET THE NEXT ONE
037650  104400  001222                  18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
037654  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
                                        ;
 037656  011646                         $RDCHR: MOV     (SP),-(SP)              ;;PUSH DOWN THE PC AND
 037660  016666  000004  000002                 MOV     4(SP),2(SP)             ;;THE PS
 037666  005066  000004                         CLR     4(SP)                   ;;GET READY FOR A CHARACTER
 037672  005046                                 CLR     -(SP)                   ;;PUT NEW PS ON STACK
 037674  012746  037702                         MOV     #64$,-(SP)              ;;PUT NEW PC ON  STACK
 037700  000002                                 RTI                             ;;POP NEW PC AND PS
 037702                                 64$:
 037702  005737  037006                 1$:     TST     $TKCNT                  ;;WAIT ON A CHARACTER
 037706  001775                                 BEQ     1$
 037710  005337  037006                         DEC     $TKCNT                  ;;DECREMENT THE COUNTER
 037714  117766  177072  000004                 MOVB    @$TKQOUT,4(SP)          ;;GET ONE CHARACTER
 037722  005237  037012                         INC     $TKQOUT                 ;;UPDATE THE POINTER
 037726  023727  037012  037025                 CMP     $TKQOUT,#$TKQEND        ;;DID IT GO OFF OF THE END?
 037734  001003                                 BNE     2$                      ;;BRANCH IF NO
 037736  012737  037014  037012                 MOV     #$TKQSRT,$TKQOUT        ;;RESET THE POINTER
 037744  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
 037746  010346                         $RDLIN: MOV     R3,-(SP)                ;;SAVE R3
 037750  012703  040054                 1$:     MOV     #$TTYIN,R3              ;;GET ADDRESS
 037754  022703  040065                 2$:     CMP     #$TTYIN+9.,R3           ;;BUFFER FULL?
 037760  101405                                 BLOS    4$                      ;;BR IF YES
 037762  104407                                 RDCHR                           ;;GO READ ONE CHARACTER FROM THE TTY
 037764  112613                                 MOVB    (SP)+,(R3)              ;;GET CHARACTER
 037766  122713  000177                 10$:    CMPB    #177,(R3)               ;;IS IT A RUBOUT
 037772  001003                                 BNE     3$                      ;;SKIP IF NOT
 037774  104400  001222                 4$:     TYPE    ,$QUES                  ;;TYPE A '?'
 040000  000763                                 BR      1$                      ;;CLEAR THE BUFFER AND LOOP
 040002  111337  040052                 3$:     MOVB    (R3),9$                 ;;ECHO THE CHARACTER
 040006  104400  040052                         TYPE    ,9$
 040012  122723  000015                         CMPB    #15,(R3)+               ;;CHECK FOR RETURN
 040016  001356                                 BNE     2$                      ;;LOOP IF NOT RETURN
 040020  105063  177777                         CLRB    -1(R3)                  ;;CLEAR RETURN (THE 15)
 040024  104400  001224                         TYPE    ,$LF                    ;;TYPE A LINE FEED
 040030  012603                                 MOV     (SP)+,R3                ;;RESTORE R3
 040032  011646                                 MOV     (SP),-(SP)              ;;ADJUST THE STACK AND PUT ADDRESS OF THE
 040034  016666  000004  000002                 MOV     4(SP),2(SP)             ;;      FIRST ASCII CHARACTER ON IT
 040042  012766  040054  000004                 MOV     #$TTYIN,4(SP)
```

```
040050  000002                              RTI                        ;;RETURN
040052     000                      9$:     .BYTE   0                  ;;STORAGE FOR ASCII CHAR. TO TYPE
040053     000                              .BYTE   0                  ;;TERMINATOR
040054  000011                      $TTYIN: .BLKB   9.                 ;;RESERVE 9. BYTES FOR TTY INPUT
040065     136  006503  000012      $CNTLC: .ASCIZ  /↑C/<15><12>       ;;CONTROL "C"
040072  052536  005015     000      $CNTLU: .ASCIZ  /↑U/<15><12>       ;;CONTROL "U"
040077     136  006507  000012      $CNTLG: .ASCIZ  /↑G/<15><12>       ;;CONTROL "G"
040104  005015  053523  020122      $MSWR:  .ASCIZ  <15><12>/SWR = /
040112  020075     000
040115     040  047040  053505      $MNEW:  .ASCIZ  /  NEW = /
040122  036440  000040
                                                                   ;FROM THE TTY
```

```
                                        .SBTTL  READ AN OCTAL NUMBER FROM THE TTY

                                        ;;*************************************************************
                                        ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                                        ;*CHANGE IT TO BINARY.
                                        ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
                                        ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
                                        ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
                                        ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
                                        ;*CALL:
                                        ;*      RDOCT                           ;;READ AN OCTAL NUMBER
                                        ;*      RETURN HERE                     ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                        ;*                                      ;;HIGH ORDER BITS ARE IN $HIOCT

040126  011646                          $RDOCT: MOV     (SP),-(SP)              ;;PROVIDE SPACE FOR THE
040130  016666  000004  000002                  MOV     4(SP),2(SP)             ;;INPUT NUMBER
040136  010046                                  MOV     R0,-(SP)                ;;PUSH R0 ON STACK
040140  010146                                  MOV     R1,-(SP)                ;;PUSH R1 ON STACK
040142  010246                                  MOV     R2,-(SP)                ;;PUSH R2 ON STACK
040144  104410                          1$:     RDLIN                           ;;READ AN ASCIZ LINE
040146  012600                                  MOV     (SP)+,R0                ;;GET ADDRESS OF 1ST CHARACTER
040150  010037  040254                          MOV     R0,5$                   ;;AND SAVE IT
040154  005001                                  CLR     R1                      ;;CLEAR DATA WORD
040156  005002                                  CLR     R2
040160  112046                          2$:     MOVB    (R0)+,-(SP)             ;;PICKUP THIS CHARACTER
040162  001420                                  BEQ     3$                      ;;IF ZERO GET OUT
040164  122716  000060                          CMPB    #'0,(SP)                ;;MAKE SURE THIS CHARACTER
040170  003026                                  BGT     4$                      ;;IS AN OCTAL DIGIT
040172  122716  000067                          CMPB    #'7,(SP)
040176  002423                                  BLT     4$
040200  006301                                  ASL     R1                      ;;*2
040202  006102                                  ROL     R2
040204  006301                                  ASL     R1                      ;;*4
040206  006102                                  ROL     R2
040210  006301                                  ASL     R1                      ;;*8
040212  006102                                  ROL     R2
040214  042716  177770                          BIC     #↑C7,(SP)               ;;STRIP THE ASCII JUNK
040220  062601                                  ADD     (SP)+,R1                ;;ADD IN THIS DIGIT
040222  000756                                  BR      2$                      ;;LOOP
040224  005726                          3$:     TST     (SP)+                   ;;CLEAN TERMINATOR FROM STACK
040226  010166  000012                          MOV     R1,12(SP)               ;;SAVE THE RESULT
040232  010237  040264                          MOV     R2,$HIOCT
040236  012602                                  MOV     (SP)+,R2                ;;POP STACK INTO R2
040240  012601                                  MOV     (SP)+,R1                ;;POP STACK INTO R1
040242  012600                                  MOV     (SP)+,R0                ;;POP STACK INTO R0
040244  000002                                  RTI                             ;;RETURN
040246  005726                          4$:     TST     (SP)+                   ;;CLEAN PARTIAL FROM STACK
040250  105010                                  CLRB    (R0)                    ;;SET A TERMINATOR
040252  104400                                  TYPE                            ;;TYPE UP THRU THE BAD CHAR.
040254  000000                          5$:     .WORD   0
040256  104400  001222                          TYPE    ,$QUES                  ;;"?" "CR" & "LF"
040262  000730                                  BR      1$                      ;;TRY AGAIN
040264  000000                          $HIOCT: .WORD   0                       ;;HIGH ORDER BITS GO HERE
```

```
                                        .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 $ERRTYP 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

 040266                                 $ERROR:
 040266  104406                                 CKSWR                           ;;TEST FOR CHANGE IN SOFT-SWR

 040270                                 REGSAV:
 040270  012737  177777  004632                 MOV     #-1,@#ERFLG$            ;SET ERROR FLAG
 040276                                 REGSA1:

 040276  105237  001103                 7$:     INCB    $ERFLG                  ;;SET THE ERROR FLAG
 040302  001775                                 BEQ     7$                      ;;DON'T LET THE FLAG GO TO ZERO
 040304  013777  001102  140630                 MOV     $TSTNM,@DISPLAY         ;;DISPLAY TEST NUMBER AND ERROR FLAG
 040312  032777  002000  140620                 BIT     #BIT10,@SWR             ;;BELL ON ERROR?
 040320  001402                                 BEQ     1$                      ;;NO - SKIP
 040322  104400  001216                         TYPE    ,$BELL                  ;;RING BELL
 040326  005237  001112                 1$:     INC     $ERTTL                  ;;COUNT THE NUMBER OF ERRORS
 040332  011637  001116                         MOV     (SP),$ERRPC             ;;GET ADDRESS OF ERROR INSTRUCTION
 040336  162737  000002  001116                 SUB     #2,$ERRPC
 040344  117737  140546  001114                 MOVB    @$ERRPC,$ITEMB          ;;STRIP AND SAVE THE ERROR ITEM CODE
 040352  032777  020000  140560                 BIT     #BIT13,@SWR             ;;SKIP TYPEOUT IF SET
 040360  001004                                 BNE     20$                     ;;SKIP TYPEOUTS
 040362  004737  040436                         JSR     PC,$ERRTYP              ;;GO TO USER ERROR ROUTINE
 040366  104400  001223                         TYPE    ,$CRLF
 040372                                 20$:
 040372  005777  140542                 2$:     TST     @SWR                    ;;HALT ON ERROR
 040376  100002                                 BPL     3$                      ;;SKIP IF CONTINUE
 040400  000000                                 HALT                            ;;HALT ON ERROR!
 040402  104406                                 CKSWR                           ;;TEST FOR CHANGE IN SOFT-SWR
 040404  032777  001000  140526         3$:     BIT     #BIT09,@SWR             ;;LOOP ON ERROR SWITCH SET?
 040412  001402                                 BEQ     4$                      ;;BR IF NO
 040414  013716  001110                         MOV     $LPERR,(SP)             ;;FUDGE RETURN FOR LOOPING
 040420  005737  001214                 4$:     TST     $ESCAPE                 ;;CHECK FOR AN ESCAPE ADDRESS
 040424  001402                                 BEQ     5$                      ;;BR IF NONE
 040426  013716  001214                         MOV     $ESCAPE,(SP)            ;;FUDGE RETURN ADDRESS FOR ESCAPE
 040432                                 5$:
 040432  000002                                 RTI                             ;;RETURN
```

B06


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

                                          .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

                                          ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
                                          ;*ERROR IS TO BE REPORTED.  IT THEN OBTAINS, FROM THE "ERROR TABLE" ($ERRTB),
                                          ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.
                                          ;*IT IS A COPY OF THE $ERRTYP SUBROUTINE FROM SYSMAC.
                                          ;*WITH ONLY MINOR CHANGES
                                          ;*FIRST IF SWITCH 6 IS SET AND SWITCH 8 RESET THEN
                                          ;*ALL REGISTER CONTENTS WILL BE TYPED BEFOR REPORTING THE ERROR
                                          ;*SECOND IF THE CURRENT ERROR HAS THE SAME ITEM NUMBER
                                          ;*AS THE PREVIOUS ERROR THEN ONLY THE DATA WILL BE TYPED
                                          ;*AND NOT THE ERROR MESSAGE AND HEADER.

 040434  000000                           PRITEM: 0                               ;PREVIOUS ITEM NO. LOCATION

 040436  017746  140476                   $ERRTYP: MOV    @SWR,-(SP)              ;GET SWITCH SETTING
 040442  042716  177277                            BIC    #↑C500,(SP)             ;KEEP ONLY SWITCH 8 AND 6
 040446  022726  000100                            CMP    #SW06,(SP)+             ;IS 6 SET AND 8 RESET
 040452  001001                                    BNE    1$                      ;IF NOT BRANCH
 040454  000402                                    BR     2$                      ;BRANCH IF SW 6 IS SET AND 8 RESET
 040456  000137  041376                   1$:      JMP    @#TYPERR                ;JUMP IF SW 8 IS SET
                                                                                  ;OR IF SW 8 IS RESET AND SW 6 IS RESET
 040462                                   2$:

 040462  104400  040470                            TYPE   ,65$                    ;;TYPE ASCIZ STRING
 040466  000406                                    BR     64$                     ;;GET OVER THE ASCIZ
                                          ;;65$:    .ASCIZ  <15><12>/RHWC =  /
 040504                                   64$:
 040504  013746  002254                            MOV    @#WC,-(SP)              ;GET READY TO TYPE RHWC CONTENTS
 040510  104401                                    TYPOC


 040512  104400  040520                            TYPE   ,67$                    ;;TYPE ASCIZ STRING
 040516  000406                                    BR     66$                     ;;GET OVER THE ASCIZ
                                          ;;67$:    .ASCIZ  <15><12>/RHBA =  /
 040534                                   66$:
 040534  013746  002256                            MOV    @#BA,-(SP)              ;GET READY TO TYPE RHBA CONTENTS
 040540  104401                                    TYPOC


 040542  104400  040550                            TYPE   ,69$                    ;;TYPE ASCIZ STRING
 040546  000406                                    BR     68$                     ;;GET OVER THE ASCIZ
                                          ;;69$:    .ASCIZ  <15><12>/RHCS2 =  /
 040564                                   68$:
 040564  013746  002260                            MOV    @#CS2,-(SP)             ;GET READY TO TYPE RHCS2 CONTENTS
 040570  104401                                    TYPOC


 040572  104400  040600                            TYPE   ,71$                    ;;TYPE ASCIZ STRING
 040576  000406                                    BR     70$                     ;;GET OVER THE ASCIZ
                                          ;;71$:    .ASCIZ  <15><12>/RHCS1 =  /
```

```
040614                          70$:
040614  013746  002262                  MOV     @#CS1,-(SP)     ;GET READY TO TYPE RHCS1 CONTENTS
040620  104401                          TYPOC


040622  104400  040630                  TYPE    ,73$            ;;TYPE ASCIZ STRING
040626  000406                          BR      72$             ;;GET OVER THE ASCIZ
                                ;;73$:  .ASCIZ  <15><12>/RHDS1 = /
040644                          72$:
040644  013746  002304                  MOV     @#DS1,-(SP)     ;GET READY TO TYPE RHDS1 CONTENTS
040650  104401                          TYPOC


040652  104400  040660                  TYPE    ,75$            ;;TYPE ASCIZ STRING
040656  000406                          BR      74$             ;;GET OVER THE ASCIZ
                                ;;75$:  .ASCIZ  <15><12>/RHER1 = /
040674                          74$:
040674  013746  002264                  MOV     @#ER1,-(SP)     ;GET READY TO TYPE RHER1 CONTENTS
040700  104401                          TYPOC


040702  104400  040710                  TYPE    ,77$            ;;TYPE ASCIZ STRING
040706  000406                          BR      76$             ;;GET OVER THE ASCIZ
                                ;;77$:  .ASCIZ  <15><12>/RHER2 = /
040724                          76$:
040724  013746  002270                  MOV     @#ER2,-(SP)     ;GET READY TO TYPE RHER2 CONTENTS
040730  104401                          TYPOC


040732  104400  040740                  TYPE    ,79$            ;;TYPE ASCIZ STRING
040736  000406                          BR      78$             ;;GET OVER THE ASCIZ
                                ;;79$:  .ASCIZ  <15><12>/RHER3 = /
040754                          78$:
040754  013746  002276                  MOV     @#ER3,-(SP)     ;GET READY TO TYPE RHER3 CONTENTS
040760  104401                          TYPOC


040762  104400  040770                  TYPE    ,81$            ;;TYPE ASCIZ STRING
040766  000406                          BR      80$             ;;GET OVER THE ASCIZ
                                ;;81$:  .ASCIZ  <15><12>/RHDST = /
041004                          80$:
041004  013746  002266                  MOV     @#DST,-(SP)     ;GET READY TO TYPE RHDST CONTENTS
041010  104401                          TYPOC


041012  104400  041020                  TYPE    ,83$            ;;TYPE ASCIZ STRING
041016  000406                          BR      82$             ;;GET OVER THE ASCIZ
                                ;;83$:  .ASCIZ  <15><12>/RHCA = /
041034                          82$:
041034  013746  002274                  MOV     @#CA,-(SP)      ;GET READY TO TYPE RHCA CONTENTS
041040  104401                          TYPOC


041042  104400  041050                  TYPE    ,85$            ;;TYPE ASCIZ STRING
```

```
041046  000406                      BR      84$             ;;GET OVER THE ASCIZ
                            ;;85$:  .ASCIZ  <15><12>/RHAS = /
        041064              84$:
041064  013746  002300              MOV     @#AS,-(SP)      ;GET READY TO TYPE RHAS CONTENTS
041070  104401                      TYPOC


041072  104400  041100              TYPE    ,87$            ;;TYPE ASCIZ STRING
041076  000406                      BR      86$             ;;GET OVER THE ASCIZ
                            ;;87$:  .ASCIZ  <15><12>/RHOF = /
041114                      86$:
041114  013746  002272              MOV     @#OF,-(SP)      ;GET READY TO TYPE RHOF CONTENTS
041120  104401                      TYPOC


041122  104400  041130              TYPE    ,89$            ;;TYPE ASCIZ STRING
041126  000406                      BR      88$             ;;GET OVER THE ASCIZ
                            ;;89$:  .ASCIZ  <15><12>/RHMR = /
041144                      88$:
041144  013746  002302              MOV     @#MR,-(SP)      ;GET READY TO TYPE RHMR CONTENTS
041150  104401                      TYPOC


041152  104400  041160              TYPE    ,91$            ;;TYPE ASCIZ STRING
041156  000406                      BR      90$             ;;GET OVER THE ASCIZ
                            ;;91$:  .ASCIZ  <15><12>/RHLA = /
041174                      90$:
041174  013746  002320              MOV     @#LA,-(SP)      ;GET READY TO TYPE RHLA CONTENTS
041200  104401                      TYPOC


041202  104400  041210              TYPE    ,93$            ;;TYPE ASCIZ STRING
041206  000406                      BR      92$             ;;GET OVER THE ASCIZ
                            ;;93$:  .ASCIZ  <15><12>/RHCC = /
041224                      92$:
041224  013746  002316              MOV     @#CC,-(SP)      ;GET READY TO TYPE RHCC CONTENTS
041230  104401                      TYPOC


041232  104400  041240              TYPE    ,95$            ;;TYPE ASCIZ STRING
041236  000406                      BR      94$             ;;GET OVER THE ASCIZ
                            ;;95$:  .ASCIZ  <15><12>/RHEC1 = /
041254                      94$:
041254  013746  002312              MOV     @#EC1,-(SP)     ;GET READY TO TYPE RHEC1 CONTENTS
041260  104401                      TYPOC


041262  104400  041270              TYPE    ,97$            ;;TYPE ASCIZ STRING
041266  000406                      BR      96$             ;;GET OVER THE ASCIZ
                            ;;97$:  .ASCIZ  <15><12>/RHEC2 = /
041304                      96$:
041304  013746  002314              MOV     @#EC2,-(SP)     ;GET READY TO TYPE RHEC2 CONTENTS
041310  104401                      TYPOC
```

```
041312  104400  041320            TYPE    ,99$                ;;TYPE ASCIZ STRING
041316  000406                    BR      98$                 ;;GET OVER THE ASCIZ
                          ;;99$:  .ASCIZ  <15><12>/RHDT =  /
041334                    98$:
041334  013746  002306            MOV     @#DT,-(SP)          ;GET READY TO TYPE RHDT CONTENTS
041340  104401                    TYPOC

041342  104400  041350            TYPE    ,101$               ;;TYPE ASCIZ STRING
041346  000406                    BR      100$                ;;GET OVER THE ASCIZ
                          ;;101$: .ASCIZ  <15><12>/RHSN =  /
041364                    100$:
041364  013746  002310            MOV     @#SN,-(SP)          ;GET READY TO TYPE RHSN CONTENTS
041370  104401                    TYPOC

041372  005037  040434            CLR     @#PRITEM            ;CLEAR PREVIOUS ERROR ITEM

041376                    TYPERR:
041376  104400  001223            TYPE    ,$CRLF              ;"CARRIAGE RETURN" & "LINE FEED"
041402  010046                    MOV     R0,-(SP)            ;SAVE R0
041404  005000                    CLR     R0                  ;PICKUP THE ITEM INDEX
041406  153700  001114            BISB    @#$ITEMB,R0
041412  001004                    BNE     1$                  ;IF ITEM NUMBER IS ZERO, JUST
                                                              ;TYPE THE PC OF THE ERROR
041414  013746  001116            MOV     $ERRPC,-(SP)        ;SAVE $ERRPC FOR TYPEOUT
                                                              ;ERROR ADDRESS
041420  104401                    TYPOC                       ;GO TYPE--OCTAL ASCII(ALL DIGITS)
041422  000454                    BR      10$                 ;GET OUT
041424  005300            1$:     DEC     R0                  ;ADJUST THE INDEX SO THAT IT WILL
041426  006300                    ASL     R0                  ;       WORK FOR THE ERROR TABLE
041430  006300                    ASL     R0
041432  006300                    ASL     R0
041434  062700  001226            ADD     #$ERRTB,R0          ;FORM TABLE POINTER
041440  020037  040434            CMP     R0,@#PRITEM         ;WAS PREVIOUS ERROR SAME
041444  001002                    BNE     13$                 ;BRANCH IF NOT
041446  022020                    CMP     (R0)+,(R0)+         ;POP R0 OVER EM AND DH
041450  000420                    BR      5$
041452  010037  040434    13$:    MOV     R0,@#PRITEM         ;SAVE NEW ERROR ITEM
041456  012037  041466            MOV     (R0)+,2$            ;PICKUP "ERROR MESSAGE" POINTER
041462  001404                    BEQ     3$                  ;SKIP TYPEOUT IF NO POINTER
041464  104400                    TYPE                        ;TYPE THE "ERROR MESSAGE"
041466  000000            2$:     .WORD   0                   ;"ERROR MESSAGE" POINTER GOES HERE
041470  104400  001223            TYPE    ,$CRLF              ;"CARRIAGE RETURN" & "LINE FEED"
041474  012037  041504    3$:     MOV     (R0)+,4$            ;PICKUP "DATA HEADER" POINTER
041500  001404                    BEQ     5$                  ;SKIP TYPEOUT IF 0
041502  104400                    TYPE                        ;TYPE THE "DATA HEADER"
041504  000000            4$:     .WORD   0                   ;"DATA HEADER" POINTER GOES HERE
041506  104400  001223            TYPE    ,$CRLF              ;"CARRIAGE RETURN" & "LINE FEED"
041512  010146            5$:     MOV     R1,-(SP)            ;SAVE R1
041514  012001                    MOV     (R0)+,R1            ;PICKUP "DATA TABLE" POINTER
041516  001415                    BEQ     9$                  ;BR IF NO DATA TO BE TYPED
041520  012000                    MOV     (R0)+,R0            ;PICKUP "DATA FORMAT" POINTER
041522  105720            6$:     TSTB    (R0)+               ;"OCTAL" OR "DECIMAL"
```

```
041524  001003                          BNE     7$              ;BR IF DECIMAL
041526  013146                          MOV     @(R1)+,-(SP)    ;SAVE @(R1)+ FOR TYPEOUT
041530  104401                          TYPOC                   ;GO TYPE -OCTAL ASCII(ALL DIGITS)
041532  000402                          BR      8$
041534                          7$:
041534  013146                          MOV     @(R1)+,-(SP)    ;SAVE @(R1)+ FOR TYPEOUT
041536  104404                          TYPDS                   ;GO TYPE--DECIMAL ASCII WITH SIGN
041540  005711                  8$:     TST     (R1)            ;IS THERE ANOTHER NUMBER?
041542  001403                          BEQ     9$              ;BR IF NO
041544  104400  041560                  TYPE    ,11$            ;TYPE TWO(2) SPACES
041550  000764                          BR      6$              ;LOOP

041552  012601                  9$:     MOV     (SP)+,R1        ;RESTORE R1
041554  012600                  10$:    MOV     (SP)+,R0        ;"CARRIAGE RETURN" & "LINE FEED"
041556  000207                          RTS     PC              ;RETURN
041560  020040    000           11$:    .ASCIZ  /  /            ;TWO(2) SPACES
        041564                          .EVEN
```

G06


```

                                            .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

 041564  017646  000000                     $TYPOS: MOV     @(SP),-(SP)        ;;PICKUP THE MODE
 041570  116637  000001  042007                     MOVB    1(SP),$0FILL       ;;LOAD ZERO FILL SWITCH
 041576  112637  042011                             MOVB    (SP)+,$OMODE+1     ;;NUMBER OF DIGITS TO TYPE
 041602  062716  000002                             ADD     #2,(SP)            ;;ADJUST RETURN ADDRESS
 041606  000406                                     BR      $TYPON
 041610  112737  000001  042007             $TYPOC: MOVB    #1,$0FILL          ;;SET THE ZERO FILL SWITCH
 041616  112737  000006  042011                     MOVB    #6,$OMODE+1        ;;SET FOR SIX(6) DIGITS
 041624  112737  000005  042006             $TYPON: MOVB    #5,$0CNT           ;;SET THE ITERATION COUNT
 041632  010346                                     MOV     R3,-(SP)           ;;SAVE R3
 041634  010446                                     MOV     R4,-(SP)           ;;SAVE R4
 041636  010546                                     MOV     R5,-(SP)           ;;SAVE R5
 041640  113704  042011                             MOVB    $OMODE+1,R4        ;;GET THE NUMBER OF DIGITS TO TYPE
 041644  005404                                     NEG     R4
 041646  062704  000006                             ADD     #6,R4              ;;SUBTRACT IT FOR MAX. ALLOWED
 041652  110437  042010                             MOVB    R4,$OMODE          ;;SAVE IT FOR USE
 041656  113704  042007                             MOVB    $0FILL,R4          ;;GET THE ZERO FILL SWITCH
 041662  016605  000012                             MOV     12(SP),R5          ;;PICKUP THE INPUT NUMBER
 041666  005003                                     CLR     R3                 ;;CLEAR THE OUTPUT WORD
 041670  006105                             1$:     ROL     R5                 ;;ROTATE MSB INTO "C"
 041672  000404                                     BR      3$                 ;;GO DO MSB
 041674  006105                             2$:     ROL     R5                 ;;FORM THIS DIGIT
 041676  006105                                     ROL     R5
 041700  006105                                     ROL     R5
 041702  010503                                     MOV     R5,R3
 041704  006103                             3$:     ROL     R3                 ;;GET LSB OF THIS DIGIT
 041706  105337  042010                             DECB    $OMODE             ;;TYPE THIS DIGIT?
 041712  100016                                     BPL     7$                 ;;BR IF NO
 041714  042703  177770                             BIC     #177770,R3         ;;GET RID OF JUNK
```

```
041720  001002                          BNE     4$              ;;TEST FOR 0
041722  005704                          TST     R4              ;;SUPPRESS THIS 0?
041724  001403                          BEQ     5$              ;;BR IF YES
041726  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
041730  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
041734  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
041740  110337  042004                  MOVB    R3,8$           ;;SAVE FOR TYPING
041744  104400  042004                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
041750  105337  042006          7$:     DECB    $OCNT           ;;COUNT BY 1
041754  003347                          BGT     2$              ;;BR IF MORE TO DO
041756  002402                          BLT     6$              ;;BR IF DONE
041760  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
041762  000744                          BR      2$              ;;GO DO THE LAST DIGIT
041764  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
041766  012604                          MOV     (SP)+,R4        ;;RESTORE R4
041770  012603                          MOV     (SP)+,R3        ;;RESTORE R3
041772  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
042000  012616                          MOV     (SP)+,(SP)
042002  000002                          RTI                     ;;RETURN
042004     000                  8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
042005     000                          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
042006     000                  $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
042007     000                  $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
042010  000000                  $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
```

```
                                .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.

042012  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
042014  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
042020  005740                          TST     -(R0)           ;;BACKUP BY 2
042022  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
042024  006300                          ASL     R0              ;;POSITION FOR INDEXING
042026  016000  042034                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
042032  000200                          RTS     R0              ;;GO TO ROUTINE

                                .SBTTL  TRAP TABLE

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

                                ;       ROUTINE
                                ;       -------
042034                          $TRPAD:
042034  036566                          $TYPE   ;;CALL=TYPE     TRAP+0(104400)  TTY TYPEOUT ROUTINE
042036  041610                          $TYPOC  ;;CALL=TYPOC    TRAP+1(104401)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
042040  041564                          $TYPOS  ;;CALL=TYPOS    TRAP+2(104402)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
042042  041624                          $TYPON  ;;CALL=TYPON    TRAP+3(104403)  TYPE OCTAL NUMBER (AS PER LAST CALL)
042044  036342                          $TYPDS  ;;CALL=TYPDS    TRAP+4(104404)  TYPE DECIMAL NUMBER (WITH SIGN)

042046  037404                          $GTSWR  ;;CALL=GTSWR    TRAP+5(104405)  GET SOFT-SWR SETTING

042050  037314                          $CKSWR  ;;CALL=CKSWR    TRAP+6(104406)  TEST FOR CHANGE IN SOFT-SWR
042052  037656                          $RDCHR  ;;CALL=RDCHR    TRAP+7(104407)  TTY TYPEIN CHARACTER ROUTINE
042054  037746                          $RDLIN  ;;CALL=RDLIN    TRAP+10(104410) TTY TYPEIN STRING ROUTINE
042056  040126                          $RDOCT  ;;CALL=RDOCT    TRAP+11(104411) READ AN OCTAL NUMBER FROM TTY
042060  033506                          WAIT.T  ;;CALL=WAT      TRAP+12(104412) DONT ADD ABOVE THIS TRAP
```

```
                                          .SBTTL  POWER DOWN AND UP ROUTINES

                                          ;;*****************************************************************
                                          ;POWER DOWN ROUTINE
042062  012737  042226  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC  ;;SET FOR FAST UP
042070  012737  000340  000026          MOV     #340,@#PWRVEC+2   ;;PRIO:7
042076  010046                          MOV     R0,-(SP)          ;;PUSH R0 ON STACK
042100  010146                          MOV     R1,-(SP)          ;;PUSH R1 ON STACK
042102  010246                          MOV     R2,-(SP)          ;;PUSH R2 ON STACK
042104  010346                          MOV     R3,-(SP)          ;;PUSH R3 ON STACK
042106  010446                          MOV     R4,-(SP)          ;;PUSH R4 ON STACK
042110  010546                          MOV     R5,-(SP)          ;;PUSH R5 ON STACK
042112  017746  137022                  MOV     @SWR,-(SP)        ;;PUSH @SWR ON STACK
042116  010637  042232                  MOV     SP,$SAVR6         ;;SAVE SP
042122  012737  042134  000024          MOV     #$PWRUP,@#PWRVEC  ;;SET UP VECTOR
042130  000000                          HALT
042132  000776                          BR      .-2               ;;HANG UP

                                          ;;*****************************************************************
                                          ;POWER UP ROUTINE
042134  012737  042226  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC  ;;SET FOR FAST DOWN
042142  013706  042232                  MOV     $SAVR6,SP         ;;GET SP
042146  005037  042232                  CLR     $SAVR6            ;;WAIT LOOP FOR THE TTY
042152  005237  042232          1$:     INC     $SAVR6            ;;WAIT FOR THE INC
042156  001375                          BNE     1$                ;;OF  WORD
042160  012677  136754                  MOV     (SP)+,@SWR        ;;POP STACK INTO @SWR
042164  012605                          MOV     (SP)+,R5          ;;POP STACK INTO R5
042166  012604                          MOV     (SP)+,R4          ;;POP STACK INTO R4
042170  012603                          MOV     (SP)+,R3          ;;POP STACK INTO R3
042172  012602                          MOV     (SP)+,R2          ;;POP STACK INTO R2
042174  012601                          MOV     (SP)+,R1          ;;POP STACK INTO R1
042176  012600                          MOV     (SP)+,R0          ;;POP STACK INTO R0
042200  012737  042062  000024          MOV     #$PWRDN,@#PWRVEC  ;;SET UP THE POWER DOWN VECTOR
042206  012737  000340  000026          MOV     #340,@#PWRVEC+2   ;;PRIO:7
042214  104400                          TYPE                      ;REPORT THE POWER FAILURE
042216  042234                  $PWRMG: .WORD   $POWER            ;;POWER FAIL MESSAGE POINTER
042220  012716                          MOV     (PC)+,(SP)        ;;RESTART AT BEGIN
042222  004710                  $PWRAD: .WORD   BEGIN             ;;RESTART ADDRESS
042224  000002                          RTI
042226  000000                  $ILLUP: HALT                      ;;THE POWER UP SEQUENCE WAS STARTED
042230  000776                          BR      .-2               ;; BEFORE THE POWER DOWN WAS COMPLETE
042232  000000                  $SAVR6: 0                         ;;PUT THE SP HERE
042234  005015  047520  042527  $POWER: .ASCIZ  <15><12>"POWER"
042242  000122
                                        .EVEN
```

```
                                        ;*****************************************************************
                                        ;
                                        ;ERROR AND MESSAGE TABLE CONDIMENTS
                                        ;
                                        ;*****************************************************************




042244  050122  032060  042040  EM1:    .ASCIZ  /RP04 DID NOT INTERRUPT/
042252  042111  047040  052117
042260  044440  052116  051105
042266  052522  052120     000
042273     111  052116  051105  EM2:    .ASCIZ  /INTERRUPT ENABLE BIT DOWN BUT EXPECTED BIT DID NOT SET/
042300  052522  052120  042440
042306  040516  046102  020105
042314  044502  020124  047504
042322  047127  041040  052125
042330  042440  050130  041505
042336  042524  020104  044502
042344  020124  044504  020104
042352  047516  020124  042523
042360  000124
042362  050122  032060  042040  EM3:    .ASCIZ  /RP04 DID NOT INTERRUPT WHEN EXPECTED BIT DID SET/
042370  042111  047040  052117
042376  044440  052116  051105
042404  052522  052120  053440
042412  042510  020116  054105
042420  042520  052103  042105
042426  041040  052111  042040
042434  042111  051440  052105
042442     000
042443     105  050130  041505  EM4:    .ASCIZ  /EXPECTED BIT DID SET BUT TIME IS IN ERROR - TIME IN 10 MICROSEC. DECIMA
042450  042524  020104  044502
042456  020124  044504  020104
042464  042523  020124  052502
042472  020124  044524  042515
042500  044440  020123  047111
042506  042440  051122  051117
042514  026440  052040  046511
042522  020105  047111  030440
042530  020060  044515  051103
042536  051517  041505  020056
042544  042504  044503  040515
042552  000114
042554  044122  051501  042040  EM5:    .ASCIZ  /RHAS DOES NOT CLEAR BY MOVING IN ALL ONES/
042562  042517  020123  047516
042570  020124  046103  040505
042576  020122  054502  046440
042604  053117  047111  020107
042612  047111  040440  046114
042620  047440  042516  000123
042626  047514  042101  047111  EM6:    .ASCIZ  /LOADING RHER1 FOR ALL UNITS DID NOT SET ANY RHAS BITS/
```

```
10755  042634  020107  044122  051105
10756  042642  020061  047506  020122
10757  042650  046101  020114  047125
10758  042656  052111  020123  044504
10759  042664  020104  047516  020124
10760  042672  042523  020124  047101
10761  042700  020131  044122  051501
10762  042706  041040  052111  000123
10763  042714  050123  041505  043111  EM7:    .ASCIZ  /SPECIFIED REGISTER NON EXISTANT, SO ABORT PROGRAM/
10764  042722  042511  020104  042522
10765  042730  044507  052123  051105
10766  042736  047040  047117  042440
10767  042744  044530  052123  047101
10768  042752  026124  051440  020117
10769  042760  041101  051117  020124
10770  042766  051120  043517  040522
10771  042774  000115
10772  042776  052123  050117  042520  EM10:   .ASCIZ  /STOPPED DRIVE HAS MOL BIT IN RHDS1 SET/
10773  043004  020104  051104  053111
10774  043012  020105  040510  020123
10775  043020  047515  020114  044502
10776  043026  020124  047111  051040
10777  043034  042110  030523  051440
10778  043042  052105     000
10779
10780  043045     127  052111  020110  EM11:   .ASCIZ  /WITH SPINDLE POWERED DOWN RHCS2 SHOULD ONLY HAVE UNIT NO: AND IR SET/
10781  043052  050123  047111  046104
10782  043060  020105  047520  042527
10783  043066  042522  020104  047504
10784  043074  047127  051040  041510
10785  043102  031123  051440  047510
10786  043110  046125  020104  047117
10787  043116  054514  044040  053101
10788  043124  020105  047125  052111
10789  043132  047040  035117  040440
10790  043140  042116  044440  020122
10791  043146  042523  000124
10792  043152  043101  042524  020122  EM12:   .ASCIZ  /AFTER SPINDLE POWERED UP, NO PACK ACKN. RHDS1 SHOULD HAVE MOL=1, VV=0/
10793  043160  050123  047111  046104
10794  043166  020105  047520  042527
10795  043174  042522  020104  050125
10796  043202  020054  047516  050040
10797  043210  041501  020113  041501
10798  043216  047113  020056  044122
10799  043224  051504  020061  044123
10800  043232  052517  042114  044040
10801  043240  053101  020105  047515
10802  043246  036514  026061  053040
10803  043254  036526  000060
10804  043260  044527  044124  051440  EM13:   .ASCIZ  /WITH SPINDLE POWERED, NO INTIALIZE, RHCS1 SHOULD HAVE GO=0, DVA=1, RDY=
10805  043266  044520  042116  042514
10806  043274  050040  053517  051105
10807  043302  042105  020054  047516
10808  043310  044440  052116  040511
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10809  043316  044514  042532  020054
10810  043324  044122  051503  020061
10811  043332  044123  052517  042114
10812  043340  044040  053101  020105
10813  043346  047507  030075  020054
10814  043354  053104  036501  026061
10815  043362  051040  054504  030475
10816  043370  020054  042511  030075
10817  043376     000
10818  043377     101  052106  051105  EM14:   .ASCIZ  /AFTER SPINDLE POWERED UP RHCC SHOULD BE=0/
10819  043404  051440  044520  042116
10820  043412  042514  050040  053517
10821  043420  051105  042105  052440
10822  043426  020120  044122  041503
10823  043434  051440  047510  046125
10824  043442  020104  042502  030075
10825  043450     000
10826  043451     120  041501  020113  EM15:   .ASCII  /PACK ACKNOWLEDGE COMMAND CAUSED AN ERROR/<15><12>
10827  043456  041501  047113  053517
10828  043464  042514  043504  020105
10829  043472  047503  046515  047101
10830  043500  020104  040503  051525
10831  043506  042105  040440  020116
10832  043514  051105  047522  006522
10833  043522     012
10834  043523     107  047517  020104          .ASCIZ  /GOOD DATA IS BEFORE COMMAND, REC DATA IS AFTER COMMAND/
10835  043530  040504  040524  044440
10836  043536  020123  042502  047506
10837  043544  042522  041440  046517
10838  043552  040515  042116  020054
10839  043560  042522  020103  040504
10840  043566  040524  044440  020123
10841  043574  043101  042524  020122
10842  043602  047503  046515  047101
10843  043610  000104
10844  043612  047516  047455  020120  EM16:   .ASCII  /NO-OP COMMAND CAUSED AN ERROR/<15><12>
10845  043620  047503  046515  047101
10846  043626  020104  040503  051525
10847  043634  042105  040440  020116
10848  043642  051105  047522  006522
10849  043650     012
10850  043651     107  047517  020104          .ASCIZ  /GOOD DATA IS BEFORE COMMAND, REC DATA IS AFTER COMMAND/
10851  043656  040504  040524  044440
10852  043664  020123  042502  047506
10853  043672  042522  041440  046517
10854  043700  040515  042116  020054
10855  043706  042522  020103  040504
10856  043714  040524  044440  020123
10857  043722  043101  042524  020122
10858  043730  047503  046515  047101
10859  043736  000104
10860  043740  051104  053111  020105  EM17:   .ASCII  /DRIVE CLEAR COMMAND CAUSED AN ERROR/<15><12>
10861  043746  046103  040505  020122
10862  043754  047503  046515  047101
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043762  020104  040503  051525
043770  042105  040440  020116
043776  051105  047522  006522
044004     012
044005     107  047517  020104           .ASCIZ  /GOOD DATA GIVES SHOULD BE, REC DATA GIVES AFTER COMMAND/
044012  040504  040524  043440
044020  053111  051505  051440
044026  047510  046125  020104
044034  042502  020054  042522
044042  020103  040504  040524
044050  043440  053111  051505
044056  040440  052106  051105
044064  041440  046517  040515
044072  042116     000
044075     122  040505  026504  EM20:    .ASCII  /READ-IN COMMAND CAUSED AN ERROR/<15><12>
044102  047111  041440  046517
044110  040515  042116  041440
044116  052501  042523  020104
044124  047101  042440  051122
044132  051117  005015
044136  047507  042117  042040           .ASCIZ  /GOOD DATA GIVES SHOULD BE, REC DATA GIVES REG. CONTENTS AFTER COMMAND/
044144  052101  020101  044507
044152  042526  020123  044123
044160  052517  042114  041040
044166  026105  051040  041505
044174  042040  052101  020101
044202  044507  042526  020123
044210  042522  027107  041440
044216  047117  042524  052116
044224  020123  043101  042524
044232  020122  047503  046515
044240  047101  000104

044244  044122  051503  020061  EM21:    .ASCIZ  /RHCS1 CONTENTS DURING COMMAND WAS IN ERROR/
044252  047503  052116  047105
044260  051524  042040  051125
044266  047111  020107  047503
044274  046515  047101  020104
044302  040527  020123  047111
044310  042440  051122  051117
044316     000
044317     122  042110  030523  EM22:    .ASCIZ  /RHDS1 CONTENTS DURING COMMAND WAS IN ERROR/
044324  041440  047117  042524
044332  052116  020123  052504
044340  044522  043516  041440
044346  046517  040515  042116
044354  053440  051501  044440
044362  020116  051105  047522
044370  000122
044372  047125  047514  042101  EM23:    .ASCII  /UNLOAD COMMAND CAUSED AN ERROR/<15><12>
044400  041440  046517  040515
044406  042116  041440  052501
044414  042523  020104  047101
044422  042440  051122  051117
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044430  005015
044432  047507  042117  042040            .ASCIZ  /GOOD DATA GIVES SHOULD BE, REC DATA GIVES REGISTER CONT. AFTER COMMAND/
044440  052101  020101  044507
044446  042526  020123  044123
044454  052517  042114  041040
044462  026105  051040  041505
044470  042040  052101  020101
044476  044507  042526  020123
044504  042522  044507  052123
044512  051105  041440  047117
044520  027124  040440  052106
044526  051105  041440  046517
044534  040515  042116     000
044541     117  043106  042523  EM24:  .ASCII  /OFFSET COMMAND CAUSED AN ERROR/<15><12>
044546  020124  047503  046515
044554  047101  020104  040503
044562  051525  042105  040440
044570  020116  051105  047522
044576  006522     012
044601     107  047517  020104            .ASCIZ  /GOOD DATA GIVES SHOULD BE, REC DATA GIVES REG. CONT. AFTER COMMAND/
044606  040504  040524  043440
044614  053111  051505  051440
044622  047510  046125  020104
044630  042502  020054  042522
044636  020103  040504  040524
044644  043440  053111  051505
044652  051040  043505  020056
044660  047503  052116  020056
044666  043101  042524  020122
044674  047503  046515  047101
044702  000104
044704  042522  052524  047122  EM25:  .ASCII  /RETURN TO CENTER LINE COMMAND CAUSED AN ERROR/<15><12>
044712  052040  020117  042503
044720  052116  051105  046040
044726  047111  020105  047503
044734  046515  047101  020104
044742  040503  051525  042105
044750  040440  020116  051105
044756  047522  006522     012
044763     107  047517  020104            .ASCIZ  /GOOD DATA GIVES SHOULD BE, REC DATA GIVES REG. CONT. AFTER COMMAND/
044770  040504  040524  043440
044776  053111  051505  051440
045004  047510  046125  020104
045012  042502  020054  042522
045020  020103  040504  040524
045026  043440  053111  051505
045034  051040  043505  020056
045042  047503  052116  020056
045050  043101  042524  020122
045056  047503  046515  047101
045064  000104
045066  030065  020060  043117  EM26:  .ASCIZ  /500 OFFSET COMMANDS ONE AFTER THE OTHER CAUSED AN ERROR/
045074  051506  052105  041440
045102  046517  040515  042116
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045110  020123  047117  020105
045116  043101  042524  020122
045124  044124  020105  052117
045132  042510  020122  040503
045140  051525  042105  040440
045146  020116  051105  047522
045154  000122
045156  051127  052111  020105   EM27:   .ASCII  /WRITE HEADER AND DATA CAUSED IMPROPER REGISTER CHANGE/<15><12>
045164  042510  042101  051105
045172  040440  042116  042040
045200  052101  020101  040503
045206  051525  042105  044440
045214  050115  047522  042520
045222  020122  042522  044507
045230  052123  051105  041440
045236  040510  043516  006505
045244     012
045245     107  047517  020104           .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
045252  040504  040524  043440
045260  053111  051505  053440
045266  040510  020124  044123
045274  052517  042114  041040
045302  020105  044124  051105
045310  006505     012
045313     122  041505  044505           .ASCIZ  /RECEIVED DATA GIVES WHAT WAS THERE AFTER COMMAND/
045320  042526  020104  040504
045326  040524  043440  053111
045334  051505  053440  040510
045342  020124  040527  020123
045350  044124  051105  020105
045356  043101  042524  020122
045364  047503  046515  047101
045372  000104
045374  051127  052111  020105   EM30:   .ASCIZ  /WRITE HEADER AND DATA CHANGED WRITE FROM BUFFER/
045402  042510  042101  051105
045410  040440  042116  042040
045416  052101  020101  044103
045424  047101  042507  020104
045432  051127  052111  020105
045440  051106  046517  041040
045446  043125  042506  000122

045454  042522  042101  044040   EM31:   .ASCII  /READ HEADER AND DATA CAUSED IMPROPER REGISTER CHANGE/<15><12>
045462  040505  042504  020122
045470  047101  020104  040504
045476  040524  041440  052501
045504  042523  020104  046511
045512  051120  050117  051105
045520  051040  043505  051511
045526  042524  020122  044103
045534  047101  042507  005015
045542  047507  042117  042040           .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
045550  052101  020101  044507
045556  042526  020123  044127
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045564  052101  051440  047510
045572  046125  020104  042502
045600  052040  042510  042522
045606  005015
045610  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES WHAT WAS THERE AFTER COMMAND/
045616  042105  042040  052101
045624  020101  044507  042526
045632  020123  044127  052101
045640  053440  051501  052040
045646  042510  042522  040440
045654  052106  051105  041440
045662  046517  040515  042116
045670     000
045671     127  044522  042524  EM32:   .ASCIZ  /WRITE HEADER DATA FOLLOWED BY READ HEADER AND DATA CAUSED DATA ERROR/
045676  044040  040505  042504
045704  020122  040504  040524
045712  043040  046117  047514
045720  042527  020104  054502
045726  051040  040505  020104
045734  042510  042101  051105
045742  040440  042116  042040
045750  052101  020101  040503
045756  051525  042105  042040
045764  052101  020101  051105
045772  047522  000122
045776  042522  042101  042040  EM33:   .ASCII  /READ DATA CAUSED IMPROPER REGISTER CHANGE/<15><12>
046004  052101  020101  040503
046012  051525  042105  044440
046020  050116  047522  042520
046026  020122  042522  044507
046034  052123  051105  041440
046042  040510  043516  006505
046050     012
046051     107  047517  020104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
046056  040504  040524  043440
046064  053111  051505  053440
046072  040510  020124  044123
046100  052517  042114  041040
046106  020105  044124  051105
046114  006505     012
046117     122  041505  044505          .ASCIZ  /RECEIVED DATA GIVES WHAT WAS THERE AFTER COMMAND/
046124  042526  020104  040504
046132  040524  043440  053111
046140  051505  053440  040510
046146  020124  040527  020123
046154  044124  051105  020105
046162  043101  042524  020122
046170  047503  046515  047101
046176  000104
046200  042522  042101  042040  EM34:   .ASCIZ  /READ DATA INCORRECT/
046206  052101  020101  047111
046214  047503  051122  041505
046222  000124
046224  051127  052111  020105  EM35:   .ASCII  /WRITE DATA COMMAND CAUSED IMPROPER REGISTER CHANGE/<15><12>
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046232  040504  040524  041440
046240  046517  040515  042116
046246  041440  052501  042523
046254  020104  046511  051120
046262  050117  051105  051040
046270  043505  051511  042524
046276  020122  044103  047101
046304  042507  005015
046310  047507  042117  042040           .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
046316  052101  020101  044507
046324  042526  020123  044127
046332  052101  051440  047510
046340  046125  020104  042502
046346  052040  042510  042522
046354  005015
046356  042522  042503  053111           .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER COMMAND/
046364  042105  042040  052101
046372  020101  044507  042526
046400  020123  042522  044507
046406  052123  051105  041440
046414  047117  042524  052116
046422  020123  043101  042524
046430  020122  047503  046515
046436  047101  000104
046442  051127  052111  020105   EM36:   .ASCIZ  /WRITE DATA COMMAND CHANGED WRITE FROM BUFFER/
046450  040504  040524  041440
046456  046517  040515  042116
046464  041440  040510  043516
046472  042105  053440  044522
046500  042524  043040  047522
046506  020115  052502  043106
046514  051105     000
046517     123  042505  020113   EM37:   .ASCII  /SEEK COMMAND CAUSED IMPROPER REGISTER CHANGE/<15><12>
046524  047503  046515  047101
046532  020104  040503  051525
046540  042105  044440  050115
046546  047522  042520  020122
046554  042522  044507  052123
046562  051105  041440  040510
046570  043516  006505     012
046575     107  047517  020104           .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
046602  040504  040524  043440
046610  053111  051505  053440
046616  040510  020124  044123
046624  052517  042114  041040
046632  020105  044124  051105
046640  006505     012
046643     122  041505  044505           .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER SEEK COMMAND/
046650  042526  020104  040504
046656  040524  043440  053111
046664  051505  051040  043505
046672  051511  042524  020122
046700  047503  052116  047105
046706  051524  040440  052106
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046714  051105  051440  042505
046722  020113  047503  046515
046730  047101  000104
046734  051127  052111  020105  EM40:   .ASCII  /WRITE CHECK CAUSED IMPROPER REGISTER CHANGE/<15><12>
046742  044103  041505  020113
046750  040503  051525  042105
046756  044440  050115  047522
046764  042520  020122  042522
046772  044507  052123  051105
047000  041440  040510  043516
047006  006505     012
047011     107  047517  020104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
047016  040504  040524  043440
047024  053111  051505  053440
047032  040510  020124  044123
047040  052517  042114  041040
047046  020105  044124  051105
047054  006505     012
047057     122  041505  044505          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER COMMAND/
047064  042526  020104  040504
047072  040524  043440  053111
047100  051505  051040  043505
047106  051511  042524  020122
047114  047503  052116  047105
047122  051524  040440  052106
047130  051105  041440  046517
047136  040515  042116     000

047143     114  041517  044513  EM41:   .ASCII  /LOCKING OUT WRITE BY WRITE LOCK BUTTON CAUSED IMPROPER REGISTER CHANGE/
047150  043516  047440  052125
047156  053440  044522  042524
047164  041040  020131  051127
047172  052111  020105  047514
047200  045503  041040  052125
047206  047524  020116  040503
047214  051525  042105  044440
047222  050115  047522  042520
047230  020122  042522  044507
047236  052123  051105  041440
047244  040510  043516  006505
047252     012
047253     107  047517  020104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
047260  040504  040524  043440
047266  053111  051505  053440
047274  040510  020124  044123
047302  052517  042114  041040
047310  020105  044124  051105
047316  006505     012
047321     122  041505  044505          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER WRITES WERE LOCKED OUT/
047326  042526  020104  040504
047334  040524  043440  053111
047342  051505  051040  043505
047350  051511  042524  020122
047356  047503  052116  047105
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047364  051524  040440  052106
047372  051105  053440  044522
047400  042524  020123  042527
047406  042522  046040  041517
047414  042513  020104  052517
047422  000124
047424  052101  042524  050115   EM42:   .ASCII  /ATTEMPTING TO WRITE WITH WRITES LOCKED OUT CAUSED IMPROPER REGISTER CHA
047432  044524  043516  052040
047440  020117  051127  052111
047446  020105  044527  044124
047454  053440  044522  042524
047462  020123  047514  045503
047470  042105  047440  052125
047476  041440  052501  042523
047504  020104  046511  051120
047512  050117  051105  051040
047520  043505  051511  042524
047526  020122  044103  047101
047534  042507  005015
047540  047507  042117  042040           .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
047546  052101  020101  044507
047554  042526  020123  044127
047562  052101  051440  047510
047570  046125  020104  042502
047576  052040  042510  042522
047604  005015
047606  042522  042503  053111           .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER ATTEMPTED WRITE/
047614  042105  042040  052101
047622  020101  044507  042526
047630  020123  042522  044507
047636  052123  051105  041440
047644  047117  042524  052116
047652  020123  043101  042524
047660  020122  052101  042524
047666  050115  042524  020104
047674  051127  052111  000105
047702  051127  052111  047111   EM43:   .ASCII  /WRITING WITH WRITES LOCKED OUT CHANGED DISK DATA/<15><12>
047710  020107  044527  044124
047716  053440  044522  042524
047724  020123  047514  045503
047732  042105  047440  052125
047740  041440  040510  043516
047746  042105  042040  051511
047754  020113  040504  040524
047762  005015
047764  047507  042117  042040           .ASCII  /GOOD DATA GIVES WHAT WAS ON DISK BEFORE WRITE WITH WRITE LOCKED OUT/<15
047772  052101  020101  044507
050000  042526  020123  044127
050006  052101  053440  051501
050014  047440  020116  044504
050022  045523  041040  043105
050030  051117  020105  051127
050036  052111  020105  044527
050044  044124  053440  044522
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050052  042524  046040  041517
050060  042513  020104  052517
050066  006524     012
050071     127  051501  040440          .ASCII  /WAS ATTEMPTED/<15><12>
050076  052124  046505  052120
050104  042105  005015
050110  042522  042503  053111          .ASCII  /RECEIVED DATA GIVES WHAT WAS READ BACK AFTER WRITE/<15><12>
050116  042105  042040  052101
050124  020101  044507  042526
050132  020123  044127  052101
050140  053440  051501  051040
050146  040505  020104  040502
050154  045503  040440  052106
050162  051105  053440  044522
050170  042524  005015
050174  044527  044124  053440          .ASCIZ  /WITH WRITE LOCKED OUT WAS ATTEMPTED/
050202  044522  042524  046040
050210  041517  042513  020104
050216  052517  020124  040527
050224  020123  052101  042524
050232  050115  042524  000104
050240  047105  041101  044514  EM44:  .ASCII  /ENABLING WRITES BY WRITE LOCK BUTTON CAUSED IMPROPER REGISTER CHANGE/<1
050246  043516  053440  044522
050254  042524  020123  054502
050262  053440  044522  042524
050270  046040  041517  020113
050276  052502  052124  047117
050304  041440  052501  042523
050312  020104  046511  051120
050320  050117  051105  051040
050326  043505  051511  042524
050334  020122  044103  047101
050342  042507  005015
050346  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
050354  052101  020101  044507
050362  042526  020123  044127
050370  052101  051440  047510
050376  046125  020104  042502
050404  052040  042510  042522
050412  005015
050414  042522  042503  053111          .ASCII  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER WRITE LOCK BUTTON/<15><12>
050422  042105  042040  052101
050430  020101  044507  042526
050436  020123  042522  044507
050444  052123  051105  041440
050452  047117  042524  052116
050460  020123  043101  042524
050466  020122  051127  052111
050474  020105  047514  045503
050502  041040  052125  047524
050510  006516     012
050513     105  040516  046102          .ASCIZ  /ENABLED WRITES/
050520  042105  053440  044522
050526  042524  000123
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11295 050532 051124 047101 043123 EM45:  .ASCII  /TRANSFERRING ON LAST BLOCK - CYLINDER 410. - 814., SECTOR 21, /<15><12>
11296 050540 051105 044522 043516
11297 050546 047440 020116 040514
11298 050554 052123 041040 047514
11299 050562 045503 026440 041440
11300 050570 046131 047111 042504
11301 050576 020122 030464 027060
11302 050604 026440 034040 032061
11303 050612 026056 051440 041505
11304 050620 047524 020122 030462
11305 050626 020054 005015
11306 050632 051124 041501 020113         .ASCII  /TRACK 18. CAUSED IMPROPER REGISTER CHANGE/<15><12>
11307 050640 034061 020054 040503
11308 050646 051525 042105 044440
11309 050654 050115 047522 042520
11310 050662 020122 042522 044507
11311 050670 052123 051105 041440
11312 050676 040510 043516 006505
11313 050704    012
11314 050705    107 047517 020104         .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
11315 050712 040504 040524 043440
11316 050720 053111 051505 053440
11317 050726 040510 020124 044123
11318 050734 052517 042114 041040
11319 050742 020105 044124 051105
11320 050750 006505    012
11321 050753    122 041505 044505         .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER TRANSFER/
11322 050760 042526 020104 040504
11323 050766 040524 043440 053111
11324 050774 051505 051040 043505
11325 051002 051511 042524 020122
11326 051010 047503 052116 047105
11327 051016 051524 040440 052106
11328 051024 051105 052040 040522
11329 051032 051516 042506 000122
11330 051040 040504 040524 051040 EM46:  .ASCII  /DATA READ FROM LAST BLOCK - CYLINDER 410. - 814., SECTOR 21,/<15><12>
11331 051046 040505 020104 051106
11332 051054 046517 046040 051501
11333 051062 020124 046102 041517
11334 051070 020113 020055 054503
11335 051076 044514 042116 051105
11336 051104 032040 030061 020056
11337 051112 020055 030470 027064
11338 051120 020054 042523 052103
11339 051126 051117 031040 026061
11340 051134 005015
11341 051136 051124 041501 020113         .ASCIZ  /TRACK 18. IS IN ERROR/
11342 051144 034061 020054 051511
11343 051152 044440 020116 051105
11344 051160 047522 000122
11345 051164 051124 047101 043123 EM47:  .ASCII  /TRANSFERRING DATA FROM NONEXISTANT SECTOR CAUSED IMPROPER /<15><12>
11346 051172 051105 044522 043516
11347 051200 042040 052101 020101
11348 051206 051106 046517 047040
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051214  047117  054105  051511
051222  040524  052116  051440
051230  041505  047524  020122
051236  040503  051525  042105
051244  044440  050115  047522
051252  042520  020122  005015
051260  042522  044507  052123                 .ASCII  /REGISTER CHANGE, GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
051266  051105  041440  040510
051274  043516  026105  043440
051302  047517  020104  040504
051310  040524  043440  053111
051316  051505  053440  040510
051324  020124  044123  052517
051332  042114  041040  020105
051340  044124  051105  006505
051346     012
051347     122  041505  044505                 .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER ATTEMPTED TRANSFER/
051354  042526  020104  040504
051362  040524  043440  053111
051370  051505  051040  043505
051376  051511  042524  020122
051404  047503  052116  047105
051412  051524  040440  052106
051420  051105  040440  052124
051426  046505  052120  042105
051434  052040  040522  051516
051442  042506  000122
051446  051124  047101  043123  EM50:    .ASCII  /TRANSFERRING FROM NONEXISTANT SECTOR CAUSED DATA ERROR/<15><12>
051454  051105  044522  043516
051462  043040  047522  020115
051470  047516  042516  044530
051476  052123  047101  020124
051504  042523  052103  051117
051512  041440  052501  042523
051520  020104  040504  040524
051526  042440  051122  051117
051534  005015
051536  047507  042117  042040                 .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
051544  052101  020101  044507
051552  042526  020123  044127
051560  052101  051440  047510
051566  046125  020104  042502
051574  052040  042510  042522
051602  005015
051604  040502  020104  040504                 .ASCIZ  /BAD DATA GIVES WHAT WAS IN BUFFER AFTER TRANSFER/
051612  040524  043440  053111
051620  051505  053440  040510
051626  020124  040527  020123
051634  047111  041040  043125
051642  042506  020122  043101
051650  042524  020122  051124
051656  047101  043123  051105
051664     000
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11403  051665     107  053111  047111  EM51:   .ASCII  /GIVING ILLEGAL FUNCTION CAUSED IMPROPER REGISTER CHANGE/<15><12>
11404  051672  020107  046111  042514
11405  051700  040507  020114  052506
11406  051706  041516  044524  047117
11407  051714  041440  052501  042523
11408  051722  020104  046511  051120
11409  051730  050117  051105  051040
11410  051736  043505  051511  042524
11411  051744  020122  044103  047101
11412  051752  042507  005015
11413  051756  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
11414  051764  052101  020101  044507
11415  051772  042526  020123  044127
11416  052000  052101  051440  047510
11417  052006  046125  020104  042502
11418  052014  052040  042510  042522
11419  052022  005015
11420  052024  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER ILLEGAL FUNCTION IS GIVEN/
11421  052032  042105  042040  052101
11422  052040  020101  044507  042526
11423  052046  020123  042522  044507
11424  052054  052123  051105  041440
11425  052062  047117  042524  052116
11426  052070  020123  043101  042524
11427  052076  020122  046111  042514
11428  052104  040507  020114  052506
11429  052112  041516  044524  047117
11430  052120  044440  020123  044507
11431  052126  042526  000116
11432  052132  051127  052111  020105  EM52:   .ASCII  /WRITE DATA ON NONEXISTANT SECTOR CAUSED IMPROPER REGISTER CHANGE/<15><1
11433  052140  040504  040524  047440
11434  052146  020116  047516  042516
11435  052154  044530  052123  047101
11436  052162  020124  042523  052103
11437  052170  051117  041440  052501
11438  052176  042523  020104  046511
11439  052204  051120  050117  051105
11440  052212  051040  043505  051511
11441  052220  042524  020122  044103
11442  052226  047101  042507  005015
11443  052234  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
11444  052242  052101  020101  044507
11445  052250  042526  020123  044127
11446  052256  052101  051440  047510
11447  052264  046125  020104  042502
11448  052272  052040  042510  042522
11449  052300  005015
11450  052302  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER ATTEMPTED WRITE DATA/
11451  052310  042105  042040  052101
11452  052316  020101  044507  042526
11453  052324  020123  042522  044507
11454  052332  052123  051105  041440
11455  052340  047117  042524  052116
11456  052346  020123  043101  042524
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052354  020122  052101  042524
052362  050115  042524  020104
052370  051127  052111  020105
052376  040504  040524     000
052403     122  040505  020104  EM53:   .ASCIZ  /READ HEADER AND DATA AFTER A SEARCH CAUSED DATA ERROR/
052410  042510  042101  051105
052416  040440  042116  042040
052424  052101  020101  043101
052432  042524  020122  020101
052440  042523  051101  044103
052446  041440  052501  042523
052454  020104  040504  040524
052462  042440  051122  051117
052470     000
052471     101  052124  046505  EM54:   .ASCII  /ATTEMPTING COMMAND WITH INVALID ADDRESS CAUSED IMPROPER REGISTER CHANGE
052476  052120  047111  020107
052504  047503  046515  047101
052512  020104  044527  044124
052520  044440  053116  046101
052526  042111  040440  042104
052534  042522  051523  041440
052542  052501  042523  020104
052550  046511  051120  050117
052556  051105  051040  043505
052564  051511  042524  020122
052572  044103  047101  042507
052600  005015
052602  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
052610  052101  020101  044507
052616  042526  020123  044127
052624  052101  051440  047510
052632  046125  020104  042502
052640  052040  042510  042522
052646  005015
052650  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER OPERATION/
052656  042105  042040  052101
052664  020101  044507  042526
052672  020123  042522  044507
052700  052123  051105  041440
052706  047117  042524  052116
052714  020123  043101  042524
052722  020122  050117  051105
052730  052101  047511  000116
052736  051127  052111  047111  EM55:   .ASCII  /WRITING OR READING WITH EXPECTED ADDRESS OVERFLOW ERROR/<15><12>
052744  020107  051117  051040
052752  040505  044504  043516
052760  053440  052111  020110
052766  054105  042520  052103
052774  042105  040440  042104
053002  042522  051523  047440
053010  042526  043122  047514
053016  020127  051105  047522
053024  006522     012
053027     103  052501  042523          .ASCII  /CAUSED IMPROPER REGISTER CHANGE/<15><12>
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053034  020104  046511  051120
053042  050117  051105  051040
053050  043505  051511  042524
053056  020122  044103  047101
053064  042507  005015
053070  047507  042117  042040            .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
053076  052101  020101  044507
053104  042526  020123  044127
053112  052101  051440  047510
053120  046125  020104  042502
053126  052040  042510  042522
053134  005015
053136  042522  042503  053111            .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER OPERATION/
053144  042105  042040  052101
053152  020101  044507  042526
053160  020123  042522  044507
053166  052123  051105  041440
053174  047117  042524  052116
053202  020123  043101  042524
053210  020122  050117  051105
053216  052101  047511  000116
053224  040504  040524  051040  EM56:    .ASCII  /DATA READ WITH AN EXPECTED ADDRESS OVERFLOW ERROR IS INCORRECT/<15><12>
053232  040505  020104  044527
053240  044124  040440  020116
053246  054105  042520  052103
053254  042105  040440  042104
053262  042522  051523  047440
053270  042526  043122  047514
053276  020127  051105  047522
053304  020122  051511  044440
053312  041516  051117  042522
053320  052103  005015
053324  047527  042122  047040            .ASCII  /WORD NO. 1 TO 260 SHOULD BE READ, WORD NO 261 TO 266 SHOULD/<15><12>
053332  027117  030440  052040
053340  020117  033062  020060
053346  044123  052517  042114
053354  041040  020105  042522
053362  042101  020054  047527
053370  042122  047040  020117
053376  033062  020061  047524
053404  031040  033066  051440
053412  047510  046125  006504
053420     012
053421     102  020105  044103            .ASCIZ  /BE CHANGED/
053426  047101  042507  000104
053434  052101  042524  050115  EM57:    .ASCII  /ATTEMPTING DATA COMMAND WITH WRONG FORMAT BIT CAUSED/<15><12>
053442  044524  043516  042040
053450  052101  020101  047503
053456  046515  047101  020104
053464  044527  044124  053440
053472  047522  043516  043040
053500  051117  040515  020124
053506  044502  020124  040503
053514  051525  042105  005015
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11565  053522  046511  051120  050117          .ASCII  /IMPROPER REGISTER CHANGE/<15><12>
11566  053530  051105  051040  043505
11567  053536  051511  042524  020122
11568  053544  044103  047101  042507
11569  053552  005015
11570  053554  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
11571  053562  052101  020101  044507
11572  053570  042526  020123  044127
11573  053576  052101  051440  047510
11574  053604  046125  020104  042502
11575  053612  052040  042510  042522
11576  053620  005015
11577  053622  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER ATTEMPTED DATA TRANSFER/
11578  053630  042105  042040  052101
11579  053636  020101  044507  042526
11580  053644  020123  042522  044507
11581  053652  052123  051105  041440
11582  053660  047117  042524  052116
11583  053666  020123  043101  042524
11584  053674  020122  052101  042524
11585  053702  050115  042524  020104
11586  053710  040504  040524  052040
11587  053716  040522  051516  042506
11588  053724  000122
11589  053726  052101  042524  050115  EM60:  .ASCII  /ATTEMPTING TO MODIFY REGISTER DURING AN OPERATION CAUSED IMPROPER/<15><
11590  053734  044524  043516  052040
11591  053742  020117  047515  044504
11592  053750  054506  051040  043505
11593  053756  051511  042524  020122
11594  053764  052504  044522  043516
11595  053772  040440  020116  050117
11596  054000  051105  052101  047511
11597  054006  020116  040503  051525
11598  054014  042105  044440  050115
11599  054022  047522  042520  006522
11600  054030     012
11601  054031     122  043505  051511          .ASCII  /REGISTER CHANGE. GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
11602  054036  042524  020122  044103
11603  054044  047101  042507  020056
11604  054052  047507  042117  042040
11605  054060  052101  020101  044507
11606  054066  042526  020123  044127
11607  054074  052101  051440  047510
11608  054102  046125  020104  042502
11609  054110  052040  042510  042522
11610  054116  005015
11611  054120  042522  042503  053111          .ASCII  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER OPERATION WAS ATTEMPTED/<15
11612  054126  042105  042040  052101
11613  054134  020101  044507  042526
11614  054142  020123  042522  044507
11615  054150  052123  051105  041440
11616  054156  047117  042524  052116
11617  054164  020123  043101  042524
11618  054172  020122  050117  051105
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054200  052101  047511  020116
054206  040527  020123  052101
054214  042524  050115  042524
054222  006504     012
054225     115  042117  044506            .ASCIZ  /MODFING REG GIVES ADDRESS OF REGISTER BEING MODIFIED WHICH CAUSED ERROR
054232  043516  051040  043505
054240  043440  053111  051505
054246  040440  042104  042522
054254  051523  047440  020106
054262  042522  044507  052123
054270  051105  041040  044505
054276  043516  046440  042117
054304  043111  042511  020104
054312  044127  041511  020110
054320  040503  051525  042105
054326  042440  051122  051117
054334     000

054335     104  053105  041511  EM61:   .ASCIZ  /DEVICE NOT AVAILABLE BEFORE COMMAND WAS TO BE GIVEN/
054342  020105  047516  020124
054350  053101  044501  040514
054356  046102  020105  042502
054364  047506  042522  041440
054372  046517  040515  042116
054400  053440  051501  052040
054406  020117  042502  043440
054414  053111  047105     000
054421     122  042110  030523  EM63:   .ASCIZ  /RHDS1 CONTENTS DURING COMMAND WAS IN ERROR/
054426  041440  047117  042524
054434  052116  020123  052504
054442  044522  043516  041440
054450  046517  040515  042116
054456  053440  051501  044440
054464  020116  051105  047522
054472  000122
054474  042522  040503  044514  EM64:   .ASCII  /RECALIBRATE COMMAND CAUSED IMPROPER REGISTER CHANGE/<15><12>
054502  051102  052101  020105
054510  047503  046515  047101
054516  020104  040503  051525
054524  042105  044440  050115
054532  047522  042520  020122
054540  042522  044507  052123
054546  051105  041440  040510
054554  043516  006505     012
054561     107  047517  020104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
054566  040504  040524  043440
054574  053111  051505  053440
054602  040510  020124  044123
054610  052517  042114  041040
054616  020105  044124  051105
054624  006505     012
054627     122  041505  044505          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER COMMAND/
054634  042526  020104  040504
054642  040524  043440  053111
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054650  051505  051040  043505
054656  051511  042524  020122
054664  047503  052116  047105
054672  051524  040440  052106
054700  051105  041440  046517
054706  040515  042116     000
054713     111  052116  051105   EM65:   .ASCIZ  /INTERRUPT FAILING/
054720  052522  052120  043040
054726  044501  044514  043516
054734     000
054735     110  040505  042504   EM66:   .ASCII  /HEADER AND DATA COMMAND FOR HEAD SELECTION TEST/<15><12>
054742  020122  047101  020104
054750  040504  040524  041440
054756  046517  040515  042116
054764  043040  051117  044040
054772  040505  020104  042523
055000  042514  052103  047511
055006  020116  042524  052123
055014  005015
055016  040503  051525  042105           .ASCII  /CAUSED ERROR/<15><12>
055024  042440  051122  051117
055032  005015
055034  044122  051504  020124           .ASCII  /RHDST GIVES WHAT TRACK WAS BEING WRITTEN OR READ/<15><12>
055042  044507  042526  020123
055050  044127  052101  052040
055056  040522  045503  053440
055064  051501  041040  044505
055072  043516  053440  044522
055100  052124  047105  047440
055106  020122  042522  042101
055114  005015
055116  047117  041440  046131           .ASCIZ  /ON CYLINDER 0, SECTOR 0/
055124  047111  042504  020122
055132  026060  051440  041505
055140  047524  020122  000060
055146  042522  042101  044040   EM67:   .ASCII  /READ HEADER AND DATA ERROR IN HEAD SELECTION TEST/<12><15>
055154  040505  042504  020122
055162  047101  020104  040504
055170  040524  042440  051122
055176  051117  044440  020116
055204  042510  042101  051440
055212  046105  041505  044524
055220  047117  052040  051505
055226  005124     015
055231     106  051111  052123           .ASCII  /FIRST FOUR WORD NUMBERS ARE HEADER/<12><15>
055236  043040  052517  020122
055244  047527  042122  047040
055252  046525  042502  051522
055260  040440  042522  044040
055266  040505  042504  005122
055274     015
055275     127  051117  020104           .ASCII  /WORD NUMBERS 5 TO 260 ARE DATA WORDS/<12><15>
055302  052516  041115  051105
055310  020123  020065  047524
```

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055316  031040  030066  040440
055324  042522  042040  052101
055332  020101  047527  042122
055340  005123     015
055343     111  020116  040504           .ASCIZ  /IN DATA WORDS BITS 4,5,6,7,8 GIVE TRACK NUMBER/
055350  040524  053440  051117
055356  051504  041040  052111
055364  020123  026064  026065
055372  026066  026067  020070
055400  044507  042526  052040
055406  040522  045503  047040
055414  046525  042502  000122

055422  042522  042101  044040   EM70:   .ASCII  /READ HEADER AND DATA ERROR IN/<15><12>
055430  040505  042504  020122
055436  047101  020104  040504
055444  040524  042440  051122
055452  051117  044440  006516
055460     012
055461     104  043111  042506           .ASCII  /DIFFERENCE LINE TEST/<15><12>
055466  042522  041516  020105
055474  044514  042516  052040
055502  051505  006524     012
055507     127  051117  020104           .ASCII  /WORD NOS 1-4 GIVE HEADER/<15><12>
055514  047516  020123  026461
055522  020064  044507  042526
055530  044040  040505  042504
055536  006522     012
055541     127  051117  020104           .ASCIZ  /WORD NOS 5-260 GIVE DATA WHICH IS THE CYLINDER ADDRESS/
055546  047516  020123  026465
055554  033062  020060  044507
055562  042526  042040  052101
055570  020101  044127  041511
055576  020110  051511  052040
055604  042510  041440  046131
055612  047111  042504  020122
055620  042101  051104  051505
055626  000123
055630  047506  041522  047111   EM71:   .ASCII  /FORCING OPI BY 3 INDEX PULSES/<15><12>
055636  020107  050117  020111
055644  054502  031440  044440
055652  042116  054105  050040
055660  046125  042523  006523
055666     012
055667     103  052501  042523           .ASCII  /CAUSED IMPROPER REGISTER CHANGE/<15><12>
055674  020104  046511  051120
055702  050117  051105  051040
055710  043505  051511  042524
055716  020122  044103  047101
055724  042507  005015
055730  047507  042117  042040           .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
055736  052101  020101  044507
055744  042526  020123  044127
055752  052101  051440  047510
```

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055760  046125  020104  042502
055766  052040  042510  042522
055774  005015
055776  042522  042503  053111              .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER 3 INDEX PULSES/
056004  042105  042040  052101
056012  020101  044507  042526
056020  020123  042522  044507
056026  052123  051105  041440
056034  047117  042524  052116
056042  020123  043101  042524
056050  020122  020063  047111
056056  042504  020130  052520
056064  051514  051505     000
056071     124  042510  042522     EM72:    .ASCII  /THERE WAS A SETUP ERROR DURING MULTIPLE WRITE/<15><12>
056076  053440  051501  040440
056104  051440  052105  050125
056112  042440  051122  051117
056120  042040  051125  047111
056126  020107  052515  052114
056134  050111  042514  053440
056142  044522  042524  005015
056150  042510  042101  051105              .ASCII  /HEADER AND DATA COMMANDS RESULTING IN AN ABORT/<15><12>
056156  040440  042116  042040
056164  052101  020101  047503
056172  046515  047101  051504
056200  051040  051505  046125
056206  044524  043516  044440
056214  020116  047101  040440
056222  047502  052122  005015
056230  043117  052040  044510              .ASCII  /OF THIS 'OPI' TEST./<15><12><15><12>
056236  020123  047447  044520
056244  020047  042524  052123
056252  006456  006412     012
056257     124  020117  051124              .ASCIZ  /TO TROUBLE SHOOT SETUP ERROR, LOOP ON THIS TEST/
056264  052517  046102  020105
056272  044123  047517  020124
056300  042523  052524  020120
056306  051105  047522  026122
056314  046040  047517  020120
056322  047117  052040  044510
056330  020123  042524  052123
056336     000
056337     122  040505  020104     EM73:    .ASCII  /READ HEADER AND DATA FOR 11960 WORDS /<15><12>
056344  042510  042101  051105
056352  040440  042116  042040
056360  052101  020101  047506
056366  020122  030461  033071
056374  020060  047527  042122
056402  020123  005015
056406  044124  052101  044440              .ASCII  /THAT IS 46 SECTORS /<15><12>
056414  020123  033064  051440
056422  041505  047524  051522
056430  006440     012
056433     124  040510  020124              .ASCIZ  /THAT IS OVER 3 INDEX PULSES CAUSED AN ERROR/
```

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056440  051511  047440  042526
056446  020122  020063  047111
056454  042504  020130  052520
056462  051514  051505  041440
056470  052501  042523  020104
056476  047101  042440  051122
056504  051117     000
056507     122  040505  020104  EM74:   .ASCII  /READ HEADER AND DATA FOR 11960 WORDS /<15><12>
056514  042510  042101  051105
056522  040440  042116  042040
056530  052101  020101  047506
056536  020122  030461  033071
056544  020060  047527  042122
056552  020123  005015
056556  044124  052101  044440          .ASCII  /THAT IS 46 SECTORS, THAT IS OVER 3 INDEX /<15><12>
056564  020123  033064  051440
056572  041505  047524  051522
056600  020054  044124  052101
056606  044440  020123  053117
056614  051105  031440  044440
056622  042116  054105  006440
056630     012
056631     120  046125  042523          .ASCIZ  /PULSES CAUSED OPI TO SET/
056636  020123  040503  051525
056644  042105  047440  044520
056652  052040  020117  042523
056660  000124
```

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056662 040506 040524 020114 CPHALT: .ASCII  /FATAL ERROR - SEE DOCUMENT LISTING/<15><12>
056670 051105 047522 020122
056676 020055 042523 020105
056704 047504 052503 042515
056712 052116 046040 051511
056720 044524 043516 005015
056726 006440 103412 177777          .ASCII  / /<15><12><207><377><377><207><377><377><207><377><377>
056734 177607 103777 177777
056742 044124 020105 047503          .ASCII  /THE CONTROLLER OR DEVICE HAS GONE OFFLINE, LOST/<15><12>
056750 052116 047522 046114
056756 051105 047440 020122
056764 042504 044526 042503
056772 044040 051501 043440
057000 047117 020105 043117
057006 046106 047111 026105
057014 046040 051517 006524
057022    012
057023    047 042522 042101          .ASCII  /'READY', BECOME UNAVAILABLE, OR HAS STATUS BITS/<15><12>
057030 023531 020054 042502
057036 047503 042515 052440
057044 040516 040526 046111
057052 041101 042514 020054
057060 051117 044040 051501
057066 051440 040524 052524
057074 020123 044502 051524
057102 005015
057104 044127 041511 020110          .ASCIZ  /WHICH CANNOT BE CLEARED/
057112 040503 047116 052117
057120 041040 020105 046103
057126 040505 042522 000104



057134 041520 020040 020040 DH1:     .ASCII  /PC      TEST    WAIT    BIT     REG     REG     RHCS1/<15><12>
057142 020040 042524 052123
057150 020040 020040 040527
057156 052111 020040 020040
057164 044502 020124 020040
057172 020040 042522 020107
057200 020040 020040 042522
057206 020107 020040 020040
057214 044122 051503 006461
057222    012
057223    040 020040 020040          .ASCIZ  /       NO      PC      EXPCTD  ADDRESS CONTENT CONTENT         /
057230 020040 047040 020117
057236 020040 020040 050040
057244 020103 020040 020040
057252 042440 050130 052103
057260 020104 040440 042104
057266 042522 051523 041440
057274 047117 042524 052116
057302 041440 047117 042524
057310 052116 000011
```

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057314  041520  020040  020040  DH4:    .ASCII  /PC      TEST    WAIT    BIT     REG     TIME IN/<15><12>
057322  020040  042524  052123
057330  020040  020040  040527
057336  052111  020040  020040
057344  044502  020124  020040
057352  020040  042522  020107
057360  020040  020040  044524
057366  042515  044440  006516
057374     012
057375     040  020040  020040          .ASCIZ  /        NO      PC      EXPCTD  ADDRESS 10 MSEC/
057402  020040  047040  020117
057410  020040  020040  050040
057416  020103  020040  020040
057424  042440  050130  052103
057432  020104  040440  042104
057440  042522  051523  030440
057446  020060  051515  041505
057454     000
057455     120  020103  020040  DH5:    .ASCII  /PC      TEST    REG     GOOD    RECEIVED/<15><12>
057462  020040  052040  051505
057470  020124  020040  051040
057476  043505  020040  020040
057504  043440  047517  020104
057512  020040  051040  041505
057520  044505  042526  006504
057526     012
057527     040  020040  020040          .ASCIZ  /        NO      ADDRESS DATA    DATA/
057534  020040  047040  020117
057542  020040  020040  040440
057550  042104  042522  051523
057556  042040  052101  020101
057564  020040  042040  052101
057572  000101
057574  041520  020040  020040  DH6:    .ASCII  /PC      TEST    REG     RECEIVED/<15><12>
057602  020040  042524  052123
057610  020040  020040  042522
057616  020107  020040  020040
057624  042522  042503  053111
057632  042105  005015
057636  020040  020040  020040          .ASCIZ  /        NO      ADDRESS DATA/
057644  020040  047516  020040
057652  020040  020040  042101
057660  051104  051505  020123
057666  040504  040524     000
057673     120  020103  020040  DH7:    .ASCIZ  /PC      TEST    REG     ADDRESS/
057700  020040  052040  051505
057706  020124  020040  051040
057714  043505  020040  020040
057722  040440  042104  042522
057730  051523     000

057733     120  020103  020040  DH10:   .ASCII  /PC      TEST    FAILING CONTENT CONTENT CONTENT CONTENT/<15><12>
057740  020040  052040  051505
057746  020124  020040  043040
```

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057754  044501  044514  043516
057762  041440  047117  042524
057770  052116  041440  047117
057776  042524  052116  041440
060004  047117  042524  052116
060012  041440  047117  042524
060020  052116  005015
060024  020040  020040  020040          .ASCIZ  /       NO      REG.    RHCS1   RHCS2   RHDS1   RHER1/
060032  020040  047516  020040
060040  020040  020040  042522
060046  027107  020040  020040
060054  044122  051503  020061
060062  020040  044122  051503
060070  020062  020040  044122
060076  051504  020061  020040
060104  044122  051105  000061

060112  041520  020040  020040  DH26:   .ASCII  /PC     TEST    CONT OF CONT OF CONT OF CONT OF CONT OF CONT OF/<15><12
060120  020040  042524  052123
060126  020040  020040  047503
060134  052116  047440  020106
060142  047503  052116  047440
060150  020106  047503  052116
060156  047440  020106  047503
060164  052116  047440  020106
060172  047503  052116  047440
060200  020106  047503  052116
060206  047440  006506     012
060213     040  020040  020040          .ASCIZ  /       NO      RHCS1   RHCS2   RHDS1   RHER1   RHER2   RHER3   /
060220  020040  047040  020117
060226  020040  020040  051040
060234  041510  030523  020040
060242  051040  041510  031123
060250  020040  051040  042110
060256  030523  020040  051040
060264  042510  030522  020040
060272  051040  042510  031122
060300  020040  051040  042510
060306  031522  000011

060312  041520  020040  020040  DH30:   .ASCII  /PC     TEST    WORD    GOOD    BAD/<15><12>
060320  020040  042524  052123
060326  020040  020040  047527
060334  042122  020040  020040
060342  047507  042117  020040
060350  020040  040502  006504
060356     012
060357     040  020040  020040          .ASCIZ  /       NO      NO      DATA    DATA/
060364  020040  047040  020117
060372  020040  020040  047040
060400  020117  020040  020040
060406  042040  052101  020101
060414  020040  042040  052101
060422  000101
```

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060424  041520  020040  020040  DH51:   .ASCII  /PC      TEST    REG     GOOD    RECVD   ILLEGL/<15><12>
060432  020040  042524  052123
060440  020040  020040  042522
060446  020107  020040  020040
060454  047507  042117  020040
060462  020040  042522  053103
060470  020104  020040  046111
060476  042514  046107  005015
060504  020040  020040  020040          .ASCIZ  /        NO      ADDRESS DATA    DATA    FUNCTN/
060512  020040  047516  020040
060520  020040  020040  042101
060526  051104  051505  020123
060534  040504  040524  020040
060542  020040  040504  040524
060550  020040  020040  052506
060556  041516  047124     000

060563     120  020103  020040  DH60:   .ASCII  /PC      TEST    REG     GOOD    RECVD   MODFING/<15><12>
060570  020040  052040  051505
060576  020124  020040  051040
060604  043505  020040  020040
060612  043440  047517  020104
060620  020040  051040  041505
060626  042126  020040  046440
060634  042117  044506  043516
060642  005015
060644  020040  020040  020040          .ASCIZ  /        NO      ADDRESS DATA    DATA    REG/
060652  020040  047516  020040
060660  020040  020040  042101
060666  051104  051505  020123
060674  040504  040524  020040
060702  020040  040504  040524
060710  020040  020040  042522
060716  000107
060720  041520  020040  020040  DH61:   .ASCII  /PC      TEST    PC OF   RHDS1/<15><12>
060726  020040  042524  052123
060734  020040  020040  041520
060742  047440  004506  051040
060750  042110  030523  005015
060756  020040  020040  020040          .ASCIZ  /        NO      JSR     WAS/
060764  020040  047516  020040
060772  020040  020040  051512
061000  020122  020040  020040
061006  040527  000123
061012  041520  020040  020040  DH62:   .ASCII  /PC      PC OF   RHCS1/<15><12>
061020  020040  041520  047440
061026  020106  020040  044122
061034  051503  006461     012
061041     040  020040  020040          .ASCIZ  /        JSR     WAS/
061046  020040  045040  051123
061054  020040  020040  053440
061062  051501     000
061065     120  020103  020040  DH65:   .ASCII  /PC      TEST    CONT    CONT    CONT/<15><12>
```

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061072  020040  052040  051505
061100  020124  020040  041440
061106  047117  020124  020040
061114  041440  047117  020124
061122  020040  041440  047117
061130  006524     012
061133     040  020040  020040            .ASCIZ  /          NO       RHCS1   RHAS     RHDS1/
061140  020040  047040  020117
061146  020040  020040  051040
061154  041510  030523  020040
061162  051040  040510  020123
061170  020040  051040  042110
061176  030523     000
061201     120  020103  020040    DH66:   .ASCIZ  /PC        TEST     RHDST    RHER1    RHER2    RHER3    RHCS1    RHCS2/
061206  020040  052040  051505
061214  020124  020040  051040
061222  042110  052123  020040
061230  051040  042510  030522
061236  020040  051040  042510
061244  031122  020040  051040
061252  042510  031522  020040
061260  051040  041510  030523
061266  020040  051040  041510
061274  031123     000

061277     120  020103  020040    DH72:   .ASCIZ  /PC        TEST     RHCSI    RHCS2    RHDS1    RHDST    RHCA     RHER1    RHWC/
061304  020040  052040  051505
061312  020124  020040  051040
061320  041510  044523  020040
061326  051040  041510  031123
061334  020040  051040  042110
061342  030523  020040  051040
061350  042110  052123  020040
061356  051040  041510  020101
061364  020040  051040  042510
061372  030522  020040  051040
061400  053510  000103


                                          .EVEN

061404  001116  004504  033234    DT1:    .WORD   $ERRPC,TSTNM,WAITPC,WAITBT,WAITRE,$BDDAT,CS1,0
061412  033240  033236  001126
061420  002262  000000
061424  001116  004504  004504    DT4:    .WORD   $ERRPC,TSTNM,TSTNM,WAITPC,WAITBT,WAITRE,$BDDAT,WAITTM,0
061432  033234  033240  033236
061440  001126  033242  000000
061446  001116  004504  004500    DT5:    .WORD   $ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT,0
061454  001124  001126  000000
061462  001116  004504  004500    DT6:    .WORD   $ERRPC,TSTNM,REGADR,$BDDAT,0
061470  001126  000000
061474  001116  004504  001200    DT7:    .WORD   $ERRPC,TSTNM,$TMP1,0
061502  000000
061504  001116  004504  001122    DT10:   .WORD   $ERRPC,TSTNM,$BDADR,CS1,CS2,DS1,ER1,0
```

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061512  002262  002260  002304
061520  002264  000000
061524  001116  004504  002262  DT26:   .WORD   $ERRPC,TSTNM,CS1,CS2,DS1,ER1,ER2,ER3,0
061532  002260  002304  002264
061540  002270  002276  000000
061546  001116  004504  004502  DT30:   .WORD   $ERRPC,TSTNM,ERWORD,$GDDAT,$BDDAT,0
061554  001124  001126  000000
061562  001116  004504  004500  DT51:   .WORD   $ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT,ILLEGL,0
061570  001124  001126  002364
061576  000000
061600  001116  004504  004500  DT60:   .WORD   $ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT,$BDADR,0
061606  001124  001126  001122
061614  000000
061616  001116  004504  033040  DT61:   .WORD   $ERRPC,TSTNM,PCJSR,$BDADR,0
061624  001122  000000
061630  001116  004504  033040  DT62:   .WORD   $ERRPC,TSTNM,PCJSR,$BDADR,0
061636  001122  000000
061642  001116  004504  002262  DT65:   .WORD   $ERRPC,TSTNM,CS1,AS,DS1,0
061650  002300  002304  000000
061656  001116  004504  002266  DT66:   .WORD   $ERRPC,TSTNM,DST,ER1,ER2,ER3,CS1,CS2,0
061664  002264  002270  002276
061672  002262  002260  000000
061700  001116  004504  002262  DT72:   .WORD   $ERRPC,TSTNM,CS1,CS2,DS1,DST,CA,ER1,WC,0
061706  002260  002304  002266
061714  002274  002264  002254
061722  000000

061724     000     000     000  DF1:    .BYTE   0,0,0,0,0,0,0
061727     000     000     000
061732     000
061733     000     000     000  DF4:    .BYTE   0,0,0,0,0,1,0
061736     000     000     001
061741     000
061742     000     000     000  DF5:    .BYTE   0,0,0,0,0
061745     000     000
061747     000     000     000  DF6:    .BYTE   0,0,0,0
061752     000
061753     000     000     000  DF7:    .BYTE   0,0,0
061756     000     000     000  DF10:   .BYTE   0,0,0,0,0,0,0
061761     000     000     000
061764     000

061765     000     000     000  DF26:   .BYTE   0,0,0,0,0,0,0,0
061770     000     000     000
061773     000     000

061775     000     000     000  DF30:   .BYTE   0,0,0,0,0
062000     000     000

062002     000     000     000  DF51:   .BYTE   0,0,0,0,0,0
062005     000     000     000

062010     000     000     000  DF60:   .BYTE   0,0,0,0,0,0
062013     000     000     000
```

```
062016     000     000     000  DF61:   .BYTE   0,0,0,0
062021     000
062022     000     000     000  DF62:   .BYTE   0,0,0,0
062025     000
062026     000     000     000  DF65:   .BYTE   0,0,0,0,0
062031     000     000
062033     000     000     000  DF66:   .BYTE   0,0,0,0,0,0,0,0,0
062036     000     000     000
062041     000     000     000

062044     000     000     000  DF72:   .BYTE   0,0,0,0,0,0,0,0,0
062047     000     000     000
062052     000     000     000

        062056                          .EVEN

        000001                  .END
```

```
ACL    = 000040     1223#
ACU    = 100000     1183#
AOE    = 001000     1100#   5542    5810
AS       002300     1302#   9503*  10418   12149
ATA    = 100000     1088#   3463    3805    3949    4159    4723    4867    5052    5191    5550    5802    6260    6551
                    6868    7165    7676    7846    9180
ATABLE   004566     1371#   1873
ATTENT   004644     1405#   1818*   1873*   3488    3789    3965    4161    4734    4880    5065    5202    5556    5836
                    6269    6567    6872    7169    7680    7862
AT0    = 000001     1120#
AT1    = 000002     1121#
AT2    = 000004     1122#
AT3    = 000010     1123#
AT4    = 000020     1124#
AT5    = 000040     1125#
AT6    = 000100     1126#
AT7    = 000200     1127#
A16    = 000400     1063#
A17    = 001000     1064#
BA       002256     1291#  10346
BAI    = 000010     1029#   8188
BASECH   035150     1616    9706#
BEGIN    004710      196    1426#  10692
BEGIN1   004660      200    1420#
BEGIN2   004674      198    1423#
BIT0   = 000001      156#   2373    2529    6849    7151
BIT00  = 000001      146#    156
BIT01  = 000002      145#    155
BIT02  = 000004      144#    154
BIT03  = 000010      143#    153
BIT04  = 000020      142#    152
BIT05  = 000040      141#    151
BIT06  = 000100      140#    150
BIT07  = 000200      139#    149
BIT08  = 000400      138#    148    9808
BIT09  = 001000      137#    147    9816   10299
BIT1   = 000002      155#   6827    7129
BIT10  = 002000      136#   6827    7129   10283
BIT11  = 004000      135#   9823
BIT12  = 010000      134#
BIT13  = 020000      133#  10290
BIT14  = 040000      132#   9794
BIT15  = 100000      131#
BIT2   = 000004      154#   6827
BIT3   = 000010      153#
BIT4   = 000020      152#   9264
BIT5   = 000040      151#
BIT6   = 000100      150#
BIT7   = 000200      149#
BIT8   = 000400      148#
BIT9   = 001000      147#
BPTVEC = 000014      163#
CA       002274     1300#  10410   12154
CC       002316     1309#  10450
```

```
CHECK    033042    2094    9161#
CHECKC   033100    9165    9171#
CHECKT   033064    2322    2477    2601    2705    2852    2998    3060    3318    3427    3597    3699    3836    4039
                   4092    4294    4443    4673    4817    4929    5003    5146    5305    5482    5748    5949    6107
                   6173    6365    6506    6692    6723    6806    7036    7108    7267    7433    7647    7781    7959
                   8093    8195    8286    8361    8484    8590    8687    8820    9167#
CHREG    033674    2161    2361    2368    2517    2524    3458    3467    3476    3743    3765    3775    3793    3800
                   3937    3944    3959    4147    4154    4718    4727    4862    4873    5047    5058    5176    5186
                   5195    5522    5531    5545    5788    5797    6239    6248    6255    6273    6537    6546    6560
                   6844    6851    6863    6876    7146    7153    7160    7173    7664    7671    7687    7698    7832
                   7841    7855    7866    9422#
CKSWR  = 104406    9793   10274   10298   10650#
CLAREA   032654    2258    2419    2646    2664    2672    2909    3155    3284    3395    3562    3667    3849    3855
                   3863    4241    4261    4410    4606    4785    4970    5114    5277    5376    5419    5663    5671
                   5679    5903    5911    6082    6146    6315    6323    6466    6474    6668    6760    6766    6774
                   6993    7011    7069    7075    7229    7235    7396    7403    8335    8437    8458    8661    8776
                   8794    9060#
CLDISK   033004    1814    1954    1996    2041    2090    2219    2407    2596    2629    2810    2998    3029    3265
                   3390    3543    3632    4033    4070    4224    4405    4569    4778    4922    4963    5107    5260
                   5333    5626    5686    5882    5918    6064    6136    6309    6459    6641    6653    6963    6975
                   7222    7389    7561    7596    7759    7901    7920    8007    8054    8144    8171    8272    8315
                   8426    8586    8642    8746    9140#
CLR    = 000040    1031#   2013    2025    2057    2065    9145
COMPAR   035032    2559    2960    3212    3514    3995    4390    4539    5865    6027    6431    6599    6920    7359
                   7534    8535    8859    9668#
COMREG   034002    2173    2382    2538    2780    2941    3192    3367    3494    3645    3811    3972    4167    4369
                   4518    4746    4887    5072    5209    5598    5844    5996    6288    6409    6579    6896    7198
                   7342    7517    7721    7885    9490#
CPHALT   056662    2095    2324    2479    2603    2707    2854    3000    3062    3320    3429    3599    3701    3898
                   4041    4094    4296    4445    4675    4819    4931    5005    5148    5307    5484    5750    5951
                   6109    6181    6357    6508    6694    6725    6808    7038    7110    7269    7435    7649    7783
                   7961    8095    8197    8288    8363    8486    8592    8689    8822   11863#
CR     = 000015      71#   9968    9978
CRLF   = 000200      72#   9939    9978
CSF    = 000002    1170#
CSU    = 000010    1172#
CS1      002262    1295#   7994*   7995    8128*   8129    8238*   8239    8404    8520   10362   12119   12131   12134
                  12149   12151   12154
CS2      002260    1292#  10354   12131   12134   12151   12154
DB       002252    1289#
DCK    = 100000    1106#
DCL    = 000100    1224#
DCLEAR   002330    1324#
DDISP  = 177570      78#    275    1458
DEI    = 000040    1078#
DFF20  = 000002    1074#
DFF5   = 000001    1073#
DF1      061724     333     345     356   12159#
DF10     061756     410     424     438     454   12170#
DF26     061765     573   12174#
DF30     061775     594     613     629     646     707     741     765     801     837     944     955   12178#
DF4      061733     369   12162#
DF5      061742     379     464     476     490     504     516     524     531     541     550     561     584     605
                    623     639     657     668     682     694     719     732     754     794     813     825     850
```

C09


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                             891     903     969   12165#
DF51      062002             780   12181#
DF6       061747             399   12167#
DF60      062010             867   12184#
DF61      062016             875   12186#
DF62      062022             883   12188#
DF65      062026             915   12190#
DF66      062033             933   12192#
DF7       061753             397   12169#
DF72      062044             985     996    1003   12196#
DH1       057134             326     338     350   11896#
DH10      057733             402     416     430     446   11967#
DH26      060112             565   11987#
DH30      060312             589     611     627     644     705     739     763     799     835     942     953   12010#
DH4       057314             363   11916#
DH5       057455             374     459     471     485     499     511     522     529     539     548     559     582     603
                             621     637     655     666     680     692     717     730     752     792     811     823     848
                             889     901     964   11934#
DH51      060424             774   12025#
DH6       057574             385   11949#
DH60      060563             861   12042#
DH61      060720             871   12059#
DH62      061012             879   12069#
DH65      061065             909   12077#
DH66      061201             925   12091#
DH7       057673             394   11960#
DH72      061277             976     994    1001   12103#
DIGB    = 000004            1075#
DISPLA    001142             275#   1458*   1466*   9837*  10282*
DISPRE    000174             179#   1466
DLT     = 100000            1041#
DL64    = 000020            1077#
DMD     = 000001            1110#   7805    7871
DPR     = 000400            1081#   2150    2749    3074    4134    4337    4486    7310    7481    9181
DRY     = 000200            1080#   2150    2867    3022    4064    4116    4957    6751    8309    8621    8769    9181
DST       002266            1297#  10402   12151   12154
DSWR    = 177570              77#    274    1457
DS1       002304            1304#   8402    8518   10370   12131   12134   12149   12154
DT        002306            1305#   1937*  10474
DTE     = 010000            1103#
DTSY    = 001000            1116#
DT1       061404             332     344     355   12119#
DT10      061504             409     423     437     453   12131#
DT26      061524             572   12134#
DT30      061546             593     612     628     645     706     740     764     800     836     943     954   12137#
DT4       061424             368   12122#
DT5       061446             378     463     475     489     503     515     523     530     540     549     560     583     604
                             622     638     656     667     681     693     718     731     753     793     812     824     849
                             890     902     968   12125#
DT51      061562             779   12139#
DT6       061462             388   12127#
DT60      061600             866   12142#
DT61      061616             874   12145#
DT62      061630             882   12147#
```

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DT65      061642          914    12149#
DT66      061656          932    12151#
DT7       061474          396    12129#
DT72      061700          984      995     1002    12154#
DVA     = 004000         1066#    2019     2141     2740     3073     4125     4328     4477     7301     7472     9173
ECH     = 000100         1097#
ECI     = 004000         1196#    2285     2305     2444     2463     2691     2824     2825     2826     3043     3044     3045     3303
                         3413     3581     3685     3880     3881     3882     4280     4428     4429     4430     4636     4655     4803
                         4988     4989     4990     5131     5132     5133     5299     5448     5467     5711     5712     5713     5730
                         5731     5732     5935     5936     5937     6101     6164     6340     6341     6342     6491     6492     6493
                         6696     6790     6791     6792     7030     7093     7252     7253     7254     7419     7420     7421     7953
                         8087     8189     8190     8191     8355     8477     8478     8479     8681     8813     8814     8815
EC1       002312         1307#   10458
EC2       002314         1308#   10466
EMTVEC=   000030          166#    1442*    1443*    1590*    1621*
EM1       042244          324    10711#
EM10      042776          400    10772#
EM11      043045          413    10780#
EM12      043152          427    10792#
EM13      043260          441    10804#
EM14      043377          457    10818#
EM15      043451          467    10826#
EM16      043612          479    10844#
EM17      043740          493    10860#
EM2       042273          336    10715#
EM20      044075          507    10877#
EM21      044244          520    10896#
EM22      044317          527    10904#
EM23      044372          534    10912#
EM24      044541          544    10930#
EM25      044704          553    10948#
EM26      045066          564    10968#
EM27      045156          576    10978#
EM3       042362          348    10725#
EM30      045374          587    11004#
EM31      045454          597    11013#
EM32      045671          608    11038#
EM33      045776          616    11050#
EM34      046200          626    11074#
EM35      046224          632    11078#
EM36      046442          642    11103#
EM37      046517          649    11111#
EM4       042443          359    10734#
EM40      046734          660    11136#
EM41      047143          671    11161#
EM42      047424          685    11193#
EM43      047702          697    11223#
EM44      050240          710    11262#
EM45      050532          722    11295#
EM46      051040          735    11330#
EM47      051164          744    11345#
EM5       042654          372    10747#
EM50      051446          757    11376#
EM51      051665          768    11403#
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EM52      052132         784     11432#
EM53      052403         797     11461#
EM54      052471         804     11471#
EM55      052736         816     11500#
EM56      053224         829     11532#
EM57      053434         840     11556#
EM6       042626         382     10754#
EM60      053726         853     11589#
EM61      054335         870       878    11637#
EM63      054421         887     11646#
EM64      054474         895     11654#
EM65      054713         908     11679#
EM66      054735         919     11683#
EM67      055146         935     11708#
EM7       042714         392     10763#
EM70      055422         946     11740#
EM71      055630         958     11765#
EM72      056071         972     11794#
EM73      056337         992     11823#
EM74      056507         999     11842#
ERFLG$    004632        1392#     7787*   10277*
ERR     = 040000        1087#     3465     3807     3951     4725     4869     5054     5193     5552     5804     6262     6553     6870
                        7167      7678     7848     8402     8518
ERRVEC= 000004           159#     1455     1456*    1467*    1592*    1600*    1623*    9799     9800*    9802*    9805*
ERWORD    004502        1353#     9681*    9687*   12137
ER1       002264        1296#     8228*    8229    10378    12131    12134    12151    12154
ER2       002270        1298#    10386    12134    12151
ER3       002276        1301#    10394    12134    12151
EXT1    = 000001        1150#
EXT10   = 000010        1153#
EXT2    = 000002        1151#
EXT20   = 000020        1154#
EXT4    = 000004        1152#
EXT40   = 000040        1155#
FEN     = 000200        1176#
FER     = 000020        1095#     6278     6565
FILL      033740        9452#
FILLRE    032706        2351      2356     2375     2507     2512     2531     2762     2767     2772     2917     2922     2927     2932
                        3163      3168     3173     3178     3183     3349     3354     3359     3483     3628     3633     3638     3733
                        3738      3755     3760     3784     3927     3932     3953     4350     4355     4360     4499     4504     4509
                        5512      5517     5540     5569     5574     5581     5586     5778     5783     5808     5821     5828     5979
                        5984      5989     6212     6217     6227     6232     6264     6385     6390     6395     6555     6859     6883
                        6888      7180     7185     7190     7323     7329     7334     7494     7499     7504     7509     7708     7714
                        7850      9088#
FINACC    004564        1365#     9239*
FINALA    004562        1364#     9240*
FIRST     004634        1394#     1479     1516*
FLHEAD    032630        2233      2245     2414     2636     2654     2901     3147     3272     3550     3839     4231     4253     4595
                        4596      5267     5353     5365     5397     5409     5639     5651     5895     6072     6659     6983     7001
                        7931      8065     8324     8447     8650     8785     9031#
FMT22   = 010000        1197#     2284     2285     2286     2304     2305     2306     2443     2444     2445     2462     2463     2464
                        2690      2691     2692     2824     2825     2826     3043     3044     3045     3302     3303     3304     3412
                        3413      3414     3580     3581     3582     3684     3685     3686     3880     3881     3892     4279     4280
                        4281      4428     4429     4430     4635     4636     4637     4654     4655     4656     4802     4803     4804
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                     4988    4989    4990    5131    5298    5299    5300    5447    5448    5449    5466    5467    5468
                     5711    5712    5713    5730    5731    5732    5935    5936    5937    6100    6101    6102    6163
                     6340    6341    6342    6491    6685    6686    6687    6790    6791    6792    7029    7030    7031
                     7092    7093    7094    7252    7253    7254    7419    7420    7421    7769    7798    7952    7953
                     7954    8086    8087    8088    8189    8190    8191    8354    8355    8356    8477    8478    8479
                     8680    8681    8682    8813    8814    8815    8894
FUTABL  002322       1320#   7574
GNS    = ****** U     178    1487    1491    1496    1500    1504    1509    1513    1566    1609    1613    1675    1701
                     1705    1709    1713    1756    1762    1768    1842    1846    1876    1882    1888    1915    1921
                     1927    1961    1965    1969    1975    8936    8942    9557    9563    9570    9574    9578    9585
                     9589    9709    9715    9727    9733    9739    9743    9749    9755    9759    9767   10336   10344
                    10352   10360   10368   10376   10384   10392   10400   10408   10416   10424   10432   10440   10448
                    10456   10464   10472   10480   10642   10643   10644   10645   10646   10648   10650   10651   10652
                    10653   10654
GO     = 000001      1060#   2120    2334    2489    2615    2719    2740    2844    2858    3014    3073    3079    3108
                     3332    3441    3611    3713    3910    4053    4106    4125    4308    4328    4457    4477    4687
                     4831    4948    5016    5160    5319    5496    5762    5963    6121    6193    6369    6520    6706
                     6742    6820    7050    7122    7281    7301    7448    7472    7652    7810    7973    8107    8207
                     8300    8375    8498    8612    8701    8760    8839    9264
GRV    = 000010      1076#
GTSWR  = 104405      1523   10648#
HCE    = 000200      1098#   3481    3798    3942
HCI    = 002000      1195#   2286    2306    2445    2464    2692    2826    3045    3304    3414    3582    3686    3882
                     4281    4430    4637    4656    4804    4990    5133    5300    5449    5468    5713    5732    5937
                     6102    6165    6342    6493    6687    6792    7031    7094    7254    7421    7954    8088    8191
                     8356    8479    8682    8815
HCRC   = 000400      1099#
HT     = 000011        69#   9937    9978
HT.    = 015440      2130#   2135    2342#   2347    2497#   2502    2621#   2626    2729#   2734    2865#   2870    2892#
                     2897    3020#   3025    3113#   3118    3138#   3143    3340#   3345    3449#   3454    3619#   3624
                     3721#   3726    3918#   3923    4062#   4067    4114#   4119    4317#   4322    4466#   4471    4694#
                     4699    4838#   4843    4955#   4960    5023#   5028    5167#   5172    5326#   5331    5503#   5508
                     5769#   5774    5970#   5975    6128#   6133    6200#   6205    6376#   6381    6527#   6532    6714#
                     6719    6749#   6754    6835#   6840    7058#   7063    7137#   7142    7290#   7295    7461#   7466
                     7655#   7660    7983#   7988    8117#   8122    8218#   8223    8307#   8312    8389#   8394    8505#
                     8510    8619#   8624    8713#   8718    8767#   8772    8846#   8851
IAE    = 002000      1101#   4696    4732    4840    4878    5025    5063    5169    5200
IE     = 000100      1061#   2006    2051    2334    2489    2615    2719    2740    2844    2858    3014    3073    3079
                     3108    3332    3441    3611    3713    3910    4053    4106    4125    4308    4328    4457    4477
                     4687    4831    4948    5016    5160    5319    5496    5762    5963    6121    6193    6369    6520
                     6706    6742    6820    7050    7122    7281    7301    7448    7472    7652    7973    8107    8207
                     8300    8375    8498    8612    8701    8760    8839    9291    9303    9376    9399
ILF    = 000001      1091#   7669
ILLEGL  002364       1338#   7586*   7602    7613    7621    7651    7693   12139
ILR    = 000002      1092#
IOTVEC= 000020        164#   1440*   1441*
IR     = 000100      1032#   3750    5538    6280    6281    6400    6401    6571    6572    7619    7630    7705    7878
                     7879
IXE    = 004000      1180#
KIPAR0= 172340        236#
KIPAR1= 172342        237#
KIPAR2= 172344        238#
KIPAR3= 172346        239#
KIPAR4= 172350        240#
```

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KIPAR5= 172352       241#
KIPAR6= 172354       242#
KIPAR7= 172356       243#
KIPDR0= 172300       225#
KIPDR1= 172302       226#
KIPDR2= 172304       227#
KIPDR3= 172306       228#
KIPDR4= 172310       229#
KIPDR5= 172312       230#
KIPDR6= 172314       231#
KIPDR7= 172316       232#
LA        002320    1310#   10442
LBT     = 002000    1083#    2344    2366    2522    5554    5806    9180
LF      = 000012      70#    9972    9978
LT.     = 000000    2130#    2135    2342#   2347    2497#   2502    2621#   2626    2729#   2734    2865#   2870    2892#
                    2897     3020#   3025    3113#   3118    3138#   3143    3340#   3345    3449#   3454    3619#   3624
                    3721#    3726    3918#   3923    4062#   4067    4114#   4119    4317#   4322    4466#   4471    4694#
                    4699     4838#   4843    4955#   4960    5023#   5028    5167#   5172    5326#   5331    5503#   5508
                    5769#    5774    5970#   5975    6128#   6133    6200#   6205    6376#   6381    6527#   6532    6714#
                    6719     6749#   6754    6835#   6840    7058#   7063    7137#   7142    7290#   7295    7461#   7466
                    7655#    7660    7983#   7988    8117#   8122    8218#   8223    8307#   8312    8389#   8394    8505#
                    8510     8619#   8624    8713#   8718    8767#   8772    8846#   8851
MCLK    = 000002    1111#
MCPE    = 020000    1067#
MHS     = 001000    1178#
MINX    = 000004    1112#    7806    7807    7818    7819    7822    7823    7826    7827
MMVEC   = 000250     214#
MOL     = 010000    1085#    1955    1971    2150    2749    3074    4134    4337    4486    7310    7481    9181
MPE     = 000400    1034#
MR        002302    1303#   10434
MRD     = 000020    1114#
MSE     = 000020    1173#
MSTCK   = 000010    1113#
MWR     = 000040    1115#
MXF     = 001000    1035#    7618    7628    7637    7703
NED     = 010000    1038#
NEM     = 004000    1037#
NHS     = 002000    1179#
NOPERA    002322    1321#
NOPUSH    004624    1385#    1420*   1424*   1427*
NOUNIT    004620    1381#    1729*   1776*   1783    1852*   8960*
NUNIT     004622    1383#    1783*   1784*
OCYL    = 100000    1226#
OF        002272    1299#   10426
OFREV   = 000200    1194#
OFSET     032770    9135#
OFSETC    002354    1334#    9136
OFSTVL    004510    1360#
OF100   = 000004    1189#
OF200   = 000010    1190#
OF25    = 000001    1187#
OF400   = 000020    1191#
OF50    = 000002    1188#
OF800   = 000040    1192#
```

```
OPERSE  034140     9552#  10020   10103
OPI   = 020000     1104#   7860    8229
OR .  = 000200     1033#   3748    3770    5536    6253    6280    6281    6400    6401    6571    6572    7618    7628
                   7878    7879
PAR   = 000010     1094#
PC    =%000007       90#   1478*   1669*   1814*   1954*   1996*   2041*   2084*   2090*   2094*   2183*   2219*   2322*
                   2392*   2407*   2477*   2548*   2568*   2596*   2601*   2629*   2705*   2790*   2810*   2852*   2950*
                   2969*   2992*   2998*   3029*   3060*   3202*   3221*   3265*   3318*   3376*   3390*   3427*   3503*
                   3522*   3543*   3597*   3654*   3699*   3820*   3832*   3896*   3982*   4003*   4033*   4039*   4070*
                   4092*   4178*   4224*   4294*   4379*   4399*   4405*   4443*   4528*   4548*   4569*   4673*   4756*
                   4778*   4817*   4897*   4922*   4929*   4963*   5003*   5082*   5107*   5146*   5219*   5260*   5305*
                   5333*   5482*   5608*   5626*   5686*   5748*   5854*   5874*   5882*   5918*   5949*   6006*   6036*
                   6064*   6107*   6136*   6179*   6298*   6309*   6355*   6419*   6440*   6459*   6506*   6589*   6608*
                   6641*   6653*   6692*   6723*   6806*   6911*   6929*   6963*   6975*   7036*   7108*   7213*   7222*
                   7267*   7352*   7368*   7389*   7433*   7527*   7543*   7561*   7596*   7647*   7731*   7759*   7781*
                   7895*   7901*   7920*   7959*   7997*   8007*   8054*   8093*   8131*   8144*   8171*   8195*   8231*
                   8241*   8272*   8286*   8315*   8361*   8400*   8426*   8484*   8516*   8545*   8586*   8590*   8642*
                   8687*   8746*   8820*   8868*   8992*   8995*   9005*   9010    9148*   9187*   9190*   9502*   9512*
                   9623*   9688*   9717*   9946*   9953*   9960*   9974*   9976*  10004*  10018*  10079*  10124*  10292*
                  10537*  10691
PCJSR   033040     9159#   9161*   9162*   9167*   9168*  12145   12147
PCLBUF  002246     1279#   9263*
PCLCSR  002244     1278#   9237*   9264*
PCLCTR  002250     1280#   9238
PGE   = 002000     1036#
PIP   = 020000     1086#
PIRQ  = 177772       76#
PIRQVE= 000240      170#
PKACK   002360     1336#   2098    2119    2140
PLU   = 020000     1182#
PRE   = 000020     1222#
PRITEM  040434     1558*   8959*   9554*  10323#  10485*  10503   10507*
PROG  = 001000     1082#
PR0   = 000000       93#
PR1   = 000040       94#
PR2   = 000100       95#
PR3   = 000140       96#
PR4   = 000200       97#
PR5   = 000240       98#
PR6   = 000300       99#
PR7   = 000340      100#
PS    = 177776       73#     74    1471*   2005*   2050*   2085*   2872*   3121*   8933*   9553*
PSEL  = 002000     1065#
PSU   = 000001     1219#
PSW   = 177776       74#
PUTREG  034726     7997    8131    8231    8241    8400    8516    9502    9610#
PWRVEC= 000024      165#   1446*   1447*  10659*  10660*  10669*  10675*  10687*  10688*
RDCHR = 104407    10178   10651#
RDLIN = 104410    10225   10652#
RDOCT = 104411     1568    9580    9591    9718    9735   10653#
RDY   = 000200     1062#   2006    2019    2051    2141    2499    2623    2731    2894    3073    3115    3140    3342
                   3451    3621    3723    3920    4125    4319    4468    5328    5505    5771    5972    6130    6202
                   6378    6529    6716    6837    7060    7139    7292    7463    7657    7985    8119    8220    8391
                   8507    8715    8848    9173
```

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READAT   002346    1331#  2446   2465   2488   3415   3440   5134   5159   6343   6368   6494   6519   6793
                   6819   7255   7280   7300   7422   7447   7471
READIN   002362    1337#
RECALI   002326    1323#  2614   4052   8299   8611   8759
REFOR    002350    1332#  2843   3107   3883   3909   4431   4456   4476   4991   5015   5714   5733   5761
                   5938   5962   8192   8206   8480   8497   8816   8838
REGADR   004500    1352#  1644*  2147*  2156*  2746*  2755*  3087*  3101*  4131*  4140*  4334*  4343*  4483*
                   4492*  7307*  7316*  7478*  7487*  9511*  12125  12127  12139  12142
REGSAV   040270   10276#
REGSA1   040276    1590  10278#
REINTO   003434    1346#  2259   2439   2458   2514   2561   2673   2820   2924   2962   3039   3170   3214
                   3285   3408   3516   3563   3864   3876   3934   3997   4254   4262   4391   4411   4424
                   4506   4541   4971   4984   5115   5127   5680   5707   5726   5780   5867   5912   5931
                   5986   6029   6324   6336   6387   6433   6475   6487   6601   6775   6786   6885   6922
                   7248   7331   7361   7404   7415   7501   7536   8185   8438   8473   8537   8777   8809
                   8861
RELEAS   002332    1325#
RESVEC=  000010     160#
RETCL    002356    1335#
RHAS     002216    1260#  1636   1677   7456*
RHBA     002174    1248#  2357   2513   2768   2923   3169   3355   3634   3739   3761   3933   4356   4505
                   4711   4855   5040   5513   5779   5985   6218   6233   6386   6884   7186   7330   7500
                   7601*  7624*  7633*  7709   7767*  7876   9640*
RHBAE    002240    1272#
RHCA     002212    1258#  2369   2525   5570   5582   5822   5829   7789*  9108*  9126*  9637*
RHCC     002234    1267#  3184   5575   5587   6845   7147   7510   9239   9616
RHCS1    002200    1253#  2098*  2122*  2336*  2491*  2498   2617*  2721*  2730   2860*  2885*  2893   2928
                   3016*  3081*  3139   3174   3334*  3341   3443*  3450   3468   3613*  3620   3715*  3722
                   3776   3912*  3919   3959   4055*  4108*  4148   4310*  4318   4459*  4467   4689*  4715
                   4833*  4859   4950*  5018*  5044   5162*  5177   5321*  5327   5498*  5504   5523   5764*
                   5770   5789   5965*  5971   6123*  6129   6195*  6201   6240   6371*  6377   6522*  6528
                   6538   6645   6708*  6715   6744*  6822*  6836   6852   6968   7052*  7059   7124*  7138
                   7154   7283*  7291   7450*  7462   7656   7688   7810*  7833   7975*  7984   7994   8109*
                   8118   8128   8209*  8219   8238   8302*  8377*  8390   8500*  8506   8614*  8703*  8714
                   8762*  8841*  8847   9110*  9127*  9136*  9140   9291   9303   9376   9399   9646*  9711
                   9745
RHCS2    002176    1249#  1678   1735*  1861*  3744   3766   4713   4857   5042   5532   6249   6279   6399
                   6570   7699   7877   9141   9643*
RHCS3    002242    1273#
RHDB     002170    1246#  1595   9719
RHDST    002204    1255#  2376   2532   2773   2876*  2933   3122*  3179   3360   3484   3639   3785   3954
                   4361   4510   4737   4870   5055   5184   5594   5839   5990   6265   6396   6556   6859
                   7181   7335   7505   7780*  7851   9109*  9638*
RHDS1    002222    1262#  2131   2162   2343   2362   2518   2622   2866   3021   3114   3459   3801   3945
                   4063   4115   4155   4719   4863   4956   5048   5187   5546   5798   6256   6547   6750
                   6864   7161   7672   7842   8308   8620   8768   9142
RHDT     002224    1263#  1736   1738   1742   1744   1747   1749   1764   1862   1864   1890   1897   1899
                   1902   1904   1907   1909   1935   1937
RHEC1    002230    1265#
RHEC2    002232    1266#
RHER1    002202    1254#  1681   3477   3794   3938   4695   4728   4839   4874   5024   5059   5168   5196
                   5541   5809   6274   6561   6877   7174   7665   7856   8228   9143
RHER2    002206    1256#
RHER3    002214    1259#
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RHLA      002236       1268#   9240
RHMR      002220       1261#   7804    7867
RHOF      002210       1257#   7788*   9135*   9644*
RHSN      002226       1264#   1884    1934    1936
RHWC      002172       1247#   2105    2316    2352    2472    2508    2699    2763    2834    2918    3053    3164    3312
                       3350    3421    3591    3629    3693    3734    3756    3890    3928    4095    4288    4351    4437
                       4500    4667    4709    4811    4853    4997    5038    5140    5476    5518    5742    5784    5944
                       5980    6173    6213    6228    6349    6391    6500    6800    6889    7102    7191    7261    7324
                       7427    7495    7600*   7623*   7632*   7641    7715    7765*   7793    7875    9093    9427    9511
                       9614    9616    9639*
RH70      004640       1399#   1530*   3729    6208    7566
RH70CK    006032       1528#
RMR     = 000004       1093#   6881    7178
RPTCTR    033504       9348#   9394
RPTRP1    011204       2002    2018#
RPTRP2    011312       2047    2062#
RPVEC     002166       1010#   1473    2001    2046    2111*   2326*   2481*   2606*   2710*   2851*   2878*   3002*   3064*
                       3125*   3323*   3432*   3602*   3704*   3901*   4044*   4097*   4299*   4448*   4678*   4822*   4934*
                       5008*   5151*   5310*   5487*   5753*   5954*   6112*   6184*   6360*   6511*   6697*   6733*   6811*
                       7041*   7113*   7272*   7438*   7964*   8098*   8199*   8291*   8366*   8489*   8603*   8692*   8751*
                       8825*   9729    9736*   9751    9770*
RPVECT    036000       1474    9764#   9770
RP06      004636       1397#   1860*   1867*   2227    2269    2429    4579    4618    5347    5391    5431    5563    5633
                       5696    5816    8630    8880    8900
RP4VEC    004506       1355#   1557*   2111    2326    2481    2606    2710    2878    3002    3125    3323    3432    3602
                       3704    3901    4044    4097    4299    4448    4678    4822    4934    5008    5151    5310    5487
                       5753    5954    6112    6184    6360    6511    6697    6733    6811    7041    7113    7272    7438
                       7964    8098    8199    8291    8366    8489    8603    8692    8751    8825
RUN       034766       2274    2294    2434    2453    2680    2815    3034    3292    3403    3570    3675    3870    4269
                       4418    4625    4644    4793    4978    5122    5288    5437    5456    5701    5720    5925    6090
                       6154    6331    6482    6675    6781    7019    7083    7243    7410    7942    8076    8179    8344
                       8467    8670    8803    9637#
RUNCTR    004642       1402#   7811*   7814*
RUNWAT    027332       7811#
R0      =%000000         81#   1473*   1474*   1475*   1594*   1597*   1680*   1684*   1722*   1725*   1730*   1779*   1822*
                       1823    1832*   1833    1835    1851    1854*   1861    1873    2001*   2002*   2003*   2046*   2047*
                       2048*   2104*   2126*   2143    2146    2161*   2173*   2233*   2245*   2258*   2274*   2294*   2315*
                       2351*   2356*   2361*   2368*   2375*   2382*   2414*   2419*   2434*   2453*   2471*   2507*   2512*
                       2517*   2524*   2531*   2538*   2559*   2636*   2646*   2654*   2664*   2672*   2680*   2698*   2724*
                       2742    2745    2762*   2767*   2772*   2780*   2815*   2833*   2901*   2909*   2917*   2922*   2927*
                       2932*   2941*   2960*   3009*   3034*   3052*   3066*   3071*   3073*   3083    3086    3147*   3155*
                       3163*   3168*   3173*   3178*   3183*   3192*   3212*   3272*   3284*   3292*   3311*   3349*   3354*
                       3359*   3367*   3395*   3403*   3420*   3458*   3467*   3476*   3483*   3494*   3514*   3550*   3562*
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                       3760*   3765*   3775*   3784*   3793*   3800*   3811*   3839*   3849*   3855*   3863*   3870*   3889*
                       3927*   3932*   3937*   3944*   3953*   3958*   3972*   3995*   4058*   4077*   4084*   4110*   4127
                       4130    4147*   4154*   4167*   4231*   4241*   4253*   4261*   4269*   4287*   4313*   4330    4333
                       4350*   4355*   4360*   4369*   4390*   4410*   4418*   4436*   4462*   4479    4482    4499*   4504*
                       4509*   4518*   4539*   4585*   4596*   4606*   4625*   4644*   4666*   4718*   4727*   4746*   4795*
                       4793*   4810*   4862*   4873*   4887*   4942*   4970*   4978*   4996*   5047*   5058*   5072*   5114*
                       5122*   5139*   5176*   5186*   5195*   5209*   5267*   5277*   5288*   5353*   5365*   5376*   5397*
                       5409*   5419*   5437*   5456*   5475*   5512*   5517*   5522*   5531*   5540*   5545*   5569*   5574*
                       5581*   5586*   5598*   5639*   5651*   5663*   5671*   5679*   5701*   5720*   5741*   5779*   5783*
                       5788*   5797*   5808*   5821*   5828*   5844*   5865*   5895*   5903*   5911*   5925*   5943*   5979*
```

		5984*	5989*	5996*	6027*	6072*	6082*	6090*	6146*	6154*	6172*	6212*	6217*	6227*
		6232*	6239*	6248*	6255*	6264*	6273*	6288*	6315*	6323*	6331*	6348*	6385*	6390*
		6395*	6409*	6431*	6466*	6474*	6482*	6499*	6537*	6546*	6555*	6560*	6579*	6599*
		6658*	6669*	6675*	6729*	6760*	6766*	6774*	6781*	6799*	6826*	6827*	6829	6844*
		6851*	6858*	6863*	6876*	6883*	6888*	6896*	6906	6907*	6908	6910*	6920*	6983*
		6993*	7001*	7011*	7019*	7069*	7075*	7083*	7101*	7128*	7129*	7131	7146*	7153*
		7160*	7173*	7180*	7185*	7190*	7198*	7208	7209*	7210	7212*	7229*	7235*	7243*
		7260*	7286*	7303	7306	7323*	7329*	7334*	7342*	7359*	7396*	7403*	7410*	7426*
		7453*	7474	7477	7494*	7499*	7504*	7509*	7517*	7534*	7574*	7576	7640*	7664*
		7671*	7687*	7698*	7708*	7714*	7721*	7766*	7767	7769*	7771*	7772*	7773*	7777*
		7792*	7804*	7805*	7806*	7807*	7818*	7819*	7822*	7823*	7826*	7827*	7832*	7841*
		7850*	7855*	7866*	7885*	7931*	7942*	7978*	8065*	8076*	8112*	8179*	8212*	8324*
		8335*	8344*	8437*	8447*	8458*	8467*	8535*	8650*	8661*	8670*	8776*	8785*	8794*
		8803*	8859*	8962*	8964	9002*	9005	9034	9035	9039	9044*	9064	9065	9066
		9073*	9091	9092	9097*	9108	9109	9112*	9126	9128*	9135	9137*	9206	9207
		9208	9215*	9265	9269*	9270	9272	9273	9274	9275	9276	9329*	9352	9355*
		9356	9358	9359	9360	9361	9409*	9425	9426	9428	9430	9432	9437*	9457
		9458	9459	9460	9471*	9496	9497	9498	9499	9500*	9528*	9611	9614*	9617
		9622*	9637	9638	9639	9640	9642	9644	9646	9647*	9674	9675	9676	9677
		9678*	9702*	9719*	9721*	9722*	9854	9864*	9868	9884	9885	9898*	9929	9930*
		9931	9934*	10222	10226*	10227	10230	10250*	10253*	10489	10490*	10491*	10498*	10499*
		10500*	10501*	10502*	10503	10505	10507	10508	10513	10519	10521*	10522	10536*	10626
		10627*	10628	10629*	10630*	10631*	10632*	10661	10686*					
R1	=%000001	82#	1595*	1596	1602	1636*	1637*	1638	1642	1644	1677*	1686	1689	1731
		2006*	2019	2051*	2126	2147	2724	2746	3083	3085	3087	3131*	4058	4110
		4131	4313	4334	4462	4483	7286	7307	7453	7478	7653*	7785*	7978	8112
		8212	8963*	8964	8967	9032	9034*	9039*	9043*	9061	9064*	9067*	9072*	9089
		9091*	9093*	9094*	9096*	9140*	9147*	9171	9176	9203	9206*	9209	9214*	9266
		9274*	9309*	9310	9319*	9320	9328*	9423	9425*	9427*	9430*	9432*	9436*	9453
		9457*	9463*	9470*	9491	9496*	9507	9509	9514	9527*	9612	9615*	9617*	9621*
		9669	9674*	9682	9685	9689	9701*	9720*	9723*	9855	9868*	9869	9873	9897*
		10223	10228*	10236*	10238*	10240*	10243*	10246	10249*	10518	10519*	10524	10528	10530
		10535*	10662	10685*										
R2	=%000002	83#	1596*	1678*	1679*	1683*	2013*	2025*	2057*	2065*	9033	9035*	9040*	9042*
		9062	9065*	9068*	9071*	9090	9092*	9094	9095*	9141*	9145*	9146*	9204	9207*
		9209*	9213*	9267	9275*	9309	9318*	9319	9327*	9424	9426*	9433*	9435*	9454
		9458*	9465*	9469*	9492	9497*	9507	9510	9514	9526*	9613	9616*	9618*	9620*
		9670	9675*	9682	9686	9689	9700*	9856	9867*	9871*	9874	9881*	9882*	9883
		9888*	9896*	10224	10229*	10237*	10239*	10241*	10247	10248*	10663	10684*		
R3	=%000003	84#	1723*	1724*	1727*	1772*	1955	1971	2127	2156	2725	2755	3097	3099
		3101	4059	4111	4140	4314	4343	4463	4492	7287	7316	7454	7487	7979
		8113	8213	9063	9066*	9067	9070*	9142*	9163	9169	9183	9205	9208*	9210*
		9212*	9268	9280*	9283*	9285*	9288*	9326*	9353	9365*	9368*	9370*	9373*	9394*
		9395*	9408*	9455	9459*	9463	9464*	9468*	9493	9498*	9519*	9525*	9671	9676*
		9679	9687	9694*	9699*	9857	9865*	9866*	9880*	9883*	9892*	9893*	9895*	10174
		10175*	10176	10179*	10180	10184	10186	10188*	10190*	10574	10583*	10589*	10590*	10593*
		10598*	10599*	10600	10609*	10664	10683*							
R4	=%000004	85#	1681*	1682*	9143*	9456	9460*	9464	9467*	9494	9499*	9512	9524*	9672
		9679*	9680*	9681	9698*	10575	10577*	10578*	10579*	10580	10581*	10595	10597*	10605*
		10608*	10665	10682*										
R5	=%000005	86#	1728*	1735	1758	1772	1774	1778*	2127*	2152	2155	2725*	2751	2754
		3074*	3097	3100	4059*	4111*	4136	4139	4314*	4339	4342	4463*	4488	4491
		7287*	7312	7315	7454*	7483	7486	7575*	7580*	7774*	7778*	7979*	8011*	8012*
		8013	8015	8016	8113*	8148*	8149*	8150	8152	8153	8213*	9495	9504*	9506*

```
                          9511   9523*  9673   9677*  9688   9697*  9858   9860*  9862*  9869*  9873*  9888   9894*
                         10576  10582* 10584* 10586* 10587* 10588* 10589  10607* 10666  10681*
R6      =%000006            87#    89   1434*  1435*  1436
R7      =%000007            88#    90
SAVER    033152           2104   2315   2471   2698   2833   3052   3311   3420   3590   3692   3889   4084   4287
                          4436   4666   4810   4996   5139   5475   5741   5943   6172   6348   6499   6799   7101
                          7260   7426   7640   7792   9202#
SAVERE   004512           1363#  2106   2175   2317   2384   2473   2540   2700   2782   2835   2943   3054   3194
                          3313   3369   3422   3488*  3496   3592   3647   3694   3789*  3813   3891   3965*  3974
                          4086   4161*  4169   4289   4371   4438   4520   4668   4709*  4711*  4713*  4715*  4734*
                          4737*  4748   4812   4853*  4855*  4857*  4859*  4870*  4880*  4889   4998   5038*  5040*
                          5042*  5044*  5055*  5065*  5074   5141   5184*  5202*  5211   5477   5556*  5594*  5600
                          5743   5836*  5839*  5846   5945   5998   6174   6269*  6281*  6282*  6290   6350   6401*
                          6402*  6411   6501   6567*  6572*  6573*  6581   6801   6872*  6898   7103   7169*  7200
                          7262   7344   7428   7519   7642   7680*  7693*  7723   7794   7862*  7875*  7876*  7879*
                          7880*  7887   9094*  9430*  9432*  9503
SC      = 100000          1069#  3472   3780   3963   4152   5181   5527   5793   6244   6542   6856   7158   7605
                          7615   7625   7634   7692   7837   7995   8129   8239
SC1     = 000100          1156#
SC10    = 001000          1159#
SC2     = 000200          1157#
SC20    = 002000          1160#
SC4     = 000400          1158#
SEECOM   002352           1333#  3013   4947   6741   9127
SEEKCY   032754           3009   4942   6729   9126#
SELECT   004626           1387#  1421*  1423*  1426*  1560   1787   1825   8948
SELTST   007616           1695   1787#
SERCH    002334           1326#  2827   2857   3046   3071   3078   4105   4124   9110
SKI     = 040000          1225#
SN       002310           1306#  1936*  10482
SND1     005774           1482   1516#
SP      =%000006            89#  1438*  1455*  1463*  1467   1569*  1570   1571   1589*  1601   1616*  1634*  1758*
                          1764*  1774*  1811*  1878*  1884*  1890*  1994*  2018   2039*  2062   2087*  2119*  2120*
                          2122   2140*  2141*  2142   2143   2150*  2151   2152   2216*  2333*  2334*  2336   2488*
                          2489*  2491   2593*  2614*  2615*  2617   2718*  2719*  2721   2739*  2740*  2741   2742
                          2749*  2750   2751   2843*  2844*  2845   2857*  2858*  2860   2989*  3013*  3014*  3016
                          3078*  3079*  3081   3262*  3331*  3332*  3334   3440*  3441*  3443   3540*  3610*  3611*
                          3613   3712*  3713*  3715   3909*  3910*  3912   4030*  4052*  4053*  4055   4105*  4106*
                          4108   4124*  4125*  4126   4127   4134*  4135   4136   4221*  4307*  4308*  4310   4327*
                          4328*  4329   4330   4337*  4338   4339   4456*  4457*  4459   4476*  4477*  4478   4479
                          4486*  4487   4488   4566*  4686*  4687*  4689   4775*  4830*  4831*  4833   4919*  4947*
                          4948*  4950   5015*  5016*  5018   5104*  5159*  5160*  5162   5257*  5318*  5319*  5321
                          5495*  5496*  5498   5761*  5762*  5764   5962*  5963*  5965   6061*  6120*  6121*  6123
                          6192*  6193*  6195   6279*  6280*  6282   6368*  6369*  6371   6399*  6400*  6402   6456*
                          6519*  6520*  6522   6570*  6571*  6573   6638*  6705*  6706*  6708   6741*  6742*  6744
                          6819*  6820*  6822   6906*  6910   6960*  7049*  7050*  7052   7121*  7122*  7124   7208*
                          7212   7280*  7281*  7283   7300*  7301*  7302   7303   7310*  7311   7312   7386*  7447*
                          7448*  7450   7471*  7472*  7473   7474   7481*  7482   7483   7558*  7651*  7652*  7653
                          7756*  7877*  7878*  7880   7917*  7972*  7973*  7975   8051*  8106*  8107*  8109   8206*
                          8207*  8209   8269*  8299*  8300*  8302   8374*  8375*  8377   8497*  8498*  8500   8583*
                          8611*  8612*  8614   8700*  8701*  8703   8759*  8760*  8762   8838*  8839*  8841   8893*
                          8894*  8895   8938*  8944*  8954*  8999*  9032*  9033*  9042   9043   9061*  9062*  9063*
                          9070   9071   9072   9089*  9090*  9095   9096   9161   9163*  9164*  9167   9169*  9171*
                          9172*  9173   9180*  9181   9189*  9203*  9204*  9205*  9212   9213   9214   9265*  9266*
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                              9267*   9268*   9269    9276*   9326    9327    9328    9329    9352*   9353*   9355    9361*   9408
                              9409    9423*   9424*   9435    9436    9453*   9454*   9455*   9456*   9467    9468    9469    9470
                              9491*   9492*   9493*   9494*   9495*   9515*   9516*   9517    9523    9524    9525    9526    9527
                              9559*   9565*   9581*   9582    9592    9593*   9611*   9612*   9613*   9620    9621    9622    9641*
                              9642*   9643    9669*   9670*   9671*   9672*   9673*   9690*   9691*   9692    9697    9698    9699
                              9700    9701    9711*   9722    9729*   9736    9745*   9751*   9799*   9802    9804    9805    9833
                              9834    9838*   9854*   9855*   9856*   9857*   9858*   9859*   9860    9863*   9876    9878*   9880
                              9890    9892    9894    9895    9896    9897    9898    9900*   9901*   9929*   9930    9931*   9933
                              9934    9935*   9937    9939    9941    9947    9949*   9951*   9959*   9963    9967    9968    9972
                             10013*  10014*  10015   10019   10021   10030   10032   10035   10038*  10039*  10040   10045   10047
                             10049*  10050   10066*  10067*  10068   10078   10085*  10088*  10089*  10093*  10094*  10096   10099*
                             10106   10109*  10113   10115   10117   10118*  10125   10127   10129*  10130   10132*  10133*  10134*
                             10135*  10136*  10151*  10152*  10153*  10154*  10155*  10161*  10174*  10179   10190   10191*  10192*
                             10193*  10220*  10221*  10222*  10223*  10224*  10226   10230*  10232   10234   10242*  10243   10245
                             10246*  10248   10249   10250   10252   10287   10301*  10304*  10325*  10326*  10327   10338*  10346*
                             10354*  10362*  10370*  10378*  10386*  10394*  10402*  10410*  10418*  10426*  10434*  10442*  10450*
                             10458*  10466*  10474*  10482*  10489*  10494*  10518*  10524*  10528*  10535   10536   10566*  10567
                             10568   10569*  10574*  10575*  10576*  10582   10607   10608   10609   10610*  10611*  10626*  10627
                             10661*  10662*  10663*  10664*  10665*  10666*  10667*  10668   10676*  10680   10681   10682   10683
                             10684   10685   10686   10691*
SRCH      032734              3066    4077    9108#
SR0     = 177572               218#
SR1     = 177574               219#
SR2     = 177576               220#
SR3     = 172516               221#
SST1      031044              8432#
SST2      031052              8435#   8442    8565
SST3      031072              8421*   8445#   8556*
SST4      031112              8422*   8456#   8557*
SST5      031124              8423*   8465#   8558*
STACK   = 001000                64#   1438    1589    1634    1811    1994    2039    2087    2216    2593    2989    3262    3540
                              4030    4221    4566    4775    4919    5104    5257    6061    6456    6638    6960    7386    7558
                              7756    7917    8051    8269    8583
START     004720              1422    1425    1430#
STKLMT= 177774                  75#
ST22      024066              6651#   6934
ST22A     022464              5994#
ST23      024644              6924    6931#
ST24      024716              6973#   7374
ST28      025732              7364    7371#
SWR       001140               274#   1436    1457*   1459    1465*   1521    1528    1604    1671    1693    9515    9690    9794
                              9808    9810    9816    9823   10023   10062   10117*  10283   10290   10295   10299   10325   10667
                             10680*
SWREG     000176               180#   1465    1521   10023   10062   10085
SW0     = 000001               128#
SW00    = 000001               118#    128
SW01    = 000002               117#    127
SW02    = 000004               116#    126
SW03    = 000010               115#    125
SW04    = 000020               114#    124
SW05    = 000040               113#    123
SW06    = 000100               112#    122   10327
SW07    = 000200               111#    121    9517    9692
SW08    = 000400               110#    120
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SW09   = 001000        109#    119
SW1    = 000002        127#
SW10   = 002000        108#
SW11   = 004000        107#
SW12   = 010000        106#    1528
SW13   = 020000        105#    1604    1671    1693
SW14   = 040000        104#
SW15   = 100000        103#
SW2    = 000004        126#
SW3    = 000010        125#
SW4    = 000020        124#
SW5    = 000040        123#
SW6    = 000100        122#
SW7    = 000200        121#
SW8    = 000400        120#
SW9    = 001000        119#
TBITVE= 000014         161#
TDF    = 000040       1174#
TESTAD   034136       9551#
TIMCNT   033502       2008     2053    9280    9285    9347#   9365    9370
TIME1    033204       9237#
TIME2    033216       1557     9239#
TKVEC  = 000060        168#   10000*  10001*
TMP0     004650       1408#    2845*   2885    3107*   3108*   3131    6645*   6826    6829*   6907    6968*   7128    7131*
                      7209
TMP1     004652       1409#    7926*   8024*   8060*   8161*
TMP4     004654       1410#
TMP5     004656       1411#    2846*   2876    3109*   3122    6646*   6931*   6969*   7371*
TN     = 000037       1811#    1812    2087#   2088    2216#   2217    2593#   2594    2989#   2990    3262#   3263    3540#
                      3541     4030#   4031    4221#   4222    4566#   4567    4775#   4776    4919#   4920    5104#   5105
                      5257#    5258    6061#   6062    6456#   6457    6638#   6639    6960#   6961    7386#   7387    7558#
                      7559     7756#   7757    7917#   7918    8051#   8052    8269#   8270    8583#   8584
TOTALA   004646       1406#    1686*   1688*
TPVEC  = 000064        169#
TRAPVE= 000034         167#    1444*   1445*   1472*   3088*   3102*   3120*
TRE    = 040000       1068#    3474    3782    3963    5183    5529    5795    6246    6544    7615    7625    7634    7839
                      8404     8520
TRK1   = 004000       1161#
TRK10  = 040000       1164#
TRK2   = 010000       1162#
TRK20  = 100000       1165#
TRK4   = 020000       1163#
TRTVEC= 000014         162#
TSTNM    004504       1354#    1587*   1666*   1812*   1949*   1992*   2037*   2089*   2217*   2594*   2990*   3263*   3541*
                      4031*    4222*   4567*   4776*   4920*   5105*   5258*   6062*   6457*   6639*   6961*   7387*   7559*
                      7757*    7918*   8052*   8270*   8584*   9559   12119   12122   12125   12127   12129   12131   12134
                     12137    12139   12142   12145   12147   12149   12151   12154
TST1     006176       1562     1573    1584#   9011
TST10    011322       2059     2079#
TST11    011566       2215#
TST12    012442       2592#
TST13    013422       2988#
TST14    014170       3261#
TST15    014676       3539#
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B10


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TST16    016026          4029#
TST17    016360          4220#
TST2     006450          1632#
TST20    017246          4565#
TST21    017426          4774#
TST22    020104          4918#
TST23    020442          5103#
TST24    020710          5256#
TST25    022530          6060#
TST26    023504          6455#
TST27    024032          6637#
TST3     006516          1640     1662#
TST30    024662          6933     6959#
TST31    025750          7373     7385#
TST32    026314          7557#
TST33    027142          7568     7755#
TST34    027570          7916#
TST35    030052          8050#
TST36    030510          8135     8268#
TST37    031322          8563     8582#
TST4     007632          1789     1807#    8957     8968
TST40    032254          8931#
TST5     010560          1947#
TST6     011112          1957     1999#
TST7     011222          2015     2021     2034#
TUF    = 000100          1175#
TYPDS  = 104404          1759     1775     1879     8939     8945     8955     9000     10529    10646#
TYPE   = 104400          1485     1489     1494     1498     1502     1507     1511     1564     1607     1611     1673     1699     1703
                         1707     1711     1754     1760     1766     1773     1840     1844     1874     1890     1896     1913     1919
                         1925     1959     1963     1967     1973     2095     2324     2479     2603     2707     2854     3000     3062
                         3320     3429     3599     3701     3898     4041     4094     4296     4445     4675     4819     4931     5005
                         5148     5307     5484     5750     5951     6109     6181     6357     6508     6694     6725     6808     7038
                         7110     7269     7435     7649     7783     7961     8095     8197     8288     8363     8496     8592     9689
                         8822     8934     8940     8953     8956     8998     9001     9555     9561     9567     9568     9572     9576
                         9583     9587     9707     9713     9725     9731     9737     9741     9747     9753     9757     9765     9899
                         9942     10017    10029    10083    10084    10087    10098    10108    10119    10138    10182    10185    10189
                         10254    10256    10285    10293    10334    10342    10350    10358    10366    10374    10382    10390    10398
                         10406    10414    10422    10430    10438    10446    10454    10462    10470    10478    10488    10510    10512
                         10515    10517    10532    10601    10642#   10689
TYPERR   041376          10330    10487#
TYPOC  = 104401          1618     1765     1885     1891     9560     9566     9712     9730     9746     9752     9769     10086    10339
                         10347    10355    10363    10371    10379    10387    10395    10403    10411    10419    10427    10435    10443
                         10451    10459    10467    10475    10483    10496    10525    10643#
TYPON  = 104403          10645#
TYPOS  = 104402          10644#
UNIB   = 000020          1030#
UNIT     004616          1380#    1570*    1575*    1782*    1791*    1820     1851*    1854     1878     8938     8962     8967*    9146
                         9641
UNITS    004576          1379#    1723     1727     1782     1832     8963
UNITSL   004630          1388#    1571*    1575     1791
UNLOAD   002324          1322#
UNS    = 040000          1105#
UPE    = 020000          1039#
USI    = 000001          1026#
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US2     = 000002       1027#
US4     = 000004       1028#
UWR     = 000010       1221#
VUF     = 000002       1220#
VU30    = 010000       1181#
VV      = 000100       1079#    2132     2150     2166     2749     3074     4134     4337     4486     7310     7481     9164     9181
WAITBT    033240       9260#    9273*    9281     9286     9359*    9366     9371    12119    12122
WAITPC    033234       9258#    9270*    9271*    9356*    9357*   12119    12122
WAITRE    033236       9259#    9272*    9281     9286     9290     9302     9358*    9366     9371     9375     9401    12119    12122
WAITTM    033242       9238*    9261#    9262*    9310     9320    12122
WAIT.P    033244       9262#
WAIT.T    033506       9351#   10654
WAT     = 104412       2130     2342     2497     2621     2729     2865     2892     3020     3113     3138     3340     3449     3619
                       3721     3918     4062     4114     4317     4466     4694     4838     4955     5023     5167     5326     5503
                       5769     5970     6128     6200     6376     6527     6714     6749     6835     7058     7137     7290     7461
                       7655     7983     8117     8218     8307     8389     8505     8619     8713     8767     8846    10654#
WC        002254       1290#    2176     2385     2541     2783     2944     3195     3370     3497     3648     3814     3975     4170
                       4372     4521     4749     4890     5075     5212     5601     5847     5999     6291     6412     6582     6899
                       7201     7345     7520     7724     7888     9615    10338    12154
WCE     = 040000       1040#
WCF     = 000040       1096#
WCU     = 000001       1169#
WLE     = 004000       1102#
WRCHDT    002340       1328#
WRCHEK    002336       1327#
WRFROM    002370       1345#    2234     2246     2280     2300     2358     2415     2420     2560     2637     2647     2655     2665
                       2686     2769     2902     2910     2961     3148     3156     3213     3273     3298     3356     3396     3515
                       3551     3576     3635     3668     3680     3740     3762     3840     3850     3856     3996     4232     4242
                       4275     4357     4392     4540     4586     4597     4607     4631     4650     4786     4798     5268     5279
                       5294     5354     5366     5377     5398     5410     5420     5443     5462     5514     5640     5652     5664
                       5672     5866     5896     5904     6028     6073     6083     6096     6147     6159     6219     6234     6316
                       6432     6467     6600     6659     6669     6681     6761     6767     6921     6984     6994     7002     7012
                       7025     7070     7076     7088     7187     7230     7236     7360     7397     7535     7624     7626     7766
                       7932     7948     8066     8082     8325     8336     8350     8448     8459     8536     8651     8662     8676
                       8786     8795     8860
WRIDAT    002342       1329#    3687     3712     4805     4830     6166     6192     7095     7121
WRIFOR    002344       1330#    2287     2307     2333     2693     2718     2739     3305     3331     3593     3610     4292     4307
                       4327     4638     4657     4686     5301     5318     5450     5469     5495     6103     6120     6688     6705
                       7032     7049     7785     7955     7972     8089     8106     8357     8374     8683     8700
WRL     = 004000       1084#
WRU     = 000400       1177#
WSU     = 000004       1171#
XE2       007260       1691     1721#
$AUTOB    001134        271#    1525*   10076    10205
$BDADR    001122        266#    6908*    7210*    9176*    9183*   12131    12142    12145    12147
$BDDAT    001126        268#    1642*    2146*    2155*    2745*    2754*    3085*    3099*    4130*    4139*    4333*    4342*    4492*
                       4491*    7306*    7315*    7477*    7486*    9290*    9302*    9375*    9401*    9510*    9686*   12119    12122
                      12125    12127    12137    12139    12142
$BELL     001216        300#   10029    10198    10285    10307
$CHARC    037002       9944*    9954*    9961     9970*    9975#
$CKSWR    037314      10062#   10650
$CMTAG    001100        254#    1433     1434     1442     1448     1449
$CM1    = 000006        286#     287#     288#     289#     290#     291#     292#
$CM2    = 000014        286#     287#     288#     289#     290#     291#     292#
```

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$CM3   = 000006        284#     286
$CM4   = 000006        292#     293#     294#     295#     296#     297#     298#
$CNTLC   040065      10017    10098    10198#
$CNTLG   040077      10083    10200#
$CNTLU   040072      10108    10199#
$CRLF    001223        302#    1773     9567     9943     9978    10119    10198    10259    10293    10307    10488    10512    10517
$DBLK    036556       9865     9899     9907#
$DOAGN   032604       8994     9003     9009#
$DTBL    036546       9868     9903#
$ENDAD   032574        188     9005#
$ENDCT   032542       8996#
$ENDMG   032613       8953     8998     9013#
$ENULL   032610       6956     9001     9012#
$EOP     032506       1619     1716     8961     8986#
$EOPCT   032534       8993#    8997
$ERFLG   001103        257#    9783     9812     9814     9820*    9841    10280*   10307
$ERMAX   001115        263#    1450*    9814     9836*    9841
$ERROR   040266       1442     1621    10273#
$ERRPC   001116        264#   10287*   10288*   10289    10307    10494    12119    12122    12125    12127    12129    12131    12134
                     12137    12139    12142    12145    12147    12149    12151    12154
$ERRTB   001226        319#   10502
$ERRTY   040436      10292    10325#
$ERTTL   001112        261#    8944     8946*   10286*   10307
$ESCAP   001214        299#    1449*    9835*   10302    10304    10307
$FILLC   001156        282#    9947     9978
$FILLS   001155        281#    9978
$GDADR   001120        265#
$GDDAT   001124        267#    1643*    2142*    2151*    2741*    2750*    3086*    3100*    4126*    4135*    4329*    4338*    4478*
                      4487*    7302*    7311*    7473*    7482*    9509*    9685*   12125    12137    12139    12142
$GET42   032564       9002#
$GTSWR   037404      10084#   10648
$HD    = 000000         12
$HIOCT   040264      10247*   10258#
$ICNT    001104        258#    9827*    9828     9830*    9840
$ILLUP   042226      10659    10675    10694#
$INTAG   001135        272#   10081*   10100    10120    10205
$ITEMB   001114        262#   10289*   10307    10491
$LF      001224        303#    9978    10189    10198    10259    10307
$LPADR   001106        259#    1451*    1809*    9582*    9593     9818*    9833*    9838     9840
$LPERR   001110        260#    1452*    7591*    8442*    8734*    9565     9592*    9818     9834*    9840    10301
$MAIL  = ****** U     1469     1521     9833     9931    10295
$MNEW    040115      10087    10203#
$MSWR    040104      10084    10201#
$MXCNT   036340       9831     9840#
$NULL    001154        280#    9949     9978
$NWTST=  000001       1578#    1580     1626#    1628     1649#    1651     1794#    1796     1939#    1941     1981#    1983     2028#
                      2030     2071#    2073     2202#    2204     2575#    2577     2974#    2976     3250#    3252     3525#    3527
                      4019#    4021     4187#    4189     4556#    4558     4765#    4767     4906#    4908     5094#    5096     5231#
                      5233     6048#    6050     6445#    6447     6618#    6620     6936#    6938     7377#    7379     7547#    7549
                      7746#    7748     7903#    7905     8030#    8032     8249#    8251     8567#    8569     8921#    8923
$OCNT    042006      10573*   10602*   10615#
$OMODE   042010      10568*   10572*   10577    10580*   10591*   10617#
$OVER    036324       9795     9811     9819     9829     9837#
$PASS    001100        255#    8952*    8954     8990*    8991*    8999     9012     9825     9841
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$POWER  042234          10690   10697#
$PWRAD  042222          10692#
$PWRDN  042062           1446   10659#  10687
$PWRMG  042216          10690#
$PWRUP  042134          10669   10675#
$QUES   001222            301#   9978   10138   10182   10198   10256   10259   10307
$RDCHR  037656          10151#  10651
$RDDEC= ****** U        10654
$RDLIN  037746          10174#  10652
$RDOCT  040126          10220#  10653
$RDSZ = 000011          10167#
$REGAD  001160            284#
$REG0   001162            286#
$REG1   001164            287#
$REG2   001166            288#
$REG3   001170            289#
$REG4   001172            290#
$REG5   001174            291#
$RTNAD  032606           9011#
$R2A  = ****** U        10654
$SAVRE= ****** U        10654
$SAVR6  042232          10668*  10676   10677*  10678*  10696#
$SCOPE  036070           1440    9792#
$SETUP= 000117           1431#   1439    1440    1442    1444    1446    1448    1449    1451    1518    8988    9793   10021
                        10026   10027   10057   10205   10274   10298   10306
$SS1  = 000000           1470#
$STUP = 177777           1431#
$SVLAD  036276           9803    9832#
$SVPC = 000200            186#    191
$SWR  = 167770              2#     12      50      51      52      53      54      55      56      57     298     299     300
                         1448    1449    1451    1452    1585    1633    1663    1808    1948    1990    2035    2080    2216
                         2593    2989    3262    3540    4030    4221    4566    4775    4919    5104    5257    6061    6456
                         6638    6960    7386    7558    7756    7917    8051    8269    8583    8932    8983    8989    9004
                         9010    9012    9784    9785    9786    9787    9788    9794    9806    9808    9809    9812    9813
                         9814    9821    9822    9823    9834    9837    9840   10265   10266   10267   10268   10269   10283
                        10290   10295   10299   10307   10693
$SWRMK= 000000             57      58    9788    9789    9810
$TIMES  001212            298#   1448*   1585*   1633*   1663*   1808*   8932*   8989*   9821*   9828    9831*   9840
$TKB    001146            277#   9981   10002   10013   10038   10066   10093
$TKCNT  037006           9982#   9997*  10027   10044*  10158   10160*
$TKINT  037026           1478    1669    2084    9717    9997#  10018   10079
$TKQEN= 037025           9986#  10052   10163
$TKQIN  037010           9983#   9998*   9999   10050*  10051*  10052   10054*
$TKQOU  037012           9984#   9999*  10161   10162*  10163   10165*
$TKQSR  037014           9985#   9998   10054   10165
$TKS    001144            276#   9981   10003*  10034*  10036   10042*  10064   10080*  10090   10102*  10122*
$TKSRV  037076          10000   10013#
$TMP0   001176            292#   1731*   1732*
$TMP1   001200            293#   1602*   2008*   2009*   2053*   2054*   7573*   7576    7578*   7582    7586    7587*   8282*
                         8417*   8432*   8560*   8635*   8638*   8726*   8735*   8874    8876*   8885    8887    8891*   8892
                         8893    8896    8905    8908    8912*  12129
$TMP2   001202            294#
$TMP3   001204            295#
$TMP4   001206            296#
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$TMPS    001210       297#
$TN    = 000041         2#      12    1561    1572    1578    1585#   1586    1626    1633#   1639    1649    1663#   1665
                     1788     1794    1808#   1811    1939    1948#   1956    1981    1990#   1991    2014    2020    2028
                     2035#    2036    2058    2071    2080#   2087    2202    2216#   2575    2593#   2974    2989#   3250
                     3262#    3525    3540#   4019    4030#   4187    4221#   4556    4566#   4765    4775#   4906    4919#
                     5094     5104#   5231    5257#   6048    6061#   6445    6456#   6618    6638#   6933    6936    6960#
                     7373     7377    7386#   7547    7558#   7568    7746    7756#   7903    7917#   8030    8051#   8135
                     8249     8269#   8562    8567    8583#   8921    8932#
$TPB     001152       279#    9967*   9978
$TPFLG   001157       283#    9925    9978
$TPS     001150       278#    9965    9978
$TRAP    042012      1444    10626#
$TRP   = 000013     10634#   10643#  10644#  10645#  10646#  10647#  10648   10649#  10650   10651#  10652#  10653#  10654#
                    10655#
$TRPAD   042034     10631    10641#
$TSTNM   001102       256#    8947*   8988*   9783    9810    9832*   9837    9841   10282   10307
$TTYIN   040054     10175    10176   10193   10197#
$TYPBN= ****** U    10647
$TYPDS   036342      9853#   10646
$TYPE    036566      9925#   10634   10642
$TYPEC   036736      9946     9953    9960    9965#   9966   10124
$TYPEX   037004      9971     9973    9976#
$TYPOC   041610     10571#   10643
$TYPON   041624     10570    10573#  10645
$TYPOS   041564     10566#   10644
$XTSTR   036102      9797#
$$GET4= 000000       9004#
$OFILL   042007     10567*   10571*  10581   10616#
$40CAT= ****** U     9794    10292
.      = 062056       174#     178#    186     187#    189#    191#    195#    197#    199#    246#    253#    304    1344#
                     1345#    1346#   1363#   1379#   1437    1451    1452    1492#   1501#   1505#   1676#   1702#   1706#
                     1714#    1757#   1763#   1769#   1847#   1877#   1916#   1922#   1928#   1966#   1970#   1976#   8937#
                     8943#    9012    9016    9571#   9579#   9586#   9728#   9768#   9840    9841    9907!   9978    9981
                     9985#    9986    9987#  10196#  10198   10205   10259   10306   10327#  10345#  10409#  10417#  10425#
                    10433#   10441#  10449#  10473#  10481#  10539#  10671   10695   12200#
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ALLREG     46#   10332   10341   10349   10357   10365   10373   10381   10389   10397   10405   10413   10421   10429   10437
        10445    10453   10461   10469   10477
CHANGR     46#    2160    2360    2367    2516    2523    3457    3466    3475    3487    3742    3764    3773    3788    3792
         3799     3936    3943    3957    3964    4146    4153    4160    4717    4726    4733    4861    4872    4879    5046
         5057     5064    5175    5185    5194    5201    5521    5530    5544    5555    5787    5796    5835    6237    6247
         6254     6268    6272    6536    6545    6559    6566    6843    6850    6862    6871    6875    7145    7152    7159
         7168     7172    7663    7670    7679    7685    7696    7831    7840    7854    7861    7865
CHECKD     46#    2322    2477    2601    2705    2852    2998    3060    3318    3427    3597    3699    3896    4039    4092
         4294     4443    4673    4817    4929    5003    5146    5305    5482    5748    5949    6107    6179    6355    6506
         6692     6723    6806    7036    7108    7267    7433    7647    7781    7959    8093    8195    8286    8361    8484
         8590     8687    8820
CHECKV     46#    2094
CHKCNT     46#
CKCNTV     46#
CLEARA     46#    2257    2418    2645    2663    2671    2908    3154    3283    3394    3561    3666    3848    3854    3862
         4240     4260    4409    4605    4784    4969    5113    5276    5375    5418    5662    5670    5678    5902    5910
         6081     6145    6314    6322    6465    6473    6667    6759    6765    6773    6992    7010    7068    7074    7228
         7234     7395    7402    8333    8435    8456    8659    8775    8792
CMPBLK     46#    2557    2958    3210    3512    3993    4388    4537    5863    6025    6429    6597    6918    7357    7532
         8533     8858
CMREGI     46#    2172    2381    2537    2779    2940    3191    3366    3493    3644    3810    3971    4166    4368    4517
         4745     4886    5071    5208    5597    5843    5995    6287    6408    6578    6895    7197    7341    7516    7720
         7884
COMMEN     15      171#
DATACO     46#    2273    2292    2433    2451    2679    2814    3033    3291    3402    3569    3674    3869    4268    4417
         4624     4642    4792    4977    5121    5287    5436    5454    5700    5718    5924    6089    6153    6330    6481
         6674     6780    7018    7082    7242    7409    7940    8074    8178    8342    8465    8668    8801
DISREG     46#    6279    6399    6570
DUM        46#    2097
ENDCOM     24      171#
ERROR      65#    1603    1645    2012    2023    2063    2148    2157    2182    2391    2547    2567    2747    2756    2789
         2949     2968    3089    3103    3201    3220    3375    3502    3521    3653    3819    3981    4002    4132    4141
         4176     4335    4344    4378    4398    4484    4493    4527    4547    4755    4896    5081    5218    5607    5853
         5873     6005    6035    6297    6418    6439    6588    6607    6909    6928    7211    7308    7317    7351    7367
         7479     7488    7526    7542    7730    7894    7998    8132    8232    8242    8407    8523    8544    8867    9177
         9184     9293    9295    9305    9314    9323    9379    9383    9402
ESCAPE    171#
FIHEAD     46#    2232    2243    2413    2635    2653    2900    3146    3271    3549    3838    4230    4252    4584    4594
         5266     5352    5363    5396    5407    5638    5649    5894    6071    6657    6982    7000    7930    8064    8322
         8445     8648    8783
FILLBL     46#
FLSVRE     46#    2350    2355    2374    2506    2511    2530    2761    2766    2771    2916    2921    2926    2931    3162
         3167     3172    3177    3182    3348    3353    3358    3482    3627    3632    3637    3732    3737    3753    3759
         3783     3926    3931    3952    4349    4354    4359    4498    4503    4508    5511    5516    5539    5568    5573
         5579     5585    5777    5782    5807    5820    5826    5978    5983    5988    6211    6216    6225    6231    6263
         6384     6389    6394    6554    6857    6882    6887    7179    7184    7189    7322    7328    7333    7493    7498
         7503     7508    7706    7712    7849
GETPRI    171#
GETSWR      2#     171#   1518
GOO        46#    2118    2332    2487    2613    2717    2856    3012    3077    3330    3439    3609    3711    3908    4051
         4104     4306    4455    4685    4829    4946    5014    5158    5317    5494    5760    5961    6119    6191    6367
         6518     6704    6740    6818    7048    7120    7279    7446    7971    8105    8205    8298    8373    8496    8610
         8699     8758    8837
LOAD       46#
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H10


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MSG       1578#   1580    1625#   1628    1648#   1651    1793#   1796    1939#   1941    1980#   1983    2027#   2030    2070#
          2073    2201#   2204    2574#   2577    2973#   2976    3249#   3252    3525#   3527    4018#   4021    4187#   4189
          4555#   4558    4764#   4767    4905#   4908    5093#   5096    5230#   5233    6047#   6050    6445#   6447    6617#
          6620    6936#   6938    7376#   7379    7546#   7549    7745#   7748    7902#   7905    8029#   8032    8248#   8251
          8566#   8569    8921#   8923
MULT       171#
NEWTST     171#   1578    1626    1649    1794    1939    1981    2028    2071    2202    2575    2974    3250    3525    4019
          4187    4556    4765    4906    5094    5231    6048    6445    6618    6936    7377    7547    7746    7903    8030
          8249    8567    8921
OFFST       46#
POP        171#   6910    7212    9042    9070    9095    9212    9325    9407    9435    9467    9522    9620    9696    9894
         10248   10680   10681
PUSH       171#   6905    7207    9031    9060    9088    9202    9265    9351    9422    9452    9490    9610    9668,   9853
         10222   10661   10667
REPORT     171#
RFORGC      46#
RHCLEA      46#   1813    1995    2040    2089    2218    2405    2595    2628    2808    2991    3028    3264    3388    3542
          3830    4032    4069    4223    4403    4568    4777    4921    4962    5106    5259    5332    5624    5685    5880
          5917    6063    6135    6307    6458    6640    6651    6962    6973    7220    7388    7560    7594    7758    7919
          8005    8053    8142    8170    8271    8314    8425    8585    8641    8744
SAVE        46#  10275
SAVTST      46#   1586    1665    1948    1991    2036
SCH         46#   3065    4076
SCOPE       66#   1594    1632    1662    1807    1947    1989    2034    2079    2215    2592    2988    3261    3539    4029
          4220    4565    4774    4918    5103    5256    6060    6455    6637    6959    7385    7557    7755    7916    8050
          8268    8582    8931    8987
SEEKCO      46#   3008    4941    6728
SETPRI     171#  10154
SETTRA   10634#  10643   10644   10645   10646   10648   10650   10651   10652   10653   10654
SETUP      171#   1432
SKIP        46#    171#   1561    1572    1639    1788    1956    2014    2020    2058    8562
SLASH      171#
SPACE      171#
SREGIS      46#   2104    2315    2471    2698    2833    3052    3311    3420    3590    3692    3889    4084    4287    4436
          4666    4810    4996    5139    5475    5741    5943    6172    6348    6499    6799    7101    7260    7426    7639
          7792
STARS       38      44     171#    184     249     304    1005    1007    1052    1054    1532    1554    1578    1583    1626
          1631    1649    1661    1741    1751    1794    1806    1859    1870    1896    1929    1939    1946    1981    1988
          2028    2033    2071    2078    2202    2214    2226    2230    2268    2271    2428    2431    2575    2591    2974
          2987    3229    3243    3250    3260    3525    3538    4019    4028    4187    4219    4556    4564    4578    4592
          4617    4621    4743    4765    4773    4906    4917    5094    5102    5231    5255    5286    5343    5346    5350
          5390    5394    5430    5434    5562    5566    5623    5632    5636    5695    5699    5815    5819    5891    6048
          6059    6445    6454    6618    6636    6936    6958    7377    7384    7547    7556    7746    7754    7903    7915
          8030    8049    8249    8267    8567    8581    8629    8633    8738    8879    8883    8899    8903    8920    8921
          8930    8980    9763    9772    9780    9843    9910    9980   10057   10072   10143   10167   10208   10261   10543
         10620   10657   10673
STARTT      46#   1811    2087    2216    2593    2989    3262    3540    4030    4221    4566    4775    4919    5104    5257
          6061    6456    6638    6960    7386    7558    7756    7917    8051    8269    8583
SWRSU      171#   1453#
TJUMP       46#   6933    7373    7568    8135
TRMTRP   10634#
TSCLR2      46#
TSCLR5      46#
TTSTNO      46#   1812    2088    2217    2594    2990    3263    3541    4031    4222    4567    4776    4920    5105    5258
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          6062    6457    6639    6961    7387    7559    7757    7918    8052    8270    8584
TYPBIN     171#
TYPDEC     171#   8999
TYPNAM     171#
TYPNUM     171#
TYPOCS     171#
TYPOCT     171#   1884    1890   10085
TYPTXT     171#   1484    1489    1494    1498    1502    1507    1511    1564    1607    1611    1673    1698    1703    1707
          1711    1754    1760    1766    1839    1844    1874    1880    1886    1912    1918    1924    1959    1963    1967
          1973    8934    8940    9555    9561    9568    9572    9576    9583    9587    9706    9713    9725    9731    9737
          9741    9747    9753    9757    9764   10334   10342   10350   10358   10366   10374   10382   10390   10398   10406
         10414   10422   10430   10438   10446   10454   10462   10470   10478
VECSET      46#   2111    2326    2481    2606    2710    2878    3002    3125    3323    3432    3602    3704    3901    4044
          4097    4299    4448    4678    4822    4934    5008    5151    5310    5487    5753    5954    6112    6184    6360
          6511    6697    6733    6811    7041    7113    7272    7438    7964    8098    8199    8291    8366    8489    8603
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