RH11-RP04

MASSBUS INTERFACE/DCL

MD-11-DZRPT-D

EP-DZRPT-D-DL-B SEP 1975

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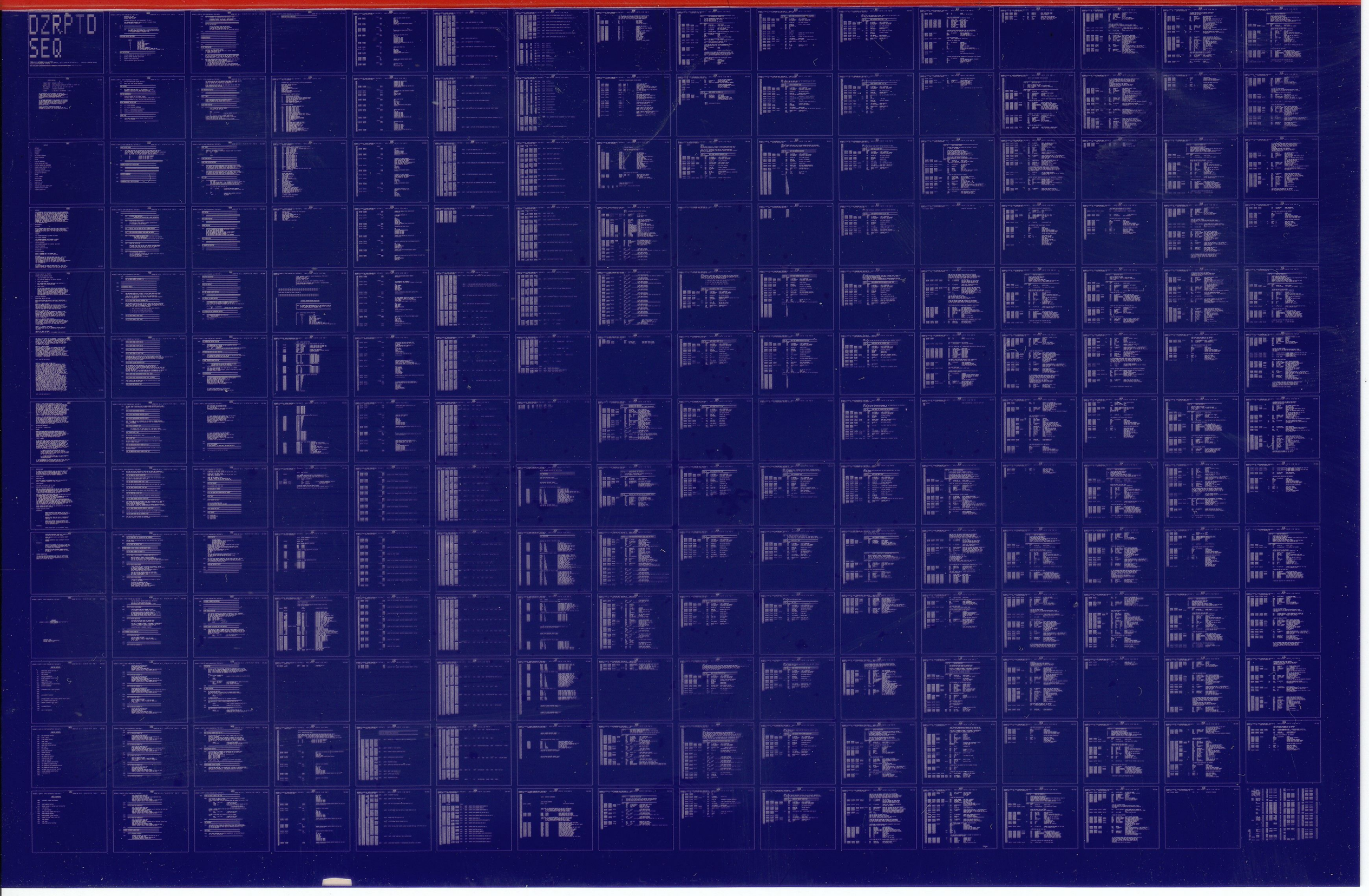

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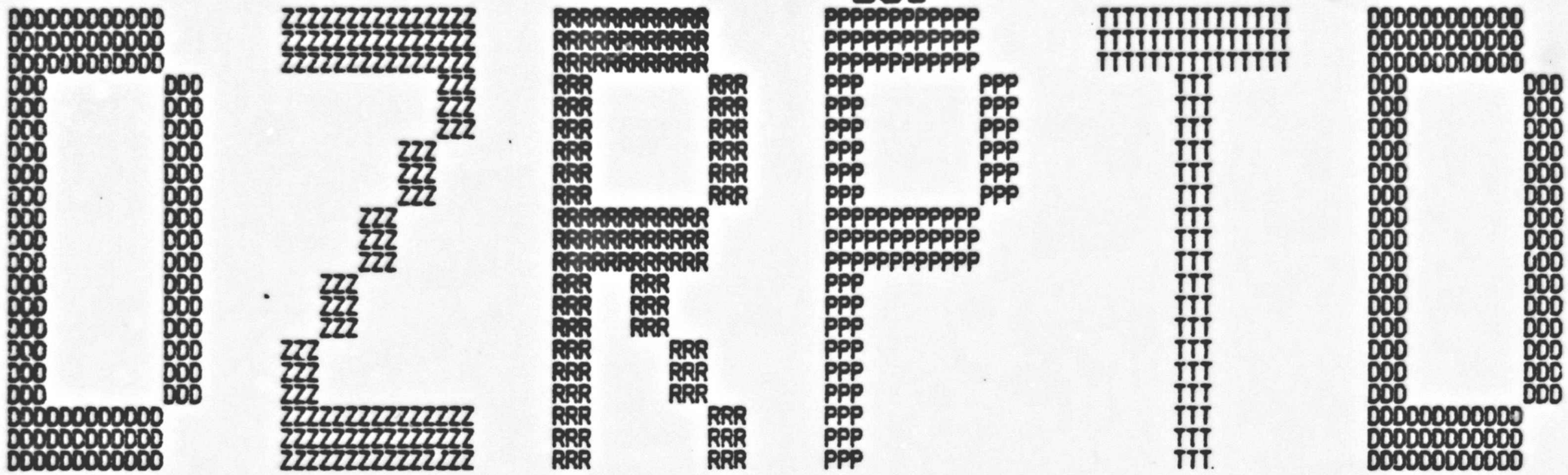

LPTSPL Version 100(2025) Running on MTA260
 START User WELLINGHAM,A [400,3722] Job DZRPTD Seq. 32 Date 09-Oct-75 17:17:49 Monitor RK213C KL10 SYS#1026 *START*
Request created: 09-Oct-75 17:12:43

[illegible] 09-Oct-75 17:17:50

C01

IDENTIFICATION

SEQ 0001

PRODUCT CODE: MAINDEC-11-DZRPT-D-D

PRODUCT NAME: RJP04 DISKLESS CONTROLLER TEST-PART II (STATIC 1B)

DATE CREATED: OCT 1974, MAR 1975, MAY 1975, AUG 1975

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: S. MALLICK, H. BLACKSTONE, J. KELLY

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D01

CONTENTS

SEQ 0002

1.0 ABSTRACT

THIS DIAGNOSTIC TESTS THE RH11 AND DCL OF AN RP04 SUBSYSTEM. IT DOES NOT USE THE DISK SURFACE OR ANY SIGNALS FROM THE MDLI. IT REQUIRES THAT THE DCL CABLE BE PLUGGED INTO THE MDLI OR BE APPROPIATELY TERMINATED. IF THE DISK IS POWERED UP, IT IS REQUIRED TO GET THE DISK TO THE "HEADS UNLOADED" POSITION. AFTER A SUCCESSFUL RUN (WITH NO ERRORS) OF THIS DIAGNOSTIC IT CAN BE ASSERTED THAT, "THAT PART OF THE DCL THAT HANDLES DATA OR DATA ASSOCIATED LOGIC IS WORKING PROPERLY". THIS IMPLIES THAT, THAT PART OF THE LOGIC WHICH HANDLES MECHANICAL COMMANDS OR ITS ASSOCIATED LOGIC IS NOT TESTED IN THIS DIAGNOSTIC. ALL DATA COMMANDS USE THE MAINTENANCE REGISTER IN THE WRAPAROUND MODE.

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP-11 COMPUTER WITH CONSOLE TELETYPE, AND A RP04 DISK SYSTEM. THE RP04 DISK SYSTEM WILL CONSIST OF AN RH11 CONTROLLER, A DISK CONTROL LOGIC (DCL), THE CABLE FROM THE DCL CAN BE CONNECTED TO THE MDLI BUT IF NOT THAT CABLE MUST BE PROPERLY TERMINATED.

2.2 STORAGE

THIS PROGRAM REQUIRES 16K WORDS OF MEMORY.

2.3 PRELIMINARY PROGRAMS

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

3.0 LOADING PROCEDURE

USE STANDARD PROCEDURE FOR LOADING .ABS TAPES

4.0 STARTING PROCEDURE

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 RP04S 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

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 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 USED
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: ALSO 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: ALSO 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 - ECC TEST-COMPARE END RESULTS ONLY 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 ON ECC TESTS (TEST 120 THRU TEST 134) INSTEAD OF COMPARING CONTENTS OF THE POSITION AND PATTERN REGISTERS AFTER EVERY CLOCK, COMPARES WILL BE DONE ONLY AT THE END OF ALL THE CLOCKS.

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 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 BECOMES UNAVAILABLE TO THE CONTROLLER, POWERS DOWN, OR CERTAIN CRITICAL STATUS BITS CANNOT BE CLEARED PRIOR TO THE START OF A TEST 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 FAILURE 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 DZRPS 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

IF THERE IS A DRIVE CONNECTED THEN THE OPERATOR MUST HAVE THE DRIVE PORT SWITCH LOCKED EITHER ON PORT A OR PORT B BUT NEVER LEAVE IT IN THE PROGRAMMABLE STATE. IF THERE IS NO DRIVE CONNECTED THEN THE CABLE NORMALLY GOING FROM THE DCL TO THE MDLI MUST BE PROPERLY TERMINATED.

8.0 MISCELLANEOUS

8.1 EXECUTION TIME

THE FIRST PASS OF THE PROGRAM WILL TAKE 1.75 MINUTES PER DRIVE. SUBSEQUENT PASSES WILL TAKE 7 MINUTE.

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 USAGE OF THESE LOOPS, HIT CONTROL 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

REVISION B:

1. ADDED READ/WRITE SETUP CHECKS TO THE 'DTE' TESTS (T12, T13 & T14) AND FIXED A BUG IN THE REGISTER SAVE PORTION OF THEIR READ/WRITE ROUTINES.

SEQ 0008

2. MODIFIED DVA, DPR, RDY, DRY & VV STATUS BIT CHECKS IN ALL TESTS TO HALT THE PROGRAM IF THEY FAIL.

3. ADDED DELAY BEFORE ISSUING DIAGNOSTIC MODE SECTOR PULSES (SP) TO ACCOUNT FOR THE SILO FILLING TIME DELAY BETWEEN ISSUING GO AND THE RUN LINE BECOMING HIGH.

REVISION C:

1. ADDED 28 NEW TESTS TO THIS PROGRAM. THESE /

TESTS WERE DEVELOPED FROM FAULT INSERTION TESTING ON THE RH11 USING "DZRPS". J01

2. ADDED REVISION DATE TO THE PROGRAM HEADER TYPE OUT.

3. CHANGED UNEXPECTED DRIVE INTERRUPT TYPE OUT MESSAGE.

REVISION D:

1. MODIFIED THE PROGRAM SO THAT WITH A LOAD AND START AT LOCATION 210, THE PROGRAM WOULD LOOP ON TESTING THE SELECTED UNIT EVEN IF THAT UNIT SHOULD FAIL TO RESPOND.

2. MODIFIED THE NON-STANDARD ADDRESS RESTART ROUTINE SO THAT THE TTY INTERRUPT BIT WOULD BE ENABLED.

9.0 PROGRAM DESCRIPTION

THE FOLLOWING SECTIONS DESCRIBE EACH TEST AND SUBROUTINES IN DETAIL AND CAN ALSO 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
****
MAINDEC-11-DZRPT-D, RJP04 DISKLESS RH11 TEST-PART 2
****

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                        PROGRAM BY SUB MALLICK, PETE BLACKSTONE, JIM KELLY

                        THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        PACKAGE (MAINDEC-11-DZQAC-A3).


                28      ***********************************

                30      ********************************************************************

                        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.

                        ********************************************************************

              ********************************************************************
        40    OPERATIONAL SWITCH SETTINGS
              ********************************************************************

                41
                                SWITCH          USE
                                ------          --------------------
                                  15            HALT ON ERROR
                                  14            LOOP ON TEST
                                  13            INHIBIT ERROR TYPEOUTS
                                  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            ECC TEST-COMPARE END RESULTS ONLY IF SW08 IS LOW

              ********************************************************************
        55    BASIC DEFINITIONS
              ********************************************************************

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

                68      GENERAL PURPOSE REGISTER DEFINITIONS

                80      PRIORITY LEVEL DEFINITIONS

                90      "SWITCH REGISTER" SWITCH DEFINITIONS
```

```
                118     DATA BIT DEFINITIONS (BIT00 TO BIT15)

                146     BASIC "CPU" TRAP VECTOR ADDRESSES

                        ;*****************************************************************
        161     TRAP CATCHER
                        ;*****************************************************************

                164     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

                        ;*****************************************************************
        168     STARTING ADDRESS(ES)
                        ;*****************************************************************

                175     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

                        ;*****************************************************************
        181     MEMORY MANAGEMENT DEFINITIONS
                        ;*****************************************************************

                183     KT11 VECTOR ADDRESS

                187     KT11 STATUS REGISTER ADDRESSES

                194     KERNAL "I" PAGE DESCRIPTOR REGISTERS

                205     KERNAL "I" PAGE ADDRESS REGISTERS

                218     ;*****************************************************************

                        ;*****************************************************************
        220     COMMON TAGS
                        ;*****************************************************************

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

                274     ;*****************************************************************
```

```
                ;*****************************************************************
276             ;ERROR POINTER TABLE
                ;*****************************************************************

278             ;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:

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

922             ;*****************************************************************
                ;*****************************************************************

                ;*****************************************************************
2001            ;HARDWARE REGISTER BIT DEFINITIONS
                ;*****************************************************************

2004            ;*****************************************************************
                ;*****************************************************************

2040            ;*****************************************************************
                ;*****************************************************************

                ;*****************************************************************
                ;*****************************************************************
2237            ;REGISTER ADDRESSES
                ;*****************************************************************

                ;*****************************************************************
2397
                ;*****************************************************************

                ;*****************************************************************
2398            ;***PROGRAM SETUP & SETUP TESTS***
                ;*****************************************************************
```

```
                ;*****************************************************************
2399            ;*****************************************************************

2513            ;*****************************************************************
                ;TEST 1  REFERENCE EACH REGISTER
                ;               REFERENCE EACH REGISTER BY A MOVE INSTRUCTION
                ;*****************************************************************

2555            ;*****************************************************************
                ;TEST 2  RHCS2-CONTROL AND STATUS 2

2558            ;       THIS PARTIALLY TESTS RHCS2 TO ENABLE DETERMINATION
                ;       OF THE NUMBER OF DRIVES PRESENT

2561            ;*****************************************************************

2579            ;*****************************************************************
                ;TEST 3  PARTIAL TEST FOR RHAS FOR UNIT NUMBERS PRESENT
                ;*****************************************************************

2596            ;*****************************************************************
                ;TEST 4  TEST FOR DRIVES PRESENT USING RHAS AND RHCS2
                ;*****************************************************************

2711            ;*****************************************************************
                ;TEST 5  TEST SERIAL NUMBER AND DRIVE TYPEI
                ;               READ SERIAL NUMBER REGISTER AND DRIVE TYPE REGISTER
                ;               TYPE IT OUT AND PROCEED
                ;               TO LOOP HERE SET SWITCH 8 AND THIS TEST NO AND RESTART

2717            ;*****************************************************************

2752            ;*****************************************************************
                ;TEST 6  CHECK MOL TO BE LOW

2755            ;       MAKE SURE THAT DRIVE IS OFF LINE BEFORE STARTING PROGRAM
                ;       IF DRIVE IS ON LINE THEN AFTER TYPE OUT THE PROGRAM WILL
                ;       HANG FOR EVER WAITING FOR DRIVE TO GO OFF LINE

2759            ;*****************************************************************

2789            ;*****************************************************************
                ;TEST 7  PACK ACKNOWLEDGE COMMAND TEST

2792            ;       THE PACK ACKNOWLEDGE COMMAND WILL BE LOADED INTO RHCS1 WITH GO
                ;       THEN ALL REGISTERS WILL BE CHECKED
                ;       RH CLEAR WILL BE GIVEN
                ;       THEN ALL REGISTERS WILL BE CHECKED
```

```
2797    ;*****************************************************************

2854    ;*****************************************************************
        ;TEST 10 MAKE CURRENT CYLINDER = 0
        ;*****************************************************************

        ;*****************************************************************
2866
        ;*****************************************************************

        ;*****************************************************************
2867    ;***DIAGNOSTIC CODE***
        ;*****************************************************************

        ;*****************************************************************
2868
        ;*****************************************************************

2871    ;THE FOLLOWING TESTS WILL ATTEMPT TO CATCH THOSE BUGS WHICH FAULT
        ;INSERTION HAS SHOWN US WE MISSED IN THE FIRST PART OF THIS TEST.
        ;
        ; THIS TEST WILL ASCERTAIN THAT THE ALL RH11 REGISTERS WIIL
        ;RESPOND TO I.E. NOT CAUSE A NON-EXISTANT MEMORY ERROR WHEN ACCESSED
        ;BY A "TST" INSRUCTION.

2878    ;*****************************************************************
        ;TEST 11 BCTA LEGAL REGISTER RESPONSE TEST
        ;*****************************************************************

2907    ;THE FOLLOWING 6 TESTS WILL TEST THE BYTE LOGIC FOR THE RH11 REGISTERS
        ;NO ATTEMPT IS MADE TO DETERMINE IF ALL POSSIBLE DATA PATTERNS CAN BE
        ;LOADED, ONLY THAT THE RH11 HARDWARE WILL ALLOW THE PROGRAM TO SELECTIVLY
        ;MANIPULATE BYTES USING THE FOLLOWING COMMANDS:
        ;
        ;       1). MOVE BYTE BOTH TO AND FROM THE WORD COUNT REGISTER
        ;
        ;       2). BIT SET INTO THE WORD COUNT REGISTER.
        ;
        ;       3). BIT CLEAR INTO THE WORD COUNT REGISTER.

2920    ;*****************************************************************
        ;TEST 12 BCTA MOVB LO BYTE TO WC
        ;*****************************************************************

2944    ;*****************************************************************
        ;TEST 13 BCTA MOVB HI BYTE TO WC
        ;*****************************************************************
```

```
2974    ;*****************************************************************
        ;TEST 14 BCTA BISB LO BYTE TO WC
        ;*****************************************************************

3001    ;*****************************************************************
        ;TEST 15 BCTA BISB HI-BYTE TO WC
        ;*****************************************************************

3032    ;*****************************************************************
        ;TEST 16 BCTA BICB LO-BYTE TO WC
        ;*****************************************************************

3060    ;*****************************************************************
        ;TEST 17 BCTA BICB HI- BYTE TO WC
        ;*****************************************************************

3092    ;THIS TEST ATTEMPT TO ACCESS AN ILLEGAL REGISTER WITHIN THE RANGE
        ;OF ADDRESSES SELECTED BY THE XOR'S. THE RH11 ADDRESS DECODE LOGIC WILL ALLOW UP TO 32
        ;CONTIGOUS REGISTERS TO EXIST IN OUR CONFIGURATION ONLY 16 WILL REALLY
        ;EXIST THIS TEST ATTEMPTS TO ACCESS THE 20(8) REGISTER IF IT RESPONDS
        ;THE TEST WILL TYPE OUT AN ERROR

3099    ;*****************************************************************
        ;TEST 20 BCTA ILLEGAL REGISTER TEST
        ;*****************************************************************

3128    ;THE FOLLOWING TWO TESTS DETERMINE IF ALL NON DRIVES SET THE
        ;NED BIT AND THAT ALL EXISTING DRIVES CLEAR THE NED BIT.
        ;THE TESTS LOOK AT TOTALAT TO DETERMINE WHICH DRIVES EXIST AND TEST THAT
        ;THESE DRIVES WILL CLEAR THE NED BIT. AND ALSO THAT NON EXISTANT DRIVES
        ;WILL SET THE NED BIT.
        ;ON FIRST PASS ONLY, IF ALL DRIVES ARE ON LINE A MESSAGE WILL SO ADVISE THE
        ;OPERATOR. THE TEST WILL CONTINUE REGARLESS OF THE OPERATORS ACTION.

3136    ;*****************************************************************
        ;TEST 21 BCTB (NED) NON-EXISTANT DRIVE TEST. (SET)
        ;*****************************************************************

3206    ;*****************************************************************
        ;TEST 22 BCTB (NED) NON-EXISTANT DRIVE TEST. (CLEARED)
        ;*****************************************************************

3247    ;TEST TO SEE IF WE CAN READ FROM THE "AS" REGISTER AND NOT CAUSE
        ;A NED NON-EXISTANT DRIVE ERROR

3250    ;*****************************************************************
        ;TEST 23 BCTB AS REGISTER TEST
        ;*****************************************************************
```

```
                THE NEXT THREE TESTS WILL TEST THE BUS ADDRESS REGISTER IN BOTH WORD
                AND BYTE MODE. THE PATTERNS ARE CHOSEN TO PICK UP ANY DROPPED OR STUCK
                BITS.

                ;*****************************************************************
                ;TEST 24 BCTC BUS ADDRESS REGISTER
                ;*****************************************************************

                ;*****************************************************************
                ;TEST 25 BCTC BUS ADDRESS REGISTER LO-BYTE
                ;*****************************************************************

                ;*****************************************************************
                ;TEST 26 BCTC BUS ADDRESS REGISTER HI-BYTE
                ;*****************************************************************

                THIS TEST CAUSE AN RH11 INTERRUPT VIA THE SPECIAL COMMAND SEQUENCE
                BIS     #IE,@RHCS2. THIS TEST PROVES ONLY THAT THE HARDWARE CAN HANDLE
                INTERRUPTS PROPERLY

                ;*****************************************************************
                ;TEST 27 RH11 INTERRUPT TEST
                ;*****************************************************************

                        THE PROGRAM SETS THE PORT SELECT BIT .THEN DOES A RESET
                        IF THE SIGNAL CLR L WAS GENERATED THE PORT SELECT BIT WILL CLEAR.

                ;*****************************************************************
                ;TEST 30 BCTD CLR L TEST
                ;*****************************************************************

                SET THE MXF FLOP AND READ IT BACK.

                ;*****************************************************************
                ;TEST 31 MXF TEST
                ;*****************************************************************

                SET THE UNIBUS PARITY ERROR FLOP DIRECTLY VIA A MOV #UPE TO RHCS2
                ATTEMPT TO READ IT BACK.

                ;*****************************************************************
                ;TEST 32 CSRB UNIBUS PARITY ERROR SET TEST
                ;*****************************************************************

                SET THE UNIBUS PARITY ERROR FLOP AND ATTEMPT TO CLEAR IT WITH A
                CONTROLLER CLEAR.

                ;*****************************************************************
                ;TEST 33 CSRB UNIBUS PARITY ERROR CLEAR TEST
                ;*****************************************************************
```

```
3605    SET THE UNIT SELECT REGISTER TO DRIVE #7 ALL BITS SET. GENERATE A
        CONTROLLER CLEAR AND VERIFY THAT THE UNIT SELECT REGISTER IS CLEARED.

3608    ****************************************************************
        TEST 34 CSRB UNIT SELECT CLEAR TEST
        ****************************************************************

3638    SET THE UPE FLOP UNIBUS PARITY ERROR. VERIFY THAT THE SETTING OF (UPE)
        ALSO SETS THE TRANSFER ERROR (TRE) FLOP

3641    ****************************************************************
        TEST 35 CSRB TRANSFER ERROR (TRE) - UPE
        ****************************************************************

3669    SET THE NED BIT NON EXISTANT DRIVE VERIFY THAT THIS SETS THE (TRE) BIT.

3671    ****************************************************************
        TEST 36 CSRB TRANSFER ERROR (TRE) NED
        ****************************************************************

3708    SET THE PORT SELECT FLOP VERIFY THAT WE CAN READ IT BACK.

3710    ****************************************************************
        TEST 37 CSRA PSEL CLEAR TEST
        ****************************************************************

3736    VERIFY THAT CONTROLLER CLEAR WILL CLEAR THE COMMAND REGISTER.

3739    ****************************************************************
        TEST 40 CSRB COMMAND REGISTER CLEAR TEST
        ****************************************************************

3766    THE COMMAND REGISTER IS SUPPOSED TO BE SELF CLEARING THAT IS WHEN THE
        RH11 IS SELECTED WHEATHER OR NOT WE ADDRESS IT DIRECTLY THE LOGIC
        SHOULD CLEAR THE COMMAND REGISTER.
        THIS IS TESTED BY LOADING A COMMAND INTO IT READING ANOTHER REGISTER
        THAN RETURNING TO CHECK THE COMMAND REGISTER TO DETERMINE IF IT CLEARED.

3772    ****************************************************************
        TEST 41 CSRB COMMAND REGISTER RESELECT CLEAR TEST
        ****************************************************************

3801    HERE WE TEST TO SEE IF SETTING (IE) AND (RDY) WILL CAUSE AN INTERRUPT.

3803    ****************************************************************
        TEST 42 CSRB READY AND IE INTERRUPT TEST
        ****************************************************************

3832    THE (IE) BIT IS SET CAUSING AN INTERRUPT. AT THE COMPLETION OF THE INTERRUPT
        WE CHECK TO SEE IF THE (IE) BIT HAS CLEARED.
```

```
3835    ;*****************************************************************
        ;TEST 43 CSR8 BOES "IE" CLEAR AFTER AN INTERRUPT
        ;*****************************************************************

3871    ;HERE WE VERIFY THAT WRITING INTO THE "AS" REGISTER OWILL NOT CAUSE
        ;AN (NED) ERROR.

3874    ;*****************************************************************
        ;TEST 44 BCTB "AS" WRITE TEST
        ;*****************************************************************

;*****************************************************************
3907    ;EXTENDED MEMORY, DRIVE TIMING & SECTOR SELECT TESTS
;*****************************************************************

3910    ;*****************************************************************
        ;TEST 45 MAKE CURRENT CYLINDER = 0
        ;*****************************************************************

3927    ;*****************************************************************
        ;TEST 46 RHCS1 - BITS 8 AND 9 - EXTENDED ADDR (A16 & A 17)

3930    ;       WRITE CYLINDER 0, FORMAT 16 BITS PER WORD
        ;       TRACK 0, SECTOR 0, KEYS 0, NUMBER OF WORDS 256
        ;       DATA IS THE CONTENTS OF THE TTY READER STATUS REGISTER
        ;       THIS WILL USE BITS A16 AND A17 WHEN THERE IS MORE THAN 28K OF MEMORY

3935    ;*****************************************************************

4014    ;*****************************************************************
        ;TEST 47 DRIVE TIMING ERROR

4017    ;       A READ HEADER AND DATA IS STARTED ON CYLINDER 0, SECTOR
        ;       0, TRACK 0, 260 WORDS.  AFTER THE HEADER IS READ IN CORRECTLY,
        ;       NO SYNC BYTE (DATA SYNC) IS GIVEN.
        ;       THEN NORMAL DIAGNOSTIC DATA CLOCKS AND DIAGNOSTIC
        ;       SECTOR CLOCKS ARE GIVEN FOR 24 BYTES.
        ;
        ;       THEN 536 BYTES OF SECTOR CLOCKS ONLY ARE GIVEN.
        ;       THIS IS TO TO BRING SECTOR PULSE UP WHICH SHOULD
        ;       SET "DRIVE TIMING ERROR" - 'DTE'
        ;*****************************************************************

4189    ;*****************************************************************
        ;TEST 50 DRIVE TIMING ERROR

4192    ;       A WRITE DATA COMMAND IS STARTED ON CYLINDER 0, SECTOR
        ;       0, TRACK 0, 256 WORDS.
        ;
        ;       THE SECTOR IS SEARCHED FOR AND
        ;       AFTER THE HEADER IS READ IN CORRECTLY,
        ;       NO SYNC BYTE (DATA SYNC) IS GIVEN.
        ;       NORMAL DIAGNOSTIC DATA CLOCKS AND DIAGNOSTIC
        ;       SECTOR CLOCKS ARE GIVEN FOR 24 BYTES,
```

```
                THEN 536 BYTES OF SECTOR CLOCKS ONLY, ARE GIVEN.

                THIS IS TO TO BRING SECTOR PULSE UP
                WHICH SHOULD SET "DRIVE TIMING ERROR" - 'DTE'
        ;*****************************************************************

4355    ;*****************************************************************
        TEST 51 DRIVE TIMING ERROR

4358            A WRITE HEADER AND DATA COMMAND IS GIVEN
                TO CYLINDER 0, SECTOR 0, TRACK 0, 256. WORDS.

                AFTER SECTOR IS FOUND (THE SECTOR FOUND FLOP IS HIGH),
                NO MORE DIAGNOSTIC DATA CLOCKS ARE GIVEN,
                ONLY SECTOR CLOCKS ARE GIVEN TILL SECTOR PULSE IS HIGH.
                THIS SHOULD SET "DRIVE TIMING ERROR" - 'DTE'
        ;*****************************************************************

4492    ;*****************************************************************
        TEST 52 SECTOR SELECTION

4495            THE SECTOR SELECTION LOGIC IS CHECKED HERE
                EACH SECTOR ON TRACK ZERO IS WRITTEN INTO.

                DATA IS - 19 WORDS OF ZEROS - SYNC WORDS, 4 HEADER WORDS
                1 CRC WORD, 5 WORDS OF ZEROS, 1 SYNC WORD, 100 ZEROS
                (DATA), 1 SYNC WORD, 70 SECTOR NUMBER TO VARY

                THE WRITTEN DATA IS CHECKED IN MEMORY

        4504    ;*****************************************************************

        ;*****************************************************************
4665    DATA TRANSFER TESTS USING ECC
        ;*****************************************************************

        4669    ;*****************************************************************
                TEST 53 WRITE ECC TEST 1

4672            THIS IS A WRITE ECC TEST
                WRITE CYLINDERO, FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 1, KEYS 0, NUMBER OF WORDS 256
                OF ALL ZEROS.

        4677    ;*****************************************************************

        4819    ;*****************************************************************
                TEST 54 READ ECC ENABLED 1A
```

```
4822            THIS IS AN ECC READ DATA TEST
                ERROR CORRECTION IS ENABLED
                NO ERROR IS INSERTED
                GOOD DATA USED IS 256 WORDS OF 0
                COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA

4829    ****************************************************************

4992    ****************************************************************
        TEST 55 READ ECC ENABLED 18

4995            THIS IS AN ECC READ DATA TEST
                ERROR CORRECTION IS ENABLED
                A CORRECTABLE ERROR IS INSERTED IN BIT POSITION 32
                GOOD DATA USED IS 256 WORDS OF 0
                COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA

5002    ****************************************************************

5172    ****************************************************************
        TEST 56 READ ECC ENABLED 1C

5175            THIS IS AN ECC READ DATA TEST
                ERROR CORRECTION IS ENABLED
                A NON CORRECTABLE ERROR IS INSERTED IN BIT POSITION 21 THRU 32
                GOOD DATA USED IS 256 WORDS OF 0
                COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA

5182    ****************************************************************

5364    ****************************************************************
        TEST 57 WRITE ECC TEST 2

5367            THIS IS A WRITE ECC TEST
                WRITE CYLINDER 0, FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 1, KEYS 0, NUMBER OF WORDS 256
                OF ALL ONES.

5372    ****************************************************************

5515    ****************************************************************
        TEST 60 READ ECC ENABLED 2A

5518            THIS IS AN ECC READ DATA TEST
                ERROR CORRECTION IS ENABLED
                NO ERROR IS INSERTED
                GOOD DATA USED IS 256 WORDS OF 177777
                COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
```

```
5525    ************************************************************

5685    ************************************************************
        TEST 61 READ ECC ENABLED 2B

5688            THIS IS AN ECC READ DATA TEST
                ERROR CORRECTION IS ENABLED
                A CORRECTABLE ERROR IS INSERTED IN BIT POSITION 32
                GOOD DATA USED IS 256 WORDS OF 177777
                COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA

5695    ************************************************************

5861    ************************************************************
        TEST 62 READ ECC ENABLED 2C

5864            THIS IS AN ECC READ DATA TEST
                ERROR CORRECTION IS ENABLED
                A NON CORRECTABLE ERROR IS INSERTED IN BIT POSITION 32 AND 21
                GOOD DATA USED IS 256 WORDS OF 177777
                COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA

5871    ************************************************************

6048    ************************************************************
        TEST 63 WRITE ECC TEST 3

6051            THIS IS A WRITE ECC TEST
                WRITE CYLINDER 0, FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 1, KEYS 0, NUMBER OF WORDS 256
                OF ALL 52525.

6056    ************************************************************

6193    ************************************************************
        TEST 64 READ ECC ENABLED 3A

6196            THIS IS AN ECC READ DATA TEST
                ERROR CORRECTION IS ENABLED
                NO ERROR IS INSERTED
                GOOD DATA USED IS 256 WORDS OF 52525
                COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA

6203    ************************************************************

6356    ************************************************************
        TEST 65 READ ECC ENABLED 3B
```

```
                6359            THIS IS AN ECC READ DATA TEST
                                ERROR CORRECTION IS ENABLED
                                A CORRECTABLE ERROR IS INSERTED IN BIT POSITION 4128
                                THIS IS THE LAST BIT OF THE ECC
                                GOOD DATA USED IS 256 WORDS OF 52525
                                COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                                TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA

                6367    ****************************************************************

                6540    ****************************************************************
                        TEST 66 READ ECC ENABLED 3C

                6543            THIS IS AN ECC READ DATA TEST
                                ERROR CORRECTION IS ENABLED
                                A NON CORRECTABLE ERROR IS INSERTED IN BIT POSITION 296 THRU 308
                                THIS IS IN WORD NUMBER 19 AND 20
                                GOOD DATA USED IS 256 WORDS OF 52525
                                COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                                TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA

                6551    ****************************************************************

                6730    ****************************************************************
                        TEST 67 READ ECC ENABLED 3D

                6733            THIS IS AN ECC READ DATA TEST
                                ERROR CORRECTION IS ENABLED
                                A NON CORRECTABLE ERROR IS INSERTED IN BIT POSITION 32 AND 4096
                                4096 IS THE LAST DATA BIT
                                GOOD DATA USED IS 256 WORDS OF 52525
                                COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                                TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA

                6741    ****************************************************************

                ****************************************************************
        6917    CURSORY INTERRUPT LOGIC TESTS
                ****************************************************************

                6921    ****************************************************************
                        TEST 70 PROGRAM INTERRUPT

                6924            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
                        ****************************************************************
```

```
                6958    ;*****************************************************************
                        ;TEST 71 INTERRUPT AT PROCESSOR AND DISK PRIORITY SAME
                6961    ;
                        ;       PROCESSOR PRIORITY IS SET AT 5 (SAME AS THE DISK)
                        ;       IE AND RDY IS SET. THIS SHOULD NOT INTERRUPT
                        ;*****************************************************************
                6991    ;*****************************************************************
                        ;********************************************************************
                        ;TEST 72 END OF DRIVE
                6995    ;
                        ;       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 PASS IS REACHED ONLY AFTER ALL DRIVES ARE COMPLETE
                7000    ;*****************************************************************
                        ;*****************************************************************
        7037
                        ;*****************************************************************
                        ;*****************************************************************
        7038            ;***SUBROUTINES***
                        ;*****************************************************************
                        ;*****************************************************************
        7039
                        ;*****************************************************************
                7044    ;*****************************************************************
                        ;*****************/***********************************************
        7046            ;END OF PASS ROUTINE
                        ;*****************************************************************
                7048    ;       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
                7090    ;*****************************************************************
                        ;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.
                7095    ;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.
                ;*****************************************************************

        ;*****************************************************************
7168    SAVE REGISTERS ROUTINE
        ;*****************************************************************

        7170    ;*****************************************************************
                ;*****************************************************************

        ;*****************************************************************
7195    FLOAT 1 AND 0
        ;*****************************************************************

        7197    ;*****************************************************************
                FLOAT A ONE AND A ZERO THRU A DESIGNATED REGISTER
                ABSOLUTE ADDRESS OF REG. UNDER TEST IS IN R4
                ;*****************************************************************

        ;*****************************************************************
7236    CLEAR MEMORY ROUTINE
        ;*****************************************************************

        7239    ;*****************************************************************
                THIS CLEARS ANY BLOCK OF MEMORY
                FILLING IT WITH ANY DATA

                CALL
                JSR     R0,CLAREA
                X                               ;STARTING ADDRESS OF BLOCK
                Y
                Z                               ;DATA TO BE FILLED
        R1 WILL HAVE STARTING ADDRESS OF BLOCK TO BE FILLED
        R2 AFTER SUBTRACTION WILL HAVE TWICE NUMBER OF LOCATIONS
        R3 WILL HAVE DATA TO BE FILLED
        TO AVOID DIVIDE ROUTINE TWO DECREMENT R2 WILL BE USED
        ;*****************************************************************
```

```
                ;*********************************************************************
7271            ;LOCAL TRAPS
                ;*********************************************************************

                7279    EXAMPLE OF THE USE OF THE ABOVE
                        THIS WILL LOOP BETWEEN X: AND SCOP1 PROVIDED THERE IS NO "NEWTST"
                        MOV     #X,     @#LAD
                        X:      ---     ---
                                ---     ---
                                ---     ---
                                SCOP1

                ;*********************************************************************
7288            ;CLEAR DISK ROUTINE
                ;*********************************************************************

                ;*********************************************************************
7301            ;CHECK DISK STATUS ROUTINES
                ;*********************************************************************

                7303    ;*****************************************************************
                        THIS CHECKS THAT DEVICE AVAILABLE (DVA) AND READY (RDY) IN RHCS1 = 1
                        AND CHECKS THAT DEVICE PRESENT (DPR), DEVICE READY (DRY) IN RHDS1 = 1
                        IT ALSO CHECKS THAT ALL OTHER BITS IN THESE REGISTERS = 0
                        ;*****************************************************************

                7361    ;*****************************************************************
                        THIS CHECKS THAT DEVICE AVAILABLE (DVA) AND READY (RDY) IN RHCS1 = 1
                        AND CHECKS THAT DEVICE PRESENT (DPR), DEVICE READY (DRY) IN RHDS1 = 1
                        IT DOES NOT CHECK THAT OTHER BITS IN THESE REGISTERS = 0
                        ;*****************************************************************

                ;*********************************************************************
7399            ;WAIT LOOP
                ;*********************************************************************

                7400    ;*****************************************************************
                                WAIT LOOP
                                ONE  LOOP OR ONE COUNT = 5.15 MICROSEC WITH BIPOLAR MEMORY (MIN)
                                ONE LOOP OR ONE COUNT = 11.86 MICROSEC WITH CORE (MIN)
                                WITH CORE ERROR IS INDICATED AFTER ABOUT 650 MILLISEC (MIN)
                        ;*****************************************************************

                7433            CALL FOR THE ABOVE WAITLOOP IS

                                MOV     @A,@#XS         ;A CONTAINS REGISTER ADDRESS
                                -       -       -       ;HENCE XS WILL HAVE ABSOLUTE REG. ADR.
                                -       -       -
                                -       -       -
                                WAT
                        XS:     0                       ;ABSOLUTE REG. ADDRESS UNDER WAIT
                                .WORD   0               ;BIT WAITED FOR
                                                        ;CONTINUE
```

```
                ;*****************************************************************
7444            ;SAVE ROUTINE
                ;*****************************************************************

7446            ;*****************************************************************
                ;*****************************************************************

                ;*****************************************************************
7474            ;WRITE CHECK ROUTINE
                ;*****************************************************************

7476            ;*****************************************************************
                ;*****************************************************************

                ;*****************************************************************
7518            ;COMPARE ROUTINE
                ;*****************************************************************

7520            ;*****************************************************************
                ;THIS IS A SUBROUTINE TO COMPARE TWO BLOCKS IN MEMORY
                ;R1 HAS GOOD DATA BUFFER ADDRESS
                ;R2 HAS TEST DATA BUFFER ADDRESS
                ;STMP0 HAS ADDRESS OF RETURN ON ERROR TO PRINT HEADER
                ;STMP1 HAS ADDRESS OF RETURN ON ERROR TO PRINT DATA
                ;R3 HAS NUMBER OF WORDS TO BE COMPARED
                ;R4 HAS ONE MORE THAN NUMBER OF WORDS TO BE COMPARED
                ;*****************************************************************

                ;*****************************************************************
7570            ;WRITE CHECK DATA
                ;*****************************************************************

7572            ;*****************************************************************
                ;*****************************************************************

                ;*****************************************************************
7616            ;CRC GENERATION ROUTINE
                ;*****************************************************************

7618            ;*****************************************************************

7644            ;*****************************************************************
```

```
                ;*****************************************************************
7710            ;SIMULATED DISK SETUP
                ;*****************************************************************

                7712    ;*************************************************************

                7722    ;*************************************************************

                ;*****************************************************************
7757            ;CHECK HCE ROUTINE
                ;*****************************************************************

                7759    ;*************************************************************

                7774    ;*************************************************************

                ;*****************************************************************
7905            ;EXIT WRT HEADER & DATA ROUTINE
                ;*****************************************************************

                7907    ;*************************************************************
                        ;*************************************************************

                ;*****************************************************************
7939            ;JAM CURRENT CYLINDER ROUTINE
                ;*****************************************************************

                7941    ;*************************************************************
                        ;THIS SUBROUTINE WILL CHANGE THE CURRENT CYLINDER REGISTER
                        ;THIS IS DONE BY GIVING A SEEK COMMAND THEN AN INIT
                        ;WHICH WILL LOAD THE CURRENT CYLINDER WITH THE DESIRED CYLINDER VALUE

                        ;CALL IS:
                        ;       JSR     R0,@#MAKECYL
                        ;       XC                      ;DESIRED VALUE OF CURRENT CYLINDER
                        ;*************************************************************

                ;*****************************************************************
7978            ;ECC GENERATION AND COMPARISON ROUTINE
                ;*****************************************************************

                7980    ;*************************************************************
                        ;THIS SUBROUTINE GENERATES AND TESTS ECC
                        ;CALL    JSR PC,ECTEST
                        ;*************************************************************

                8161    ;CHECK HARDWARE
```

```
                ;*****************************************************************
8208            ;ECC GENERATION CONTROL ROUTINE
                ;*****************************************************************

                8210    ;*************************************************************
                        ;THIS SUBROUTINE WILL CONTROL THE ECC GENERATION ROUTINE
                        ;FOR ERROR CORRECTION PROCESS
                        ;CALL    JSR,    PC,@#ECORR
                        ;        XP      ;EXPECTED POSITION REGISTER WHEN CORRECTION IS COMPLETE
                        ;*************************************************************

                ;*****************************************************************
8268            ;SOFTWARE DISK DATA ECC GEN. ROUTINE
                ;*****************************************************************

                8270    ;*************************************************************
                        ;THIS SUBROUTINE GENERATES THE ECC FOR WHAT IS ON DISK AND INSERTS THEM
                        ;ON LOCATIONS "DISK+1000" AND "DISK+1002"
                        ;*************************************************************

                ;*****************************************************************
8310            ;RH BASE ADDRESS CHANGE ROUTINE
                ;*****************************************************************

                8312    ;*************************************************************
                                ;THIS ROUTINE WILL ALLOW THE CHANGE OF THE BASE
                                ;ADDRESS FROM 176700 TO ANY TYPED VALUE
                        ;*************************************************************

                8378    ;THIS IS A LITTLE ROUTINE THAT TESTS NED BIT 11 IN RHCS2
                        ;THIS LOOPS HERE FOR EVER
                        ;TO BE USED ONLY IF DRIVES PRESENT LOOKING AT NED DOES NOT AGREE
                        ;WITH WHAT IS REALY THERE

                ;*****************************************************************
8390            ;DISK SIMULATION
                ;*****************************************************************

                8391    ;*************************************************************
                        ;*************************************************************
                        ;IN A WRITE HEADER AND DATA COMMAND FILL THE FOLLOWING
                        ;WCLY=WITH CYLINDER TO BE ON DISK
                        ;WSECTR=WITH SECTOR AND TRACK TO BE ON DISK
                        ;WKEY1= WITH KEY1 TO BE ON DISK
                        ;WKEY2= WITH KEY2 TO BE ON DISK
                        ;FNWORD= NO OF DATA WORDS TO BE WRITTEN ON DISK
                        ;THE COMMAND THEN IS   JSR PC,COMWHD



                        ;IN A WRITE DATA COMMAND FILL THE FOLLOWING
                        ;CYL=WITH CYLINDER TO BE FOUND ON DISK
                        ;SECOTR= WITH SECTOR AND TRACK TO BE FOUND ON DISK
```

```
                KEY1= WITH KEY1 TO BE FOUND ON DISK
                KEY2= WITH KEY2 TO BE FOUND ON JISK
                X= 1  MUST BE ONE
                NOWORD= WITH NUMBER OF DATA WORDS TO BE WRITTEN
                THE COMMAND THEN IS JSR PC,COMHD



                IN A READ HEADER AND DATA COMMAND FILL THE FOLLOWING
                CYL= WITH CYLINDER TO BE FOUND ON DISK
                SECOTR= WITH SECTOR AND TRACK TO BE FOUND ON DISK
                KEY1= WITH KEY1 TO BE FOUND ON DISK
                KEY2=WITH KEY2 TO BE FOUND ON DISK
                DAWORD= WITH NUMBER OF WORDS TO BE FOUND ON DISK
                ;X=0 MUST BE ZERO
                THE COMMAND THEN IS JSR PC,COMHD
```

```
                IN A READ DATA COMMAND FILL THE FOLLOWING
                CYL= WITH CYLINDER TO BE FOUND ON DISK
                SECOTR= WITH SECTOR AND TRACK TO BE FOUND ON DISK
                KEY1= WITH KEY1 TO BE FOUND ON DISK
                KEY2=WITH KEY2 TO BE FOUND ON DISK
                DAWORD= WITH NUMBER OF WORDS TO BE FOUND ON DISK
                ;X=0 MUST BE ZERO
                THE COMMAND THEN IS JSR PC,COMHD

8444

8451    ;*****************************************************************
                WRITE DATA COMMAND
                OR READ COMMAND, I.E DATA ONLY, OR HEADER AND DATA
                ;*****************************************************************

8554    ;*****************************************************************

8556    THE DISK SECTOR IS DEVIDED AS FOLLOWS
```

```
8558    19 WORDS OF 0, ONE WORD 144000
        THESE MAKE 39 BYTES FOR SECTOR GAP AND ONE SYNC. BYTE

8569    5 WORDS OF 0 ONE WORD 144000
        THESE MAKE 11 BYTES FOR HEADER GAP AND ONE SYNC. BYTE
        THESE ARE DCL GENERATED

8575    THERE ARE 256 WORDS OF DATA
        THERE ARE 2 WORDS FOR ECC GENERATED BY DCL
        15 WORDS OF 0 FOR DATA GAP AND TOLERANCE GAP
        ;*****************************************************************

8585    ;*****************************************************************
        READ DISK HEADER
        ;*****************************************************************

8683    READ COMMAND START FROM HERE

8712    ;*****************************************************************
        READ ONE WORD IN "WORD"
        ;*****************************************************************

8779    ;*****************************************************************
        WRITE ONE WORD WHICH COMES BACK IN "WWORD"
        ;*****************************************************************

8847    ;*****************************************************************
        WRITE DATA
        ;*****************************************************************

8920    ;*****************************************************************
        WRITE HEADER AND DATA


        THIS IS THE SIMULATED DISK
        ONLY ONE SECTOR OF SPACE IS ALLOWED
        ;*****************************************************************
        ;*****************************************************************

8953    ;*****************************************************************
        WRITE HEADER AND DATA
        ;*****************************************************************

9088    ;*****************************************************************
        WRITE HEADER
        ;*****************************************************************

9096    R0 = MAINT.REG.
        R1 = SIMULATED DISK
        R2 = BYTE COUNT
        R3 = WRITE WORD
        R5 = WORD COUNT
```

```
9237    ;*****************************************************************
        ;SEARCH SECTOR
        ;*****************************************************************

9246            ;R0=RHMR ADDRESS
                ;R1=PASSED ARGUMENT (SECTOR SEARCHED FOR)
                ;R2=CLOCK COUNT (PER BYTE)
                ;R3=SECTOR COUNTER FROM R1
                ;R5=BYTES PER WORD COUNT
        ;BEBORE INDEX IS GIVEN TWO SECTOR CLOCKS ARE GIVEN TO RESET
        ;SECTOR PULSE IN CASE IT IS SET
        ;AT BEGINNING OF EACH SECTOR ONE SECTOR CLOCK HAS TO RISE
        ;BEFORE CLOCK THEN EVERY EIGHT CLOCKS ONE SECTOR CLOCK IS
        ;IDENTICAL WITH CLOCK
        ;NUMBERING THE SECTOR CLOCKS AS FOLLOWS
        ;THE SECTOR CLOCK UNDER INDEX - 0
        ;THE NEXT - 1
        ;THE NEXT  - 2
        ;ETC.
        ;THEN THE LAST SECTOR CLOCK IN ONE SECTOR HAS NUMBER - 608
        ;THE NEXT SECTOR THEN HAS 608 SECTOR CLOCKS
        ;THE NEXT SECTOR THEN HAS ANOTHER 608 SECTOR CLOCKS
        ;AND SO ON

9295    ;FOR FIRST BYTE SECTOR CLOCK WILL GO HIGH THEN CLOCK WILL GO HIGH
        ;BOTH WILL COME DOWN TOGETHER THEN SEVEN CLOCKS WILL BE GIVEN
        ;;FOR SECOND BYTE AND ALL OTHER BYTES TILL NEXT SECTOR SECTOR CLOCK
        ;WILL BE IDENTICAL WITH ONE CLOCK

9350    ;*****************************************************************
        ;READ ONE SECTOR OF DATA
        ;*****************************************************************

9383    ;*****************************************************************

9392    ;*****************************************************************

        ;*****************************************************************
9394
        ;*****************************************************************
```

```
                ;*****************************************************************
9395            ;***SYSMAC LIBRARY ROUTINES***
                ;*****************************************************************

                ;*****************************************************************
9396
                ;*****************************************************************

                9400    ;*****************************************************************

                ;*****************************************************************
9402            ;SCOPE HANDLER ROUTINE
                ;*****************************************************************

                9404    ;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

                9474    ;*****************************************************************

                ;*****************************************************************
9476            ;CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
                ;*****************************************************************

                9478    ;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

                9542    ;*****************************************************************
```

```
                ;*********************************************************************
9544            ;TYPE ROUTINE
                ;*********************************************************************

9546            ;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

                ;2) USING A JSR INSTRUCTION
                ;       MOV     PS,-(SP)        ;;PUSH PROCESSOR STATUS WORD ON THE STACK
                ;       JSR     PC,$TYPE        ;;CALL TYPE ROUTINE
                ;       MESADDR                 ;;FIRST ADRESS OF MESSAGE

9589            ;*********************************************************************

                ;*********************************************************************
9591            ;TTY INPUT ROUTINE
                ;*********************************************************************

9600            ;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

9617            ;TK SERVICE ROUTINE
                ;THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT

9639            ;*********************************************************************
                ;THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                ;CALL:
                ;       RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY

9643            ;       RETURN HERE             ;;CHARACTER IS ON THE STACK

9659            ;*********************************************************************
                ;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
```

```
        9692    **************************************************************

                ********************************************************
        9694    READ AN OCTAL NUMBER FROM THE TTY
                ********************************************************

        9696    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

        9746    **************************************************************

                ********************************************************
        9748    ERROR HANDLER ROUTINE
                ********************************************************

        9750    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

        9792    **************************************************************

                ********************************************************
        9794    ERROR MESSAGE TYPEOUT ROUTINE
                ********************************************************

        9796    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.

        9849    **************************************************************
```

```
                ;*********************************************************************
9851            ;BINARY TO OCTAL (ASCII) AND TYPE
                ;*********************************************************************

9853            ;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

9927            ;*********************************************************************

                ;*********************************************************************
9929            ;TRAP DECODER
                ;*********************************************************************

9931            ;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.

                ;*********************************************************************
9944            ;TRAP TABLE
                ;*********************************************************************

9946            ;THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                ;BY THE "TRAP" INSTRUCTION.

9963            ;*********************************************************************
```

```
                ;*********************************************************************
9965            ;POWER DOWN AND UP,ROUTINES
                ;*********************************************************************
```

DZRPTD.SUB TABLE OF CONTENTS

```
                        .TITLE  MAINDEC-11-DZRPT-D, RJP04 DISKLESS RH11 TEST-PART 2
                        ;*COPYRIGHT (C) 1975
                        ;*DIGITAL EQUIPMENT CORP.
                        ;*MAYNARD, MASS. 01754
                        ;*
                        ;*PROGRAM BY SUB MALLICK, PETE BLACKSTONE, JIM KELLY
                        ;*
                        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        ;*PACKAGE (MAINDEC-11-DZQAC-A3).
                        ;*


;/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:
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;DRIVE MUST BE LOCKED ON PORT A OR PORT B

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



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

;*****************************************************************
;*
;*NOTE: ALL MACRO CALLS BEGINNING WITH ".S" 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
;*        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            ECC TEST-COMPARE END RESULTS ONLY IF SW08 IS 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
177776                  PS=     177776          ;;PROCESSOR STATUS WORD
                        .EQUIV  PS,PSW
177774                  STKLMT= 177774          ;;STACK LIMIT REGISTER
177772                  PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
177570                  SWR=    177570          ;;SWITCH REGISTER
177570                  DISPLAY=SWR

                        ;*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

                                .SBTTL  STARTING ADDRESS(ES)
                        000200          .=200

000200  000137  017346                  JMP     @#BEGIN         ;;JUMP TO STARTING ADDRESS OF PROGRAM
        000210                          .=210                           ;& STARTING ADDRESSES
000210  000137  017336                  JMP     @#BEGIN2                ;JUMP SELECT TEST

                                ;#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
```

```
                                .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

                                ;*KERNAL "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

                                ;*KERNAL "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.

                    000046                  .=46
000046  044034                  $ENDAD                  ;;LOGICAL END OF 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
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  OF 'GOOD' DATA
001122  000000                  $BDADR: .WORD   0        ;;CONTAINS  OF 'BAD' DATA
001124  000000                  $GDDAT: .WORD   0        ;;CONTAINS 'GOOD' DATA
001126  000000                  $BDDAT: .WORD   0        ;;CONTAINS 'BAD' DATA
001130  000000  000000  000000          .WORD   0,0,0    ;;RESERVED--NOT TO BE USED
001136  177560                  $TKS:   177560           ;;TTY KBD STATUS
001140  177562                  $TKB:   177562           ;;TTY KBD BUFFER
001142  177564                  $TPS:   177564           ;;TTY PRINTER STATUS REG.
001144  177566                  $TPB:   177566           ;;TTY PRINTER BUFFER REG.
001146  000                     $NULL:  .BYTE   0        ;;CONTAINS NULL CHARACTER FOR FILLS
001147  002                     $FILLS: .BYTE   2        ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001150  012                     $FILLC: .BYTE   12       ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001151  000                     $TPFLG: .BYTE   0        ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001152  000000                  $REGAD: .WORD   0        ;;CONTAINS THE  FROM
                                                         ;;WHICH  ($REG0) WAS OBTAINED
001154  000000                  $REG0:  .WORD   0        ;;CONTAINS (($REGAD)+0)
001156  000000                  $REG1:  .WORD   0        ;;CONTAINS (($REGAD)+2)
001160  000000                  $REG2:  .WORD   0        ;;CONTAINS (($REGAD)+4)
001162  000000                  $REG3:  .WORD   0        ;;CONTAINS (($REGAD)+6)
001164  000000                  $REG4:  .WORD   0        ;;CONTAINS (($REGAD)+10)
001166  000000                  $REG5:  .WORD   0        ;;CONTAINS (($REGAD)+12)
001170  000000                  $TMP0:  .WORD   0        ;;USER DEFINED
001172  000000                  $TMP1:  .WORD   0        ;;USER DEFINED
001174  000000                  $TMP2:  .WORD   0        ;;USER DEFINED
001176  000000                  $TMP3:  .WORD   0        ;;USER DEFINED
001200  000000                  $TMP4:  .WORD   0        ;;USER DEFINED
001202  000000                  $TMP5:  .WORD   0        ;;USER DEFINED
001204  000000                  $TIMES: 0                ;;MAX. NUMBER OF ITERATIONS
001206  000000                  $ESCAPE:0                ;;ESCAPE ON ERROR
001210  177607  000377            $BELL:  .ASCIZ  <207><377><377>  ;;CODE FOR BELL
001214  077                     $QUES:  .ASCII  /?/      ;;QUESTION MARK
```

```
  272  001215  015              $CRLF:  .ASCII  <15>          ;;CARRIAGE RETURN
  273  001216  000012           $LF:    .ASCIZ  <12>          ;;LINE FEED
```

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

                        .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

001220                  $ERRTB:



                        ;ITEM1
001220  002130                  EM1             ;WRONG DATA IN READING OR WRITING HARDWARE REGISTER
001222  005444                  DH1             ;PC
                                                ;REG. ADDR.
                                                ;GOOD DATA
                                                ;RECEIVED DATA
001224  011760                  DT1             ;$ERRPC,$TSTNM,REGADR,$GDDAT,$BDDAT
001226  012512                  DF1             ;0,0,0,0,0



                        ;ITEM2
001230  002213                  EM2             ;ERROR ON  DATA COMMAND

001232  010456                  DH33            ;PC
                                                ;PC OF JSR
                                                ;TEST NO
                                                ;WORD NO.
                                                ;GOOD DATA
                                                ;CONTENTS OF RHCS1
                                                ;CONTENTS OF RHDS1
                                                ;CONTENTS OF RHER1
001234  012344                  DT33            ;$ERRPC,PCJSR,$TSTNM,ERWORD,$GDDAT,CS1,DS1,ER1
001236  012662                  DF33            ;0,0,0,1,0,0,0,0


                        ;ITEM3
001240  002213                  EM2             ;ERROR ON  DATA COMMAND

001242  010241                  DH32            ;PC
```

```
                                                                ;PC OF JSR
                                                                ;TEST NO
                                                                ;WORD NO.
                                                                ;GOOD DATA
                                                                ;BAD DATA
                                                                ;CONTENTS OF RHCS1
                                                                ;CONTENTS OF RHDS1
                                                                ;CONTENTS OF RHER1
001244  012320                          DT32                  ;$ERRPC,PCJSR,$TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1
001246  012651                          DF32                  ;0,0,0,1,0,0,0,0,0,

                        ;ITEM4
001250  002213                          EM2                   ;ERROR ON  DATA COMMAND

001252  010043                          DH31                  ;PC
                                                              ;TEST NO
                                                              ;WORD NO.
                                                              ;GOOD DATA
                                                              ;BAD DATA
                                                              ;CONTENTS OF RHCS1
                                                              ;CONTENTS OF RHDS1
                                                              ;CONTENTS OF RHER1

001254  012276                          DT31                  ;$ERRPC,$TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1
001256  012641                          DF31                  ;0,0,1,0,0,0,0,0,


                        ;ITEM5
001260  000000                          0                     ;
001262  000000                          0                     ;
001264  012276                          DT31                  ;$ERRPC,$TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1
001266  012641                          DF31                  ;0,0,1,0,0,0,0,0,


                        ;ITEM6
001270  002242                          EM6                   ;ERROR ON WRITE HEADER AND DATA

001272  010241                          DH32                  ;PC
                                                              ;PC OF JSR
                                                              ;TEST NO
                                                              ;WORD NO.
                                                              ;GOOD DATA
                                                              ;BAD DATA
                                                              ;CONTENTS OF RHCS1
                                                              ;CONTENTS OF RHDS1
                                                              ;CONTENTS OF RHER1

001274  012320                          DT32                  ;$ERRPC,PCJSR,$TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1
001276  012651                          DF32                  ;0,0,0,1,0,0,0,0,0,
```

```
                                ;ITEM7
001300  002242                          EM6             ;ERROR ON WRITE HEADER AND DATA
001302  005562                          DH2             ;PC
                                                        ;TEST NO
                                                        ;WORD NO.
                                                        ;GOOD DATA
                                                        ;BAD DATA
001304  012006                          DT3             ;$ERRPC,$TSTNM,ERWORD,$GDDAT,$BDDAT
001306  012523                          DF3             ;0,0,1,0,0,

                                ;ITEM10
001310  000000                          0               ;
001312  000000                          0               ;
001314  012006                          DT3             ;$ERRPC,$TSTNM,ERWORD,$GDDAT,$BDDAT
001316  012523                          DF3             ;0,0,1,0,0,

                                ;ITEM11
001320  002301                          EM11            ;CONTROLLER OR DRIVE STATUS
001322  005674                          DH11            ;PC
                                                        ;TEST NO
                                                        ;FAILING REG. ADDR
                                                        ;CONTENTS OF RHCS1
                                                        ;CONTENTS OF RHCS2
                                                        ;CONTENTS OF RHDS1
                                                        ;CONTENTS OF RHER1
001324  012022                          DT11            ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001326  012530                          DF11            ;0,0,0,0,0,0

                                ;ITEM12
001330  002301                          EM11            ;WRONG DATA FROM SILO

001332  005444                          DH1             ;PC
                                                        ;REG.ADDR
                                                        ;GOOD DATA
                                                        ;RECEIVED DATA
001334  011760                          DT1             ;$ERRPC,REGADR,$GDDAT,$BDDAT
001336  012512                          DF1             ;0,0,0,0

                                ;ITEM13
001340  000000                          0
001342  000000                          0
001344  011760                          DT1             ;$ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT
001346  012512                          DF1             ;0,0,0,0,0

                                ;ITEM14
001350  002334                          EM14            ;REGISTER FAILED
001352  006051                          DH14            ;PC
                                                        ;FAILING REG. ADDR
```

```
                                                        ;CONTENTS OF FAILING REG.
                                                        ;CONTENTS OF RHCS1
                                                        ;CONTENTS OF RHCS2
                                                        ;CONTENTS OF RHDS1
                                                        ;CONTENTS OF RHER1
001354  012042                          DT14          ;$ERRPC,$BDADR,$BDDAT,CS1,CS2,DS1,ER1
001356  012537                          DF14          ;0,0,0,0,0,0,0

                                ;ITEM15
001360  002354                          EM15          ;SPECIFIED REG. NON EXISTANT SO ABORT
                                                      ;PROGRAM
001362  006250                          DH15          ;PC
                                                      ;ADDR. OF REG
001364  012064                          DT15          ;$ERRPC,TEMP1
001366  012547                          DF15          ;0,0

                                ;ITEM16
001370  002425                          EM16          ;WAIT LOOP FAILED
001372  006300                          DH16          ;PC
                                                      ;WAT PC
                                                      ;BIT WANTED
                                                      ;REG. ADR.
                                                      ;REG. CONT.
001374  012074                          DT16          ;$ERRPC,$TMP3,$TMP1,$TMP0,$BDDAT
001376  012552                          DF16          ;0,0,0,0

                                ;ITEM17
001400  002446                          EM17          ;WRITE CHECK FAILING
001402  006436                          DH17          ;PC
                                                      ;TEST NO
                                                      ;CONTENTS OF RHBA
                                                      ;CONTENTS OF RHDB
                                                      ;CONTENTS OF RHWC
                                                      ;CONTENTS OF RHCS1
                                                      ;CONTENTS OF RHCS2
001404  012112                          DT17          ;$ERRPC,$TSTNM,$BA,DB,WC,CS1,CS2
001406  012557                          DF17          ;0,0,0,0,0,0,0

                                ;ITEM20
001410  002472                          EM20          ;REGISTER FAILING
001412  006613                          DH20          ;PC
                                                      ;TST NO
                                                      ;CONTENTS OF RHER1
                                                      ;CONTENTS OF RHER2
                                                      ;CONTENTS OF RHER3
                                                      ;CONTENTS OF RHAS
                                                      ;CONTENTS OF RHDS1
001414  012132                          DT20          ;$ERRPC,TSTNM ER1,ER2,ER3,AS,DS1
001416  012566                          DF20          ;0,0,0,0,0,0,0
```

```
                                ;ITEM21
                                
001420  002513                          EM21            ;INTERRUPT FAILING
001422  006767                          DH21            ;PC
                                                        ;TEST NO
                                                        ;CONTENTS OF RHCS1
                                                        ;CONTENTS OF RHAS
                                                        ;CONTENTS OF RHDS1
001424  012152                          DT21            ;$ERRPC,TSTNM,CS1,AS,DS1
001426  012575                          DF21            ;0,0,0,0,0

                                ;ITEM22
001430  002535                          EM22            ;MISSMATCH IN DRIVE PRESENT
                                                        ;LOOKING AT RHAS AND RHCS2-NED(BIT#12)
                                                        ;DRIVE PRESENT DO NOT AGREE
                                                        ;NOTE: ON DUAL PORT SYSTEM
                                                        ;DRIVE ON OTHER PORT WILL NOT GIVE NED
                                                        ;HENCE THERE WILL BE A MISSMATCH
                                                        ;177777-MEANS NOT PRESENT
001432  007103                          DH22            ;PC
                                                        ;TEST NO
                                                        ;RHAS UNIT
                                                        ;RHCS2 UNIT
                                                        ;
001434  012166                          DT22            ;$ERRPC,TSTNM$,$GDDAT,$BDDAT
001436  012602                          DF22            ;0,0,0,0

                                ;ITEM23
001440  000000                          0               ;MISSMATCH IN DRIVE PRESENT
                                                        ;LOOKING AT RHAS AND RHCS2-NED(BIT#12)
                                                        ;DRIVE PRESENT DO NOT AGREE
                                                        ;177777-MEANS NOT PRESENT
001442  000000                          0               ;PC
                                                        ;TEST NO
                                                        ;RHAS UNIT
                                                        ;RHCS2 UNIT
                                                        ;
001444  012166                          DT22            ;$ERRPC,TSTNM$,$GDDAT,$BDDAT
001446  012602                          DF22            ;0,0,0,0

                                ;ITEM 24
001450  003136                          EM24            ;LOOK AHEAD REGISTER AT THE
                                                        ;BEGINNING OF A SECTOR IS IN
                                                        ;ERROR
001452  007177                          DH24            ;PC
                                                        ;RHDST
                                                        ;BAD RHLA
                                                        ;GOOD RHLA
                                                        ;SECTOR NO
                                                        ;SECTOR CLOCK
```

```
001454  012200                          DT24        ;$ERRPC,DST,$BDDAT,$TMP1,$TMP2,$TMP3
001456  012606                          DF24        ;0,0,0,0,0

                        ;ITEM 25
001460  003231                          EM25        ;LOOK AHEAD REGISTER IS
                                                    ;IN ERROR

001462  007177                          DH24        ;PC
                                                    ;RHDST
                                                    ;BAD RHLA
                                                    ;GOOD RHLA
                                                    ;SECTOR NO
                                                    ;SECTOR CLOCK
001464  012200                          DT24        ;$ERRPC,DST,$BDDAT,$TMP1,$TMP2,$TMP3
001466  012606                          DF24        ;0,0,0,0,0
                        ;ITEM26
001470  002301                          EM11        ;CONTROLLER OR DRIVE STATUS

001472  007355                          DH26        ;PC
                                                    ;PC OF JSR
                                                    ;FAILING REGISTER ADDRESS
                                                    ;CONTENTS OF RHCS1
                                                    ;CONTENTS OF RHCS2
                                                    ;CONTENTS OF RHDS1
                                                    ;CONTENTS OF RHER1

001474  012220                          DT26        ;$ERRPC,PCJSR,$BDADR,CS1,CS2,DS1,ER1
001476  012615                          DF26        ;0,0,0,0,0,0,0,

                        ;ITEM27
001500  002130                          EM1         ;ERROR IN READING OR WRITING HARDWARE REGISTER

001502  007553                          DH27        ;PC
                                                    ;PC OF JSR
                                                    ;TEST NUMBER
                                                    ;FAILING REGISTER
                                                    ;GOOD DATA
                                                    ;RECEIVED DATA

001504  012242                          DT27        ;$ERRPC,PCJSR,TSTNM,REGADR,$GDDAT,$BDDAT
001506  012625                          DF27        ;0,0,0,0,0,0

                        ;ITEM30
001510  003271                          EM30        ;CURRENT CYLINDER DOES NOT REFLECT DESIRED CYLINDER REG.
001512  007711                          DH30        ;PC
                                                    ;PC OF JSR
                                                    ;REGISTER ADDRESS
                                                    ;GOOD DATA
                                                    ;BAD DATA
```

```
598  001514  012260                          DT30            ;$ERRPC,PCJSR,REGADR,$GDDAT,$BDDAT
599  001516  012633                          DF30            ;0,0,0,0,0
600
601
602
603                                  ;ITEM31
604  001520  003413                          EM31            ;ECC GENERATED IS INCORRECT
605                                                          ;EVERY WORD IN THIS SECTOR IS GIVEN IN "DATA USED"
606
607  001522  010655                          DH34            ;PC
608                                                          ;TEST NUMBER
609                                                          ;GOOD ECC1
610                                                          ;GOOD EC2C
611                                                          ;WRITTEN ECC1
612                                                          ;WRITTEN ECC2
613                                                          ;DATA USED
614
615  001524  012366                          DT34            ;$ERRPC,TSTNM,GECC1,GECC2,WECC1,WECC2,DISK
616
617  001526  012672                          DF34            ;0,0,0,0,0,0,0
618
619
620                                  ;ITEM32
621  001530  003536                          EM32            ;ON READ COMMAND AFTER DATA AND ECC HAVE BEEN READ
622                                                          ;ECC REGISTER OR RHER1 IS IN ERROR
623                                                          ;ONLY LOWER 11 BITS OF PATTERN REGISTER
624                                                          ;CAN BE READ
625                                                          ;THIS SHUOLD MATCH LOWER 11 BITS OF ECC1
626
627  001532  011030                          DH35            ;PC
628                                                          ;TEST NUMBER
629                                                          ;GOOD ECC1
630                                                          ;GOOD ECC2
631                                                          ;PATTERN REGISTER
632                                                          ;RHER1
633
634  001534  012406                          DT35            ;$ERRPC,TSTNM,GECC1,GECC2,EC2,ER1
635
636  001536  012701                          DF35            ;0,0,0,0,0,0
637
638
639
640                                  ;ITEM33
641  001540  004025                          EM33            ;HIGH COUNT BIT NOT HIGH AFTER 38859 CLOCKS
642  001542  011225                          DH36            ;PC
643                                                          ;PC OF JSR
644                                                          ;TEST NUMBER
645                                                          ;RHMR
646                                                          ;POSITION REG.
647                                                          ;PATTERN REGISTER
648
649  001544  012430                          DT36            ;$ERRPC,PCJSR,TSTNM,MR,EC1,EC2
650
651  001546  012711                          DF36            ;0,0,0,0,0,0
```

```
                                ;ITEM34
001550  004077                          EM34            ;ZERO DETECT BIT NOT HIGH WHEN THE
                                                        ;32 BIT ECC REGISTER HAS ITS 21 BITS
                                                        ;OF ZEROS
                                                        ;ERROR PRINTOUT WILL CONTINUE TILL
                                                        ;ZERO DETECT BIT IS HIGH
001552  011225                          DH36            ;PC
                                                        ;PC OF JSR
                                                        ;TEST NUMBER
                                                        ;RHMR
                                                        ;POSITION REG.
                                                        ;PATTERN REGISTER
001554  012430                          DT36            ;$ERRPC,PCJSR,TSTNM,MR,EC1,EC2
001556  012711                          DF36            ;0,0,0,0,0,0

                                ;ITEM35
001560  004172                          EM35            ;POSITION REGISTER OR 11 BITS OF
                                                        ;PATTERN REGISTER INCORRECT
                                                        ;LOWER 11 BITS OF PATTERN REGISTER
                                                        ;SHOULD MATCH LOWER 11 BITS OF GOOD ECC1
                                                        ;DATA ENVELOPE AND N-CODE ZEROS ARE IN DECIMAL

001562  011363                          DH37            ;PC
                                                        ;TEST NUMBER
                                                        ;ECC POSITION
                                                        ;GOOD POSITION
                                                        ;GOOD ECC1
                                                        ;GOOD ECC2
                                                        ;ECC PATTERN
                                                        ;DATA ENVELOPE
                                                        ;N-CODE ZEROS
001564  012446                          DT37            ;$ERRPC,TSTNM,EC1,POSITI,GECC1,GECC2,EC2,DATENV,ZCODE
001566  012717                          DF37            ;0,0,0,0,0,0,0,0,0

                                ;ITEM36
001570  004471                          EM36            ;ON A READ COMMAND WITH NON CORRECTABLE
                                                        ;ERROR INSERTED DCK AND ECH SHOULD BE SET
001572  011030                          DH35            ;PC
                                                        ;TEST NUMBER
                                                        ;GOOD ECC1
                                                        ;GOOD ECC2
                                                        ;PATTERN REGISTER
                                                        ;POSITION REGISTER
                                                        ;RHER1
```

```
                                                    ;SERRPC,TSTNM,GECC1,GECC2,EC2,EC1,ER1
                                                    ;0,0,0,0,0,0,0
                                    ;ITEM37
                                                    ;ERROR ON  DATA COMMAND
                                                    ;WITH A16 A17 USED
                                                    ;PC
                                                    ;TEST NO
                                                    ;WORD NO.
                                                    ;GOOD DATA
                                                    ;BAD DATA
                                                    ;CONTENTS OF RHCS1
                                                    ;CONTENTS OF RHDS1
                                                    ;CONTENTS OF RHER1
                                                    ;SERRPC,STSTNM,ERWORD,SGDDAT,SBDDAT,CS1,DS1,ER1
                                                    ;0,0,1,0,0,0,0,0,
                                    ;ITEM40
                                                    ;
                                                    ;
                                                    ;SERRPC,STSTNM,ERWORD,SGDDAT,SBDDAT,CS1,DS1,ER1
                                                    ;0,0,1,0,0,0,0,0,
                                    ;ITEM41
                                                    ;THERE WAS A READ/WRITE HEADER & DATA
                                                    ;ERROR DURING 'DTE' TEST SETUP - THE
                                                    ;TEST IS ABORTED AT THAT POINT
                                                    ;PC
                                                    ;TEST NO
                                                    ;FAILING REGISTER ADDRESS
                                                    ;CONTENTS OF RHCS1
                                                    ;CONTENTS OF RHCS2
                                                    ;CONTENTS OF RHDS1
                                                    ;CONTENTS OF RHER1
                                                    ;SERRPC,STSTNM,SBDADR,CS1,CS2,DS1,ER1
                                                    ;0,0,0,0,0,0
```

```
                                ;ITEM 42
001630  012740                          EM42
001632  014405                          DH42
001634  014674                          DT42    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS.
001636  014732                          DF42

                                ;ITEM 43

001640  013023                          EM43
001642  014405                          DH42
001644  014674                          DT42    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS.
001646  014732                          DF42

                                ;ITEM 44

001650  013067                          EM44
001652  014462                          DH44
001654  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001656  014735                          DF44

                                ;ITEM 45
001660  013124                          EM45
001662  014462                          DH44
001664  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001666  014735                          DF44

                                ;ITEM 46

001670  013154                          EM46
001672  014462                          DH44
001674  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001676  014735                          DF44

                                ;ITEM 47

001700  013203                          EM47
001702  014405                          DH42
001704  014674                          DT42    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS.
001706  014732                          DF42

                                ;ITEM 50

001710  013235                          EM50
001712  014462                          DH44
001714  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001716  014735                          DF44

                                ;ITEM 51

001720  013273                          EM51
001722  014462                          DH44
001724  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001726  014735                          DF44
```

```
                                ;ITEM 52
                                
001730  013314                          EM52
001732  014462                          DH44
001734  014704                          DT44
001736  014735                          DF44
                                
                                ;ITEM 53
                                
001740  013354                          EM53
001742  014462                          DH44
001744  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001746  014735                          DF44
                                
                                ;ITEM 54
                                
001750  013416                          EM54
001752  014576                          DH54
001754  014720                          DT54    ;ERROR PC, TEST NUMBER.
001756  014742                          DF54
                                
                                ;ITEM 55
                                
001760  013455                          EM55
001762  014462                          DH44
001764  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001766  014735                          DF44
                                
                                ;ITEM 56
                                
001770  013470                          EM56
001772  014462                          DH44
001774  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001776  014735                          DF44
                                
                                ;ITEM 57
                                
002000  013506                          EM57
002002  014462                          DH44
002004  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
002006  014735                          DF44
                                
                                ;ITEM 60
                                
002010  013535                          EM60
002012  014462                          DH44
002014  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
002016  014735                          DF44
                                
                                ;ITEM 61
                                
002020  013535                          EM60
002022  014462                          DH44
```

```
                                        DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
                                        DF44

                                ;ITEM 62

                                        EM62
                                        DH44
                                        DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
                                        DF44

                                ;ITEM 63

                                        EM63
                                        DH44
                                        DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
                                        DF44

                                ;ITEM   64

                                        EM64
                                        DH44
                                        DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
                                        DF44

                                ;ITEM 65

                                        EM65
                                        DH44
                                        DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
                                        DF44

                                ;ITEM 66

                                        EM66
                                        DH44
                                        DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
                                        DF44

                                ;ITEM 67

                                        EM67
                                        DH54
                                        DT54    ;ERROR PC, TEST NUMBER.
                                        DF54

                                ;ITEM 70

                                        EM70
                                        DH54
                                        DT54    ;ERROR PC, TEST NUMBER.
                                        DF54

                                ;ITEM 71
```

FLTINS.ITM ERROR POINTER TABLE

```
917  002120  014356                    EM71
918  002122  014462                    DH44
919  002124  014704                    DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
920  002126  014735                    DF44
```

```
                                ;*****************************************************************
                                ;
                                ;ERROR AND MESSAGE TABLE CONDIMENTS
                                ;
                                ;*****************************************************************


002130  051127  047117  020107  EM1:    .ASCIZ  /WRONG DATA IN READING OR WRITING HARDWARE REGISTER/
002136  040504  040524  044440
002144  020116  042522  042101
002152  047111  020107  051117
002160  053440  044522  044524
002166  043516  044040  051101
002174  053504  051101  020105
002202  042522  044507  052123
002210  051105     000
002213     105  051122  051117  EM2:    .ASCIZ  /ERROR ON  DATA COMMAND/
002220  047440  020116  042040
002226  052101  020101  047503
002234  046515  047101  000104
002242  051105  047522  020122  EM6:    .ASCIZ  /ERROR ON WRITE HEADER AND DATA/
002250  047117  053440  044522
002256  042524  044040  040505
002264  042504  020122  047101
002272  020104  040504  040524
002300     000
002301     103  047117  051124  EM11:   .ASCIZ  /CONTROLLER OR DRIVE STATUS/
002306  046117  042514  020122
002314  051117  042040  044522
002322  042526  051440  040524
002330  052524  000123
002334  042522  044507  052123  EM14:   .ASCIZ  /REGISTER FAILED/
002342  051105  043040  044501
002350  042514  000104
002354  050123  041505  043111  EM15:   .ASCIZ  /SPECIFIED REGISTER NON EXISTANT SO ABORT/
002362  042511  020104  042522
002370  044507  052123  051105
002376  047040  047117  042440
002404  044530  052123  047101
002412  020124  047523  040440
002420  047502  052122     000
002425     127  044501  020124  EM16:   .ASCIZ  /WAIT LOOP FAILED/
002432  047514  050117  043040
002440  044501  042514  000104
002446  051127  052111  020105  EM17:   .ASCIZ  /WRITE CHECK FAILING/
002454  044103  041505  020113
002462  040506  046111  047111
002470  000107
002472  042522  044507  052123  EM20:   .ASCIZ  /REGISTER FAILING/
002500  051105  043040  044501
002506  044514  043516     000
```

```
  975  002513    111  052116  051105  EM21:   .ASCIZ  /INTERRUPT FAILING/
  976  002520 052522  052120  043040
  977  002526 044501  044514  043516
  978  002534    000
  979  002535    105  051122  051117  EM22:   .ASCII  /ERROR ON DRIVE PRESENT/<15><12>
  980  002542 047440  020116  051104
  981  002550 053111  020105  051120
  982  002556 051505  047105  006524
  983  002564    012
  984  002565    124  042510  052440          .ASCII  /THE UNIT NO'S FOUND BY SETTING RHAS/<15><12>
  985  002572 044516  020124  047516
  986  002600 051447  043040  052517
  987  002606 042116  041040  020131
  988  002614 042523  052124  047111
  989  002622 020107  044122  051501
  990  002630 005015
  991  002632 047504  047040  052117          .ASCII  /DO NOT AGREE WITH THE UNIT NO. FOUND FROM/<15><12>
  992  002640 040440  051107  042505
  993  002646 053440  052111  020110
  994  002654 044124  020105  047125
  995  002662 052111  047040  027117
  996  002670 043040  052517  042116
  997  002676 043040  047522  006515
  998  002704    012
  999  002705    122  041510  031123          .ASCII  /RHCS2-'NED' BIT #12/<15><12>
 1000  002712 023455  042516  023504
 1001  002720 041040  052111  021440
 1002  002726 031061  005015
 1003  002732 033461  033467  033467          .ASCII  /177777-MEANS NO UNIT FOUND/<15><12>
 1004  002740 046455  040505  051516
 1005  002746 047040  020117  047125
 1006  002754 052111  043040  052517
 1007  002762 042116  005015
 1008  002766 047516  042524  020072          .ASCII  /NOTE: ON DUAL PORT SYSTEM, DRIVE ON OTHER PORT WILL NOT GIVE/<15><12>
 1009  002774 047117  042040  040525
 1010  003002 020114  047520  052122
 1011  003010 051440  051531  042524
 1012  003016 026115  042040  044522
 1013  003024 042526  047440  020116
 1014  003032 052117  042510  020122
 1015  003040 047520  052122  053440
 1016  003046 046111  020114  047516
 1017  003054 020124  044507  042526
 1018  003062 005015
 1019  003064 047047  042105  026047          .ASCIZ  /'NED', HENCE THERE WILL BE AN EXTRA DRIVE/
 1020  003072 044040  047105  042503
 1021  003100 052040  042510  042522
 1022  003106 053440  046111  020114
 1023  003114 042502  040440  020116
 1024  003122 054105  051124  020101
 1025  003130 051104  053111  000105
 1026  003136 047514  045517  040440  EM24:   .ASCIZ  /LOOK AHEAD REGISTER AT THE BEGINNING OF SECTOR IS IN ERROR/
 1027  003144 042510  042101  051040
 1028  003152 043505  051511  042524
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 1029  003160  020122  052101  052040
 1030  003166  042510  041040  043505
 1031  003174  047111  044516  043516
 1032  003202  047440  020106  042523
 1033  003210  052103  051117  044440
 1034  003216  020123  047111  042440
 1035  003224  051122  051117     000
 1036  003231     114  047517  020113  EM25:   .ASCIZ  /LOOK AHEAD REGISTER IS IN ERROR/
 1037  003236  044101  040505  020104
 1038  003244  042522  044507  052123
 1039  003252  051105  044440  020123
 1040  003260  047111  042440  051122
 1041  003266  051117     000
 1042  003271     103  051125  042522  EM30:   .ASCII  /CURRENT CYLINDER DOES NOT MATCH DESIRED CYLINDER REGIHSTER/<15><12>
 1043  003276  052116  041440  046131
 1044  003304  047111  042504  020122
 1045  003312  047504  051505  047040
 1046  003320  052117  046440  052101
 1047  003326  044103  042040  051505
 1048  003334  051111  042105  041440
 1049  003342  046131  047111  042504
 1050  003350  020122  042522  044507
 1051  003356  051510  042524  006522
 1052  003364     012
 1053  003365     101  052106  051105          .ASCIZ  /AFTER A SEEK AND INIT/
 1054  003372  040440  051440  042505
 1055  003400  020113  047101  020104
 1056  003406  047111  052111     000
 1057  003413     105  041503  043440  EM31:   .ASCII  /ECC GENERATED IS INCORRECT/<15><12>
 1058  003420  047105  051105  052101
 1059  003426  042105  044440  020123
 1060  003434  047111  047503  051122
 1061  003442  041505  006524     012
 1062  003447     105  042526  054522          .ASCIZ  /EVERY WORD ON THIS SECTOR IS THAT GIVEN IN "DATA USED"/
 1063  003454  053440  051117  020104
 1064  003462  047117  052040  044510
 1065  003470  020123  042523  052103
 1066  003476  051117  044440  020123
 1067  003504  044124  052101  043440
 1068  003512  053111  047105  044440
 1069  003520  020116  042042  052101
 1070  003526  020101  051525  042105
 1071  003534  000042
 1072  003536  047117  051040  040505  EM32:   .ASCII  /ON READ COMMAND, AFTER DATA AND ECC HAVE BEEN READ,/<15><12>
 1073  003544  020104  047503  046515
 1074  003552  047101  026104  040440
 1075  003560  052106  051105  042040
 1076  003566  052101  020101  047101
 1077  003574  020104  041505  020103
 1078  003602  040510  042526  041040
 1079  003610  042505  020116  042522
 1080  003616  042101  006454     012
 1081  003623     105  041503  051040          .ASCII  /ECC REGISTERS OR RHER1 ARE IN ERROR/<15><12>
 1082  003630  043505  051511  042524
```

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1083  003636  051522  047440  020122
1084  003644  044122  051105  020061
1085  003652  051101  020105  047111
1086  003660  042440  051122  051117
1087  003666  005015
1088  003670  047117  054514  046040          .ASCII  /ONLY LOWER 11 BITS OF PATTERN REG. CAN BE READ/<15><12>
1089  003676  053517  051105  030440
1090  003704  020061  044502  051524
1091  003712  047440  020106  040520
1092  003720  052124  051105  020116
1093  003726  042522  027107  041440
1094  003734  047101  041040  020105
1095  003742  042522  042101  005015
1096  003750  044124  051511  051440          .ASCIZ  /THIS SHOULD MATCH LOWER 11 BITS OF GOOD ECC1/
1097  003756  047510  046125  020104
1098  003764  040515  041524  020110
1099  003772  047514  042527  020122
1100  004000  030461  041040  052111
1101  004006  020123  043117  043440
1102  004014  047517  020104  041505
1103  004022  030503     000
1104  004025     110  043511  020110  EM33:   .ASCIZ  /HIGH COUNT BIT NOT SET AFTER 38859 CLOCKS/
1105  004032  047503  047125  020124
1106  004040  044502  020124  047516
1107  004046  020124  042523  020124
1108  004054  043101  042524  020122
1109  004062  034063  032470  020071
1110  004070  046103  041517  051513
1111  004076     000
1112  004077     132  051105  020117  EM34:   .ASCIZ  /ZERO DETECT BIT NOT HIGH WHEN 32 BIT ECC REG. HAS 21 ZEROS/
1113  004104  042504  042524  052103
1114  004112  041040  052111  047040
1115  004120  052117  044040  043511
1116  004126  020110  044127  047105
1117  004134  031440  020062  044502
1118  004142  020124  041505  020103
1119  004150  042522  027107  044040
1120  004156  051501  031040  020061
1121  004164  042532  047522  000123
1122  004172  047520  044523  044524  EM35:   .ASCII  /POSITION REGISTER OR 11 BITS OF PATTERN REGISTER INCORRECT/<15><12>
1123  004200  047117  051040  043505
1124  004206  051511  042524  020122
1125  004214  051117  030440  020061
1126  004222  044502  051524  047440
1127  004230  020106  040520  052124
1128  004236  051105  020116  042522
1129  004244  044507  052123  051105
1130  004252  044440  041516  051117
1131  004260  042522  052103  005015
1132  004266  047514  042527  020122          .ASCII  /LOWER 11 BITS OF PATTERN REGISTER SHOULD MATCH LOWER/<15><12>
1133  004274  030461  041040  052111
1134  004302  020123  043117  050040
1135  004310  052101  042524  047122
1136  004316  051040  043505  051511
```

DZRPTC.ERR ERROR POINTER TABLE

```
1137  004324  042524  020122  044123
1138  004332  052517  042114  046440
1139  004340  052101  044103  046040
1140  004346  053517  051105  005015
1141  004354  030461  041040  052111          .ASCII  /11 BITS OF GOOD ECC1/<15><12>
1142  004362  020123  043117  043440
1143  004370  047517  020104  041505
1144  004376  030503  005015
1145  004402  040504  020124  047105          .ASCIZ  /DAT ENVLOP GOOD POSITION AND N-CODE ZEROS ARE IN OCTAL/
1146  004410  046126  050117  043440
1147  004416  047517  020104  047520
1148  004424  044523  044524  047117
1149  004432  040440  042116  047040
1150  004440  041455  042117  020105
1151  004446  042532  047522  020123
1152  004454  051101  020105  047111
1153  004462  047440  052103  046101
1154  004470     000
1155  004471     117  020116  042522  EM36:   .ASCII  /ON READ COMMAND WITH NON-CORRECTABLE ERROR DCK AND ECH SHOULD BE SET/<1
1156  004476  042101  041440  046517
1157  004504  040515  042116  053440
1158  004512  052111  020110  047516
1159  004520  026516  047503  051122
1160  004526  041505  040524  046102
1161  004534  020105  051105  047522
1162  004542  020122  041504  020113
1163  004550  047101  020104  041505
1164  004556  020110  044123  052517
1165  004564  042114  041040  020105
1166  004572  042523  006524     012
1167  004577     111  020106  047520          .ASCIZ  /IF POSITION REGISTER =10040 OR 10041 IT IS GOOD/
1168  004604  044523  044524  047117
1169  004612  051040  043505  051511
1170  004620  042524  020122  030475
1171  004626  030060  030064  047440
1172  004634  020122  030061  032060
1173  004642  020061  052111  044440
1174  004650  020123  047507  042117
1175  004656     000
1176  004657     127  044522  044524  EM37:   .ASCIZ  /WRITING WITH BUS ADDRESS HIGHER THAN 28K CAUSED ERROR/
1177  004664  043516  053440  052111
1178  004672  020110  052502  020123
1179  004700  042101  051104  051505
1180  004706  020123  044510  044107
1181  004714  051105  052040  040510
1182  004722  020116  034062  020113
1183  004730  040503  051525  042105
1184  004736  042440  051122  051117
1185  004744     000
1186  004745     124  042510  042522  EM40:   .ASCII  /THERE WAS A READ-WRITE HEADER & DATA ERROR DURING 'DTE'/<15><12>
1187  004752  053440  051501  040440
1188  004760  051040  040505  026504
1189  004766  051127  052111  020105
1190  004774  042510  042101  051105
```

DZRPTC.ERR ERROR POINTER TABLE

```
1191  005002  023040  042040  052101
1192  005010  020101  051105  047522
1193  005016  020122  052504  044522
1194  005024  043516  023440  052104
1195  005032  023505  005015
1196  005036  042524  052123  051440        .ASCIZ  /TEST SETUP - THE TEST WAS ABORTED AT THAT POINT/
1197  005044  052105  050125  026440
1198  005052  052040  042510  052040
1199  005060  051505  020124  040527
1200  005066  020123  041101  051117
1201  005074  042524  020104  052101
1202  005102  052040  040510  020124
1203  005110  047520  047111  000124
```

```
1204  005116  040506  040524  020114  CPHALT: .ASCII  /FATAL ERROR - SEE DOCUMENT FOR BEST COURSE OF ACTION/<15><12>
1205  005124  051105  047522  020122
1206  005132  020055  042523  020105
1207  005140  047504  052503  042515
1208  005146  052116  043040  051117
1209  005154  041040  051505  020124
1210  005162  047503  051125  042523
1211  005170  047440  020106  041501
1212  005176  044524  047117  005015
1213  005204  006440  103412  177777          .ASCII  / /<15><12><207><377><377><207><377><377><207><377><377>
1214  005212  177607  103777  177777
1215  005220  044124  020105  051120          .ASCII  /THE PROGRAM HAS HALTED DURING A TEST BECAUSE CONTROLLER/<15><12>
1216  005226  043517  040522  020115
1217  005234  040510  020123  040510
1218  005242  052114  042105  042040
1219  005250  051125  047111  020107
1220  005256  020101  042524  052123
1221  005264  041040  041505  052501
1222  005272  042523  041440  047117
1223  005300  051124  046117  042514
1224  005306  006522     012
1225  005311     117  020122  042504          .ASCII  /OR DEVICE HAS LOST 'READY', BECOME UNAVAILABLE,/<15><12>
1226  005316  044526  042503  044040
1227  005324  051501  046040  051517
1228  005332  020124  051047  040505
1229  005340  054504  026047  041040
1230  005346  041505  046517  020105
1231  005354  047125  053101  044501
1232  005362  040514  046102  026105
1233  005370  005015
1234  005372  047507  042516  047440          .ASCIZ  /GONE OFFLINE, OR CANNOT CLEAR STATUS BITS/
1235  005400  043106  044514  042516
1236  005406  020054  051117  041440
1237  005414  047101  047516  020124
1238  005422  046103  040505  020122
1239  005430  052123  052101  051525
1240  005436  041040  052111  000123
1241
1242  005444  041520  020040  020040  DH1:    .ASCII  /PC      TEST    REG.    GOOD    ACTUAL /<15><12>
1243  005452  020040  042524  052123
1244  005460  020040  020040  042522
1245  005466  027107  020040  020040
1246  005474  047507  042117  020040
1247  005502  020040  041501  052524
1248  005510  046101  006411     012
1249  005515     040  020040  020040          .ASCIZ  /       NO      ADDR.   DATA    DATA/
1250  005522  020040  047040  020117
1251  005530  020040  020040  040440
1252  005536  042104  027122  020040
1253  005544  042040  052101  020101
1254  005552  020040  042040  052101
1255  005560  000101
1256  005562  041520  020040  020040  DH2:    .ASCII  /PC      TEST    WORD    GOOD    BAD/<15><12>
1257  005570  020040  042524  052123
```

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1258  005576  020040  020040  047527
1259  005604  042122  020040  020040
1260  005612  047507  042117  020040
1261  005620  020040  040502  006504
1262  005626     012
1263  005627     040  020040  020040          .ASCIZ  /       NO      NO      DATA    DATA/
1264  005634  020040  047040  020117
1265  005642  020040  020040  047040
1266  005650  020117  020040  020040
1267  005656  042040  052101  020101
1268  005664  020040  042040  052101
1269  005672  000101
1270  005674  041520  020040  020040  DH11:   .ASCII  /PC     TEST    FAILING CONT.   CONT.   CONT.   CONT./<15><12>
1271  005702  020040  042524  052123
1272  005710  020040  020040  040506
1273  005716  046111  047111  020107
1274  005724  047503  052116  020056
1275  005732  020040  047503  052116
1276  005740  020056  020040  047503
1277  005746  052116  020056  020040
1278  005754  047503  052116  006456
1279  005762     012
1280  005763     040  020040  020040          .ASCIZ  /       NO      REG ADR RHCS1   RHCS2   RHDS1   RHER1/
1281  005770  020040  047040  020117
1282  005776  020040  020040  051040
1283  006004  043505  040440  051104
1284  006012  051040  041510  030523
1285  006020  020040  051040  041510
1286  006026  031123  020040  051040
1287  006034  042110  030523  020040
1288  006042  051040  042510  030522
1289  006050     000
1290  006051     120  020103  020040  DH14:   .ASCII  /PC     TEST    FAILING CONT.   CONT.   CONT.   CONT.   CONT.   /<15><12
1291  006056  020040  052040  051505
1292  006064  020124  020040  043040
1293  006072  044501  044514  043516
1294  006100  041440  047117  027124
1295  006106  020040  041440  047117
1296  006114  027124  020040  041440
1297  006122  047117  027124  020040
1298  006130  041440  047117  027124
1299  006136  020040  041440  047117
1300  006144  027124  006411     012
1301  006151     040  020040  020040          .ASCIZ  /       NO      REG ADR BAD REG RHCS1   RHCS2   RHDS1   RHER1   /
1302  006156  020040  047040  020117
1303  006164  020040  020040  051040
1304  006172  043505  040440  051104
1305  006200  041040  042101  051040
1306  006206  043505  051040  041510
1307  006214  030523  020040  051040
1308  006222  041510  031123  020040
1309  006230  051040  042110  030523
1310  006236  020040  051040  042510
1311  006244  030522  000011
```

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1312  006250  041520  020040  020040  DH15:   .ASCIZ  /PC     TEST   REG ADR/
1313  006256  020040  042524  052123
1314  006264  020040  020040  042522
1315  006272  020107  042101  000122
1316  006300  041520  020040  020040  DH16:   .ASCII  /PC     TEST   WAT    BIT    REG    REG/<15><12>
1317  006306  020040  042524  052123
1318  006314  020040  020040  040527
1319  006322  020124  020040  020040
1320  006330  044502  020124  020040
1321  006336  020040  042522  020107
1322  006344  020040  020040  042522
1323  006352  006507    012
1324  006355     040  020040  020040          .ASCIZ  /      NO     PC     WANTED ADDRESS CONTENTS/
1325  006362  020040  047040  020117
1326  006370  020040  020040  050040
1327  006376  020103  020040  020040
1328  006404  053440  047101  042524
1329  006412  020104  040440  042104
1330  006420  042522  051523  041440
1331  006426  047117  042524  052116
1332  006434  000123
1333  006436  041520  020040  020040  DH17:   .ASCII  /PC     TEST   CONT.  CONT.  CONT.  CONT.  CONT./<15><12>
1334  006444  020040  042524  052123
1335  006452  020040  020040  047503
1336  006460  052116  020056  020040
1337  006466  047503  052116  020056
1338  006474  020040  047503  052116
1339  006502  020056  020040  047503
1340  006510  052116  020056  020040
1341  006516  047503  052116  006456
1342  006524     012
1343  006525     040  020040  020040          .ASCIZ  /      NO     RHBA   RHDB   RHMC   RHCS1  RHCS2/
1344  006532  020040  047040  020117
1345  006540  020040  020040  051040
1346  006546  041110  020101  020040
1347  006554  051040  042110  020102
1348  006562  020040  051040  053510
1349  006570  020103  020040  051040
1350  006576  041510  030523  020040
1351  006604  051040  041510  031123
1352  006612     000
1353  006613     120  020103  020040  DH20:   .ASCII  /PC     TEST   CONT   CONT   CONT   CONT   CONT/<15><12>
1354  006620  020040  052040  051505
1355  006626  020124  020040  041440
1356  006634  047117  020124  020040
1357  006642  041440  047117  020124
1358  006650  020040  041440  047117
1359  006656  020124  020040  041440
1360  006664  047117  020124  020040
1361  006672  041440  047117  006524
1362  006700     012
1363  006701     040  020040  020040          .ASCIZ  /      NO     RHER1  RHER2  RHER3  RHAS   RHDS1/
1364  006706  020040  047040  020117
1365  006714  020040  020040  051040
```

DZRPTC.ERR ERROR POINTER TABLE

```
1366  006722  042510  030522  020040
1367  006730  051040  042510  031122
1368  006736  020040  051040  042510
1369  006744  031522  020040  051040
1370  006752  040510  020123  020040
1371  006760  051040  042110  030523
1372  006766     000
1373  006767     120  020103  020040  DH21:  .ASCII  /PC      TEST    CONT    CONT    CONT/<15><12>
1374  006774  020040  052040  051505
1375  007002  020124  020040  041440
1376  007010  047117  020124  020040
1377  007016  041440  047117  020124
1378  007024  020040  041440  047117
1379  007032  006524     012
1380  007035     040  020040  020040          .ASCIZ  /       NO      RHCS1   RHAS    RHDS1/
1381  007042  020040  047040  020117
1382  007050  020040  020040  051040
1383  007056  041510  030523  020040
1384  007064  051040  040510  020123
1385  007072  020040  051040  042110
1386  007100  030523     000
1387  007103     120  020103  020040  DH22:  .ASCII  /PC      TEST    RHAS    RHCS2/<15><12>
1388  007110  020040  052040  051505
1389  007116  020124  020040  051040
1390  007124  040510  020123  020040
1391  007132  051040  041510  031123
1392  007140  005015
1393  007142  020040  020040  020040          .ASCIZ  /       NO      UNIT    UNIT/
1394  007150  020040  047516  020040
1395  007156  020040  020040  047125
1396  007164  052111  020040  020040
1397  007172  047125  052111     000
1398  007177     120  020103  020040  DH24:  .ASCII  /PC      TEST    RHDST   BAD     GOOD    SECTOR  SECTOR/<15><12>
1399  007204  020040  052040  051505
1400  007212  020124  020040  051040
1401  007220  042110  052123  020040
1402  007226  041040  042101  020040
1403  007234  020040  043440  047517
1404  007242  020104  020040  051440
1405  007250  041505  047524  020122
1406  007256  051440  041505  047524
1407  007264  006522     012
1408  007267     040  020040  020040          .ASCIZ  /       NO      CONT.   RHLA    RHLA    NO      CLOCK/
1409  007274  020040  047040  020117
1410  007302  020040  020040  041440
1411  007310  047117  027124  020040
1412  007316  051040  046110  020101
1413  007324  020040  051040  046110
1414  007332  020101  020040  047040
1415  007340  020117  020040  020040
1416  007346  041440  047514  045503
1417  007354     000
1418  007355     120  020103  020040  DH26:  .ASCII  /PC      TEST    PC OF   FAILING CONT.   CONT.   CONT.   CONT./<15><12>
1419  007362  020040  052040  051505
```

DZRPTC.ERR ERROR POINTER TABLE

```
1420  007370  020124  020040  050040
1421  007376  020103  043117  020040
1422  007404  043040  044501  044514
1423  007412  043516  041440  047117
1424  007420  027124  020040  041440
1425  007426  047117  027124  020040
1426  007434  041440  047117  027124
1427  007442  020040  041440  047117
1428  007450  027124  005015
1429  007454  020040  020040  020040        .ASCIZ /      NO     JSR    REG ADD RHCS1   RHCS2   RHDS1   RHER1 /
1430  007462  020040  047516  020040
1431  007470  020040  020040  051512
1432  007476  020122  020040  020040
1433  007504  042522  020107  042101
1434  007512  020104  044122  051503
1435  007520  020061  020040  044122
1436  007526  051503  020062  020040
1437  007534  044122  051504  020061
1438  007542  020040  044122  051105
1439  007550  004461     000
1440  007553     120  020103  020040  DH27: .ASCII /PC     TEST   PC OF  FAILING GOOD    ACTUAL /<15><12>
1441  007560  020040  052040  051505
1442  007566  020124  020040  050040
1443  007574  020103  043117  020040
1444  007602  043040  044501  044514
1445  007610  043516  043440  047517
1446  007616  020104  020040  040440
1447  007624  052103  040525  004514
1448  007632  005015
1449  007634  020040  020040  020040        .ASCIZ /      NO     JSR    REG.    DATA    DATA/
1450  007642  020040  047516  020040
1451  007650  020040  020040  051512
1452  007656  020122  020040  020040
1453  007664  042522  027107  020040
1454  007672  020040  040504  040524
1455  007700  020040  020040  040504
1456  007706  040524     000
1457  007711     120  020103  020040  DH30: .ASCII /PC     TEST   PC OF  REG.    GOOD    BAD/<15><12>
1458  007716  020040  052040  051505
1459  007724  020124  020040  050040
1460  007732  020103  043117  020040
1461  007740  051040  043505  020056
1462  007746  020040  043440  047517
1463  007754  020104  020040  041040
1464  007762  042101  005015
1465  007766  020040  020040  020040        .ASCIZ /      NO     JSR    ADDR    DATA    DATA/
1466  007774  020040  047516  020040
1467  010002  020040  020040  051512
1468  010010  020122  020040  020040
1469  010016  042101  051104  020040
1470  010024  020040  040504  040524
1471  010032  020040  020040  040504
1472  010040  040524     000
1473  010043     120  020103  020040  DH31: .ASCII /PC     TEST   WORD    GOOD    BAD     CONT.   CONT.   CONT./<15><12>
```

```
1474  010050  020040  052040  051505
1475  010056  020124  020040  053440
1476  010064  051117  020104  020040
1477  010072  043440  047517  020104
1478  010100  020040  041040  042101
1479  010106  020040  020040  041440
1480  010114  047117  027124  020040
1481  010122  041440  047117  027124
1482  010130  020040  041440  047117
1483  010136  027124  005015
1484  010142  020040  020040  020040        .ASCIZ  /       NO      NO      DATA    DATA    RHCS1   RHDS1   RHER1   /
1485  010150  020040  047516  020040
1486  010156  020040  020040  047516
1487  010164  020040  020040  020040
1488  010172  040504  040524  020040
1489  010200  020040  040504  040524
1490  010206  020040  020040  044122
1491  010214  051503  020061  020040
1492  010222  044122  051504  020061
1493  010230  020040  044122  051105
1494  010236  004461    000
1495  010241    120   020103  020040  DH32:   .ASCII  /PC     TEST    PC OF   WORD    GOOD    BAD     CONT.   CONT.   CONT./
1496  010246  020040  052040  051505
1497  010254  020124  020040  050040
1498  010262  020103  043117  020040
1499  010270  053440  051117  020104
1500  010276  020040  043440  047517
1501  010304  020104  020040  041040
1502  010312  042101  020040  020040
1503  010320  041440  047117  027124
1504  010326  020040  041440  047117
1505  010334  027124  020011  041440
1506  010342  047117  027124  005015
1507  010350  020040  020040  020040        .ASCIZ  /       NO      JSR     NO      DATA    DATA    RHCS1   RHDS1   RHER1/
1508  010356  020040  047516  020040
1509  010364  020040  020040  051512
1510  010372  020122  020040  020040
1511  010400  047516  020040  020040
1512  010406  020040  040504  040524
1513  010414  020040  020040  040504
1514  010422  040524  020040  020040
1515  010430  044122  051503  020061
1516  010436  020040  044122  051504
1517  010444  020061  020040  044122
1518  010452  051105  000061
1519  010456  041520  020040  020040  DH33:   .ASCII  /PC     TEST    PC OF   WORD    GOOD    CONT.   CONT.   CONT.   /<15><12
1520  010464  020040  042524  052123
1521  010472  020040  020040  041520
1522  010500  047440  020106  020040
1523  010506  047527  042122  020040
1524  010514  020040  047507  042117
1525  010522  020040  020040  047503
1526  010530  052116  020056  020040
1527  010536  047503  052116  020056
```

DZRPTC.ERR ERROR POINTER TABLE

```
1528  010544  020040  047503  052116
1529  010552  004456  005015
1530  010556  020040  020040  020040          .ASCIZ  /       NO      JSR     NO      DATA    RHCS1   RHDS1   RHER1   /
1531  010564  020040  047516  020040
1532  010572  020040  020040  051512
1533  010600  020122  020040  020040
1534  010606  047516  020040  020040
1535  010614  020040  040504  040524
1536  010622  020040  020040  044122
1537  010630  051503  020061  020040
1538  010636  044122  051504  020061
1539  010644  020040  044122  051105
1540  010652  004461     000
1541  010655     120  020103  020040  DH34:   .ASCII  /PC     TEST    GOOD    GOOD    WRITTEN WRITTEN DATA/<15><12>
1542  010662  020040  052040  051505
1543  010670  020124  020040  043440
1544  010676  047517  020104  020040
1545  010704  043440  047517  020104
1546  010712  020040  053440  044522
1547  010720  052124  047105  053440
1548  010726  044522  052124  047105
1549  010734  042040  052101  006501
1550  010742     012
1551  010743     040  020040  020040          .ASCIZ  /       NO      ECC1    ECC2    ECC1    ECC2    USED/
1552  010750  020040  047040  020117
1553  010756  020040  020040  042440
1554  010764  041503  020061  020040
1555  010772  042440  041503  020062
1556  011000  020040  042440  041503
1557  011006  020061  020040  042440
1558  011014  041503  020062  020040
1559  011022  052440  042523  000104
1560  011030  041520  020040  020040  DH35:   .ASCII  /PC     TEST    GOOD    GOOD    PATTERN POSITON GOOD    RHER1   /<15><12
1561  011036  020040  042524  052123
1562  011044  020040  020040  047507
1563  011052  042117  020040  020040
1564  011060  047507  042117  020040
1565  011066  020040  040520  052124
1566  011074  051105  020116  047520
1567  011102  044523  047524  020116
1568  011110  047507  042117  020040
1569  011116  020040  044122  051105
1570  011124  004461  005015
1571  011130  020040  020040  020040          .ASCIZ  /       NO      ECC1    ECC2    REG.    REG.    POSITON REG./
1572  011136  020040  047516  020040
1573  011144  020040  020040  041505
1574  011152  030503  020040  020040
1575  011160  041505  031103  020040
1576  011166  020040  042522  027107
1577  011174  020040  020040  042522
1578  011202  027107  020040  020040
1579  011210  047520  044523  047524
1580  011216  020116  042522  027107
1581  011224     000
```

```
1582  011225     120  020103  020040  DH36:  .ASCII  /PC     TEST   PC OF  RHMR   POSITON PATTERN/<15><12>
1583  011232  020040  052040  051505
1584  011240  020124  020040  050040
1585  011246  020103  043117  020040
1586  011254  051040  046510  020122
1587  011262  020040  050040  051517
1588  011270  052111  047117  050040
1589  011276  052101  042524  047122
1590  011304  005015
1591  011306  020040  020040  020040         .ASCIZ  /      NO     JSR    CONT.  REG.   REG./
1592  011314  020040  047516  020040
1593  011322  020040  020040  051512
1594  011330  020122  020040  020040
1595  011336  047503  052116  020056
1596  011344  020040  042522  027107
1597  011352  020040  020040  042522
1598  011360  027107     000
1599  011363     120  020103  020040  DH37:  .ASCII  /PC     TEST   POSITON POSITON GOOD   GOOD   PATTERN DATA   N-CODE/
1600  011370  020040  052040  051505
1601  011376  020124  020040  050040
1602  011404  051517  052111  047117
1603  011412  050040  051517  052111
1604  011420  047117  043440  047517
1605  011426  020104  020040  043440
1606  011434  047517  020104  020040
1607  011442  050040  052101  042524
1608  011450  047122  042040  052101
1609  011456  020101  020040  047040
1610  011464  041455  042117  006505
1611  011472     012
1612  011473     040  020040  020040         .ASCIZ  /      NO     ECC    GOOD   ECC1   ECC2   ECC    ENVLOPE ZEROS
1613  011500  020040  047040  020117
1614  011506  020040  020040  042440
1615  011514  041503  020040  020040
1616  011522  043440  047517  020104
1617  011530  020040  042440  041503
1618  011536  020061  020040  042440
1619  011544  041503  020062  020040
1620  011552  042440  041503  020040
1621  011560  020040  042440  053116
1622  011566  047514  042520  055040
1623  011574  051105  051517  000011
1624
1625  011602  041520  020040  020040  DH40:  .ASCII  /PC     TEST   FAILING CONT.  CONT.  CONT.  CONT./<15><12>
1626  011610  020040  042524  052123
1627  011616  020040  020040  040506
1628  011624  046111  047111  020107
1629  011632  047503  052116  020056
1630  011640  020040  047503  052116
1631  011646  020056  020040  047503
1632  011654  052116  020056  020040
1633  011662  047503  052116  006456
1634  011670     012
1635  011671     040  020040  020040         .ASCIZ  /      NO     REG ADR RHCS1  RHCS2  RHDS1  RHER1/
```

DZRPTC.ERR ERROR POINTER TABLE

```
1636  011676  020040  047040  020117
1637  011704  020040  020040  051040
1638  011712  043505  040440  051104
1639  011720  051040  041510  030523
1640  011726  020040  051040  041510
1641  011734  031123  020040  051040
1642  011742  042110  030523  020040
1643  011750  051040  042510  030522
1644  011756      000
1645
1646          011760                  .EVEN
1647
1648  011760  001116  017322  044716  DT1:    .WORD   $ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT,0
1649  011766  001124  001126  000000
1650  011774  001116  017322  051722  DT2:    .WORD   $ERRPC,TSTNM,ERWORD,$GDDAT,0
1651  012002  001124  000000
1652  012006  001116  017322  051722  DT3:    .WORD   $ERRPC,TSTNM,ERWORD,$GDDAT,$BDDAT,0
1653  012014  001124  001126  000000
1654
1655  012022  001116  017322  001122  DT11:   .WORD   $ERRPC,TSTNM,$BDADR,CS1,CS2,DS1,ER1,0
1656  012030  015030  015026  015052
1657  012036  015032  000000
1658  012042  001116  017322  001122  DT14:   .WORD   $ERRPC,TSTNM,$BDADR,$BDDAT,CS1,CS2,DS1,ER1,0
1659  012050  001126  015030  015026
1660  012056  015052  015032  000000
1661  012064  001116  017322  001172  DT15:   .WORD   $ERRPC,TSTNM,$TMP1,0
1662  012072  000000
1663  012074  001116  017322  001176  DT16:   .WORD   $ERRPC,TSTNM,$TMP3,$TMP1,$TMP0,$BDDAT,0
1664  012102  001172  001170  001126
1665  012110  000000
1666  012112  001116  017322  015024  DT17:   .WORD   $ERRPC,TSTNM,BA,DB,WC,CS1,CS2,0
1667  012120  015020  015022  015030
1668  012126  015026  000000
1669
1670  012132  001116  017322  015032  DT20:   .WORD   $ERRPC,TSTNM,ER1,ER2,ER3,AS,DS1,0
1671  012140  015036  015044  015046
1672  012146  015052  000000
1673  012152  001116  017322  015030  DT21:   .WORD   $ERRPC,TSTNM,CS1,AS,DS1,0
1674  012160  015046  015052  000000
1675  012166  001116  017322  001124  DT22:   .WORD   $ERRPC,TSTNM,$GDDAT,$BDDAT,0
1676  012174  001126  000000
1677  012200  001116  017322  015034  DT24:   .WORD   $ERRPC,TSTNM,DST,$BDDAT,$TMP1,$TMP2,$TMP3,0
1678  012206  001126  001172  001174
1679  012214  001176  000000
1680  012220  001116  017322  015130  DT26:   .WORD   $ERRPC,TSTNM,PCJSR,$BDADR,CS1,CS2,DS1,ER1,0
1681  012226  001122  015030  015026
1682  012234  015052  015032  000000
1683  012242  001116  017322  015130  DT27:   .WORD   $ERRPC,TSTNM,PCJSR,REGADR,$GDDAT,$BDDAT,0
1684  012250  044716  001124  001126
1685  012256  000000
1686  012260  001116  017322  015130  DT30:   .WORD   $ERRPC,TSTNM,PCJSR,REGADR,$GDDAT,$BDDAT,0
1687  012266  044716  001124  001126
1688  012274  000000
1689
```

```
1690  012276  001116  017322  051722  DT31:   .WORD   $ERRPC,TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1,0
1691  012304  001124  001126  015030
1692  012312  015052  015032  000000
1693  012320  001116  017322  015130  DT32:   .WORD   $ERRPC,TSTNM,PCJSR,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1,0
1694  012326  051722  001124  001126
1695  012334  015030  015052  015032
1696  012342  000000
1697  012344  001116  017322  015130  DT33:   .WORD   $ERRPC,TSTNM,PCJSR,ERWORD,$GDDAT,CS1,DS1,ER1,0
1698  012352  051722  001124  015030
1699  012360  015052  015032  000000
1700  012366  001116  017322  047646  DT34:   .WORD   $ERRPC,TSTNM,GECC1,GECC2,WECC1,WECC2,DISK,0
1701  012374  047650  054520  054522
1702  012402  053520  000000
1703  012406  001116  017322  047646  DT35:   .WORD   $ERRPC,TSTNM,GECC1,GECC2,EC2,EC1,POSITI,ER1,0
1704  012414  047650  015062  015060
1705  012422  047660  015032  000000
1706  012430  001116  017322  015130  DT36:   .WORD   $ERRPC,TSTNM,PCJSR,MR,EC1,EC2,0
1707  012436  015050  015060  015062
1708  012444  000000
1709  012446  001116  017322  015060  DT37:   .WORD   $ERRPC,TSTNM,EC1,POSITI,GECC1,GECC2,EC2,DATENV,ZCODE,0
1710  012454  047660  047646  047650
1711  012462  015062  047664  047666
1712  012470  000000
1713  012472  001116  017322  001122  DT40:   .WORD   $ERRPC,TSTNM,$BDADR,CS1,CS2,DS1,ER1,0
1714  012500  015030  015026  015052
1715  012506  015032  000000
1716
1717
1718
1719
1720  012512  000     000     000     DF1:    .BYTE   0,0,0,0,0
1721  012515  000     000
1722  012517  000     000     001     DF2:    .BYTE   0,0,1,0
1723  012522  000
1724  012523  000     000     001     DF3:    .BYTE   0,0,1,0,0
1725  012526  000     000
1726
1727  012530  000     000     000     DF11:   .BYTE   0,0,0,0,0,0,0
1728  012533  000     000     000
1729  012536  000
1730  012537  000     000     000     DF14:   .BYTE   0,0,0,0,0,0,0,0
1731  012542  000     000     000
1732  012545  000     000
1733  012547  000     000     000     DF15:   .BYTE   0,0,0
1734  012552  000     000     000     DF16:   .BYTE   0,0,0,0,0
1735  012555  000     000
1736  012557  000     000     000     DF17:   .BYTE   0,0,0,0,0,0,0
1737  012562  000     000     000
1738  012565  000
1739  012566  000     000     000     DF20:   .BYTE   0,0,0,0,0,0,0
1740  012571  000     000     000
1741  012574  000
1742
1743  012575  000     000     000     DF21:   .BYTE   0,0,0,0,0
```

```
1744  012600  000  000
1745  012602  000  000  000  DF22:  .BYTE  0,0,0,0
1746  012605  000
1747  012606  000  000  000  DF24:  .BYTE  0,0,0,0,0,0,0,0
1748  012611  000  000  000
1749  012614  000
1750  012615  000  000  000  DF26:  .BYTE  0,0,0,0,0,0,0,0,0
1751  012620  000  000  000
1752  012623  000  000
1753  012625  000  000  000  DF27:  .BYTE  0,0,0,0,0,0,0
1754  012630  000  000  000
1755  012633  000  000  000  DF30:  .BYTE  0,0,0,0,0,0,0
1756  012636  000  000  000
1757
1758  012641  000  000  001  DF31:  .BYTE  0,0,1,0,0,0,0,0,0
1759  012644  000  000  000
1760  012647  000  000
1761  012651  000  000  000  DF32:  .BYTE  0,0,0,1,0,0,0,0,0,0
1762  012654  001  000  000
1763  012657  000  000  000
1764  012662  000  000  000  DF33:  .BYTE  0,0,0,1,0,0,0,0,0
1765  012665  001  000  000
1766  012670  000  000
1767  012672  000  000  000  DF34:  .BYTE  0,0,0,0,0,0,0,0,0
1768  012675  000  000  000
1769  012700  000
1770  012701  000  000  000  DF35:  .BYTE  0,0,0,0,0,0,0,0,0
1771  012704  000  000  000
1772  012707  000  000
1773  012711  000  000  000  DF36:  .BYTE  0,0,0,0,0,0,0
1774  012714  000  000  000
1775  012717  000  000  000  DF37:  .BYTE  0,0,0,0,0,0,0,0,0,0
1776  012722  000  000  000
1777  012725  000  000  000
1778  012730  000  000  000  DF40:  .BYTE  0,0,0,0,0,0,0,0
1779  012733  000  000  000
1780  012736  000
1781
1782        012740                        .EVEN
1783  012740  044122  030461  051040  EM42:  .ASCIZ  /RH11 REGISTER FAILED TO RESPOND TO A "TST" COMMAND/
1784  012746  043505  051511  042524
1785  012754  020122  040506  046111
1786  012762  042105  052040  020117
1787  012770  042522  050123  047117
1788  012776  020104  047524  040440
1789  013004  021040  051524  021124
1790  013012  041440  046517  040515
1791  013020  042116     000
1792
1793  013023     122  030510  020061  EM43:  .ASCIZ  /RH11 ILLEGAL REGISTER RESPONSE TEST/
1794  013030  046111  042514  040507
1795  013036  020114  042522  044507
1796  013044  052123  051105  051040
1797  013052  051505  047520  051516
```

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1798  013060  020105  042524  052123
1799  013066     000
1800
1801  013067     115  053117  020105  EM44:   .ASCIZ  /MOVE BYTE TO WORD COUNT TEST/
1802  013074  054502  042524  052040
1803  013102  020117  047527  042122
1804  013110  041440  052517  052116
1805  013116  052040  051505  000124
1806
1807  013124  044502  020123  054502  EM45:   .ASCIZ  /BIS BYTE TO WORD COUNT /
1808  013132  042524  052040  020117
1809  013140  047527  042122  041440
1810  013146  052517  052116  000040
1811
1812  013154  044502  020103  054502  EM46:   .ASCIZ  /BIC BYTE TO WORD COUNT/
1813  013162  042524  052040  020117
1814  013170  047527  042122  041440
1815  013176  052517  052116     000
1816
1817  013203     101  042104  042522  EM47:   .ASCIZ  /ADDRESS SELECT XOR'S TEST/
1818  013210  051523  051440  046105
1819  013216  041505  020124  047530
1820  013224  023522  020123  042524
1821  013232  052123     000
1822
1823  013235     116  047117  042440  EM50:   .ASCIZ  /NON EXISTANT DRIVE (NED) TEST/
1824  013242  044530  052123  047101
1825  013250  020124  051104  053111
1826  013256  020105  047050  042105
1827  013264  020051  042524  052123
1828  013272     000
1829
1830  013273     101  020123  042522  EM51:   .ASCIZ  /AS REGISTER TEST/
1831  013300  044507  052123  051105
1832  013306  052040  051505  000124
1833
1834  013314  052502  051523  040440  EM52:   .ASCIZ  /BUSS ADDRESS REGISTER DATA TEST/
1835  013322  042104  042522  051523
1836  013330  051040  043505  051511
1837  013336  042524  020122  040504
1838  013344  040524  052040  051505
1839  013352  000124
1840
1841  013354  052502  051523  040440  EM53:   .ASCIZ  /BUSS ADDRESS REGISTER MOVE  BYTE /
1842  013362  042104  042522  051523
1843  013370  051040  043505  051511
1844  013376  042524  020122  047515
1845  013404  042526  020040  054502
1846  013412  042524  000040
1847
1848  013416  044122  030461  044440  EM54:   .ASCIZ  /RH11 INTERRUPT FAILED TO OCCUR/
1849  013424  052116  051105  052522
1850  013432  052120  043040  044501
1851  013440  042514  020104  047524
```

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1852  013446  047440  041503  051125
1853  013454     000
1854
1855  013455     122  051505  052105  EM55:   .ASCIZ  /RESET TEST/
1856  013462  052040  051505  000124
1857
1858  013470  054115  020106  041040  EM56:   .ASCIZ  /MXF  BIT TEST/
1859  013476  052111  052040  051505
1860  013504  000124
1861
1862  013506  047125  041111  051525  EM57:   .ASCIZ  /UNIBUS PARITY BIT TEST/
1863  013514  050040  051101  052111
1864  013522  020131  044502  020124
1865  013530  042524  052123     000
1866
1867  013535     104  042517  020123  EM60:   .ASCIZ  /DOES SELECTING THE RH11 CLEAR THE UNIT SELECT REGISTER/
1868  013542  042523  042514  052103
1869  013550  047111  020107  044124
1870  013556  020105  044122  030461
1871  013564  041440  042514  051101
1872  013572  052040  042510  052440
1873  013600  044516  020124  042523
1874  013606  042514  052103  051040
1875  013614  043505  051511  042524
1876  013622  000122
1877
1878  013624  047504  051505  052040  EM61:   .ASCIZ  /DOES TRE GET SET BY UNIBUS PARITY ERROR/
1879  013632  042522  043440  052105
1880  013640  051440  052105  041040
1881  013646  020131  047125  041111
1882  013654  051525  050040  051101
1883  013662  052111  020131  051105
1884  013670  047522  000122
1885
1886  013674  047516  020116  054105  EM62:   .ASCIZ  /NON EXISTANT DRIVE (NED) FAILED TO SET (TRE)/
1887  013702  051511  040524  052116
1888  013710  042040  044522  042526
1889  013716  024040  042516  024504
1890  013724  043040  044501  042514
1891  013732  020104  047524  051440
1892  013740  052105  024040  051124
1893  013746  024505     000
1894
1895  013751     116  047117  042440  EM63:   .ASCIZ  /NON EXISTANT MEMORY (NEM) FAILED TO SET (TRE)/
1896  013756  044530  052123  047101
1897  013764  020124  042515  047515
1898  013772  054522  024040  042516
1899  014000  024515  043040  044501
1900  014006  042514  020104  047524
1901  014014  051440  052105  024040
1902  014022  051124  024505     000
1903
1904  014027     120  051117  020124  EM64:   .ASCIZ  /PORT SELECT FAILED TO CLEAR/
1905  014034  042523  042514  052103
```

FLTINS.ERR ERROR POINTER TABLE

```
1906  014042  043040  044501  042514
1907  014050  020104  047524  041440
1908  014056  042514  051101     000
1909
1910  014063     103  047117  051124  EM65:   .ASCIZ  /CONTROLLER CLEAR FAILED TO CLEAR COMMAND REGISTER/
1911  014070  046117  042514  020122
1912  014076  046103  040505  020122
1913  014104  040506  046111  042105
1914  014112  052040  020117  046103
1915  014120  040505  020122  047503
1916  014126  046515  047101  020104
1917  014134  042522  044507  052123
1918  014142  051105     000
1919
1920  014145     122  051505  046105  EM66:   .ASCIZ  /RESELECT FAILED TO CLEAR COMMAND REGISTER/
1921  014152  041505  020124  040506
1922  014160  046111  042105  052040
1923  014166  020117  046103  040505
1924  014174  020122  047503  046515
1925  014202  047101  020104  042522
1926  014210  044507  052123  051105
1927  014216     000
1928
1929  014217     111  052116  051105  EM67:   .ASCIZ  /INTERRUPT CAUSED BY  RDY!IE BITS SET FAILED TO OCCUR/
1930  014224  052522  052120  041440
1931  014232  052501  042523  020104
1932  014240  054502  020040  042122
1933  014246  020531  042511  041040
1934  014254  052111  020123  042523
1935  014262  020124  040506  046111
1936  014270  042105  052040  020117
1937  014276  041517  052503  000122
1938
1939  014304  042511  043040  044501  EM70:   .ASCIZ  /IE FAILED TO CLEAR FOLLOWING AN INTERRUPT/
1940  014312  042514  020104  047524
1941  014320  041440  042514  051101
1942  014326  043040  046117  047514
1943  014334  044527  043516  040440
1944  014342  020116  047111  042524
1945  014350  051122  050125  000124
1946
1947  014356  051501  051040  043505  EM71:   .ASCIZ  /AS REGISTER WRITE TEST/
1948  014364  051511  042524  020122
1949  014372  051127  052111  020105
1950  014400  042524  052123     000
1951
1952
1953
1954  014405     120  020103  020040  DH42:   .ASCII  /PC      TEST   ILLEGAL/<15><12>
1955  014412  020040  052040  051505
1956  014420  004524  046111  042514
1957  014426  040507  006514     012
1958  014433     040  020040  020040          .ASCIZ  /       NO     ADDRESS/
1959  014440  020040  047040  020117
```

```
1960  014446  020040  020040  042101
1961  014454  051104  051505  000123
1962  014462  041520  020040  020040  DH44:   .ASCII  /PC      TEST    REGISTER CONT    CONT/<15><12>
1963  014470  020040  042524  052123
1964  014476  020040  020040  042522
1965  014504  044507  052123  051105
1966  014512  041440  047117  020124
1967  014520  020040  041440  047117
1968  014526  006524    012
1969  014531    040   020040  020040          .ASCIZ  /       NO      ADDRESS  GOOD    BAD/
1970  014536  020040  047040  020117
1971  014544  020040  020040  040440
1972  014552  042104  042522  051523
1973  014560  020040  047507  042117
1974  014566  020040  020040  040502
1975  014574  000104
1976  014576  041520  020040  020040  DH54:   .ASCII  /PC      TEST    REGISTER         CONTS/<15><12>
1977  014604  020040  042524  052123
1978  014612  020040  051040  043505
1979  014620  051511  042524  020122
1980  014626  020040  020040  020040
1981  014634  041440  047117  051524
1982  014642  005015
1983  014644  020040  020040  020040          .ASCIZ  /       NO      ADDRESS/
1984  014652  020040  047516  020040
1985  014660  020040  040440  042104
1986  014666  042522  051523     000
1987
1988          014674                  .EVEN
1989
1990  014674  001116  017322  044716  DT42:   .WORD   SERRPC,TSTNM,REGADR,0
1991  014702  000000
1992  014704  001116  017322  044716  DT44:   .WORD   SERRPC,TSTNM,REGADR,$GDDAT,$BDDAT,0
1993  014712  001124  001126  000000
1994  014720  001116  017322  044716  DT54:   .WORD   SERRPC,TSTNM,REGADR,$GDDAT,0
1995  014726  001124  000000
```

FLTINS.ERR ERROR POINTER TABLE

```
1996  014732  000  000  000  DF42:  .BYTE  0,0,0
1997  014735  000  000  000  DF44:  .BYTE  0,0,0,0,0
1998  014740  000  000
1999  014742  000  000  000  DF54:  .BYTE  0,0,0,0
2000  014745  000
```

```
                        .SBTTL  HARDWARE REGISTER BIT DEFINITIONS


                        ;*****************************************************************
                        ;RH11 REGISTERS
                        ;*****************************************************************


                        ;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                  US1=    1               ;UNIT SELECT (BIT #0)
000002                  US2=    2               ;UNIT SELECT (BIT #1)
000004                  US4=    4               ;UNIT SELECT (BIT #2)
000010                  BAI=    10              ;BUS ADDRESS INCREMENT INHIBIT (BIT #3)
000020                  PAT=    20              ;INVERT PARITY ON MASS BUS TO EVEN (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 REGISTERS
                        ;*****************************************************************



                        ;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                  DF5=    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                  LST=    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)
```

```
2094            100000          DCK=    100000                  ;DATA CHECK ERROR (BIT 15)
2095
2096                            ;MAINTAINABILITY REGISTER (RHMR)(#03)
2097
2098            000001          DMD=    1                       ;DIAGINOSTIC MODE (BIT #0)
2099            000002          MCLK=   2                       ;MAINTAINABILITY CLOCK (BIT #1)
2100            000004          MINX=   4                       ;MAINTAINABILITY INDEX (BIT #2)
2101            000010          MSTCK=  10                      ;MAINTAINABILITY SECTOR CLOCK (BIT #3)
2102            000020          MRD=    20                      ;MAINTAINABILITY READ (BIT #4)
2103            000040          MWR=    40                      ;MAINTAINABILITY WRITE (BIT #5)
2104            000200          DENVL=  200                     ;DATA ENVELOPE (BIT #7)
2105            000400          ZER=    400                     ;ZERO DETECT (BIT #8)
2106            001000          DTSY=   1000                    ;MAINTAINABILITY SYNC DETECTED (BIT #9)
2107
2108                            ;ATTENTION SUMMARY PSEUDO-REGISTER (RHAS) (#04)
2109
2110            000001          AT0=    1                       ;DEVICE 0 (BIT #0)
2111            000002          AT1=    2                       ;DEVICE 1 (BIT #1)
2112            000004          AT2=    4                       ;DEVICE 2 (BIT #2)
2113            000010          AT3=    10                      ;DEVICE 3 (BIT #3)
2114            000020          AT4=    20                      ;DEVICE 4 (BIT #4)
2115            000040          AT5=    40                      ;DEVICE 5 (BIT #5)
2116            000100          AT6=    100                     ;DEVICE 6 (BIT #6)
2117            000200          AT7=    200                     ;DEVICE 7 (BIT #7)
2118
2119
2120
2121
2122
2123                            ;DESIRED SECTOR/TRACK ADDRESS REGISTER (RHDST) (#1)
2124                            ;EACH BIT IS CALLED BY BIT NUMBER
2125
2126
2127
2128
2129
2130                            ;DRIVE TYPE REGISTER (RHDT) (#06)
2131                            ;EACH BIT IS CALLED BY BIT NUMBER
2132
2133
2134
2135
2136
2137                            ;LOOK-AHEAD REGISTER (RHLA) (#07)
2138
2139            000001          EXT1=   1                       ;EXTENSION 1 (BIT #0)
2140            000002          EXT2=   2                       ;EXTENSION 2 (BIT #1)
2141            000004          EXT4=   4                       ;EXTENSION 3 (BIT #2)
2142            000010          EXT10=  10                      ;EXTENSION 4 (BIT #3)
2143            000020          EXT20=  20                      ;EXTENSION 5 (BIT #4)
2144            000040          EXT40=  40                      ;EXTENSION 6 (BIT #5)
2145            000100          SC1=    100                     ;SECTOR COUNT FIELD 0 (BIT #6)
2146            000200          SC2=    200                     ;SECTOR COUNT FIELD 1 (BIT #7)
2147            000400          SC4=    400                     ;SECTOR COUNT FIELD 2 (BIT #8)
```

```
2148    001000          SC10=   1000            ;SECTOR COUNT FIELD 3 (BIT #9)
2149    002000          SC20=   2000            ;SECTOR COUNT FIELD 4 (BIT #10)
2150    004000          TRK1=   4000            ;TRACK FIELD 1 (BIT #11)
2151    010000          TRK2=   10000           ;TRACK FIELD 2 (BIT #12)
2152    020000          TRK4=   20000           ;TRACK FIELD 3 (BIT #13)
2153    040000          TRK10=  40000           ;TRACK FIELD 4 (BIT #14)
2154    100000          TRK20=  100000          ;TRACK FIELD 5 (BIT #15)
2155
2156                    ;ERROR REGISTER #2 (RHER2) (#10)
2157
2158    000001          WCU=    1               ;WRITE CURRENT UNSAFE (BIT #0)
2159    000002          CSF=    2               ;CURRENT SINK FAILURE (BIT #1)
2160    000004          WSU=    4               ;WRITE SELECT UNSAFE (BIT #2)
2161    000010          CSU=    10              ;CURRENT SWITCH UNSAFE (BIT #3)
2162    000020          MSE=    20              ;MOTOR SEQUENCE ERROR (BIT #4)
2163    000040          TDF=    40              ;TRANSITIONS DETECTOR FAILURE (BIT #5)
2164    000100          TUF=    100             ;TRANSITIONS UNSAFE (BIT #6)
2165    000200          FEN=    200             ;FAILSAFE ENABLED (BIT #7)
2166    000400          WRU=    400             ;WRITE READY UNSAFE (BIT #8)
2167    001000          MHS=    1000            ;MULTIPLE HEAD SELECT (BIT #9)
2168    002000          NHS=    2000            ;NO HEAD SELECTION (BIT #10)
2169    004000          IXE=    4000            ;INDEX ERROR (BIT #11)
2170    010000          VU30=   10000           ;30VOLT UNSAFE (BIT #12)
2171    020000          PLU=    20000           ;PLO UNSAFE (BIT #13)
2172    100000          ACU=    100000          ;ACUNSAFE (BIT #15)
2173
2174                    ;OFFSET REGISTER (RHOF) (#11)
2175
2176    000001          OF25=   1               ;OFFSET 25 MICRO INCHES (BIT #0)
2177    000002          OF50=   2               ;OFFSET 50 MICRO INCHES (BIT #1)
2178    000004          OF100=  4               ;OFFSET 100 MICRO INCHES (BIT #2)
2179    000010          OF200=  10              ;OFFSET 200 MICRO INCHES (BIT #3)
2180    000020          OF400=  20              ;OFFSET 400 MICRO INCHES (BIT #4)
2181    000040          OF800=  40              ;OFFSET 800 MICRO INCHES (BIT #5)
2182
2183    000200          OFREV=  200             ;OFFSET NEGATIVE (REVERSE) (BIT #7)
2184    002000          HCI=    2000            ;HEADER COMPARE INHIBIT (BIT #10)
2185    004000          ECI=    4000            ;ERROR CORRECTION CODE INHIBIT (BIT #11)
2186    010000          FMT22=  10000           ;FORMAT BIT (BIT #12
2187
2188
2189
2190
2191
2192                    ;DESIRED CYLINDER ADDRESS (RHCA) (#12)
2193                    ;EACH BIT IS CALLED BY BIT NUMBER.
2194
2195
2196
2197
2198
2199                    ;CURRENT CYLINDER ADDRESS (RHCC) (#13)
2200                    ;EACH BIT IS CALLED BY BIT NUMBER
2201
```

```
2202
2203
2204
2205
2206                            ;SERIAL NUMBER REGISTER (RHSN) (#14)
2207                            ;EACH IS CALLED BY BIT NUMBER
2208
2209
2210
2211
2212
2213                            ;ERROR REGISTER #03 (RHER3) (#15)
2214
2215    000001                  PSU=    1               ;PACK SPEED UNSAFE (BIT #0)
2216    000002                  VUF=    2               ;VELOCITY UNSAFE (BIT #1)
2217    000010                  UWR=    10              ;ANY UNSAFE EXCEPT READ/WRITE (BIT #3)
2218    000020                  PRE=    20              ;DISK PACK ROTATION ERROR (BIT #4)
2219    000040                  ACL=    40              ;AC LOW (BIT #5)
2220    000100                  DCL=    100             ;DC LOW (BIT #6)
2221    040000                  SKI=    40000           ;SEEK INCOMPLETE (BIT #14)
2222    100000                  OCYL=   100000          ;OFF CYLINDER (BIT #15)
2223
2224                            ;ECC POSITION REGISTER (RHEC1) (#16)
2225                            ;EACH BIT IS CALLED BY BIT NUMBER
2226
2227
2228
2229
2230
2231                            ;ECC PATTERN REGISTER (RHEC2) (#17)
2232                            ;EACH BIT IS CALLED BY BIT NUMBER
2233
```

```
                                .SBTTL  REGISTER ADDRESSES



                                ;RP04 VECTOR ADDRESS
014746  000254                  RPVEC:  254                     ;RP04 VECTOR ADDRESS



                                ;RP04 DISK I/O REGISTERS LOCATED IN THE RH11 CONTROLLER
                                ;NOTE:  THE CONTENTS OF THESE LOCATIONS WILL BE DIFFRENT
                                ;       IF THE "CHANGE BASE ADDRESS" ROUTINE IS USED.
                                ;       THIS ROUTINE STARTS AT LOCATION TAGED "BASECH"

014750  176722                  RHDB:   176722                  ;DATA BUFFER SEE NOTE ABOVE
014752  176702                  RHWC:   176702                  ;WORD COUNT SEE NOTE ABOVE
014754  176704                  RHBA:   176704                  ;BUS ADDRESS SEE NOTE ABOVE
014756  176710                  RHCS2:  176710                  ;CONTROL AND STATUS 2 SEE NOTE ABOVE

                                ;RP04 DISK I/O REGISTERS LOCATED IN THE RP04 DEVICE LOGIC
                                ;NOTE:  THE CONTENTS OF THESE LOCATIONS WILL BE DIFFRENT
                                ;       IF THE "CHANGE BASE ADDRESS ROUTINE IS USED.
                                ;       THIS ROUTINE STARTS AT LOCATION TAGED "BASECH"

014760  176700                  RHCS1:  176700                  ;CONTROL AND STATUS 1 SEE NOTE ABOVE
014762  176714                  RHER1:  176714                  ;ERROR #1 SEE NOTE ABOVE
014764  176706                  RHDST:  176706                  ;DESIRED SECTOR/TRACK ADDRESS SEE NOTE ABOVE
014766  176740                  RHER2:  176740                  ;ERROR #2 SEE NOTE ABOVE
014770  176732                  RHOF:   176732                  ;OFFSET SEE NOTE ABOVE
014772  176734                  RHCA:   176734                  ;DESIRED CYLINDER ADDRESS SEE NOTE ABOVE
014774  176742                  RHER3:  176742                  ;ERROR #3 SEE NOTE ABOVE
014776  176716                  RHAS:   176716                  ;ATTENTION SUMMARY SEE NOTE ABOVE
015000  176724                  RHMR:   176724                  ;MAINTAINABILITY SEE NOTE ABOVE
015002  176712                  RHDS1:  176712                  ;DRIVE STATUS SEE NOTE ABOVE
015004  176726                  RHDT:   176726                  ;DRIVE TYPE SEE NOTE ABOVE
015006  176730                  RHSN:   176730                  ;SERIAL NUMBER SEE NOTE ABOVE
015010  176744                  RHEC1:  176744                  ;ECC POSITION SEE NOTE ABOVE
015012  176746                  RHEC2:  176746                  ;ECC PATTERN SEE NOTE ABOVE
015014  176720                  RHLA:   176720                  ;LOOK-AHEAD SEE NOTE ABOVE
015016  176736                  RHCC:   176736                  ;CURRENT CYLINDER ADDRESS SEE NOTE ABOVE
```

```
2281
2282                                    ;THE FOLLOWING LOCATIONS ARE RESERVED FOR REGISTER SAVES
2283                                    ;ANY TIME THERE IS AN ERROR ALL THESE WILL BE FILLED
2284                                    ;ONLY SOME MAY BE PRINTED BUT ALL WILL BE FILLED TRUE
2285                                    ;FOR THE TIME JUST AFTER THE "ERROR" ERROR COMMAND
2286
2287  015020  000000                    DB:     0                       ;DATA BUFFER
2288  015022  000000                    WC:     0                       ;WORD COUNT
2289  015024  000000                    BA:     0                       ;BUS ADDRESS
2290  015026  000000                    CS2:    0                       ;CONTROL AND STATUS 2
2291
2292
2293  015030  000000                    CS1:    0                       ;CONTROL AND STATUS 1
2294  015032  000000                    ER1:    0                       ;ERROR #1
2295  015034  000000                    DST:    0                       ;DESIRED SECTOR/TRACK ADDRESS
2296  015036  000000                    ER2:    0                       ;ERROR #2
2297  015040  000000                    OF:     0                       ;OFFSET
2298  015042  000000                    CA:     0                       ;DESIRED CYLINDER ADDRESS
2299  015044  000000                    ER3:    0                       ;ERROR #3
2300  015046  000000                    AS:     0                       ;ATTENTION SUMMARY
2301  015050  000000                    MR:     0                       ;MAINTAINABILITY
2302  015052  000000                    DS1:    0                       ;DRIVE STATUS
2303  015054  000000                    DT:     0                       ;DRIVE TYPE
2304  015056  000000                    SN:     0                       ;SERIAL NUMBER
2305  015060  000000                    EC1:    0                       ;ECC POSITION
2306  015062  000000                    EC2:    0                       ;ECC PATTERN
2307  015064  000000                    LA:     0                       ;LOOK-AHEAD
2308  015066  000000                    CC:     0                       ;CURRENT CYLINDER ADDRESS
2309
2310
```

```
2311                                    ;FLAGS AND INTERNAL PROGRAM CONTROL WORDS
2312
2313
2314
2315  015070  000010                    UNITS:  .BLKW   8.              ;THIS IS FILLED WITH -1
2316  015110  000000                    UNIT:   .WORD   0               ;UNIT UNDER TEST
2317  015112  000000                    NOUNIT: .WORD   0               ;NUMBER OF UNITS PRESENT
2318                                                                    ;USED TO KEEP TRACK OF UNIT UNDER TEST
2319  015114  000000                    NUNIT:  .WORD   0               ;USED TO DETERMIN IF THERE ARE MORE
2320                                                                    ;THAN ONE UNIT
2321  015116  000000                    SELECT: .WORD   0               ;ALL ONES INDICATE UNIT TO BE SELECTED
2322  015120  000000                    UNITSL: .WORD   0               ;UNIT NO. SELECTED
2323
2324  015122  000000                    ERFLG$: 0                       ;ERROR FLAG
2325
2326  015124  000000                    SAVDT:  0                       ;SAVE DRIVE TYPE REGISTER
2327                                                                    ;FOR COMPARISON IN DRIVE CLEAR TEST
2328                                                                    ;AND RH INIT TEST
2329  015126  000000                    SAVSN:  0                       ;SAVE SERIAL NUMBER REGISTER
2330                                                                    ;FOR COMPARISON IN DRIVE CLEAR TEST
2331                                                                    ;AND RH INIT TEST
2332
2333  015130  000000                    PCJSR:  0                       ;SAVE PC OF JSR WHICH GAVE THE ERROR
2334
2335  015132  000000                    ATTENT: 0                       ;ATTENTION BIT FOR PRESENT UNIT
2336  015134  000000                    TOTALAT:        0               ;TOTAL ATTENTION BITS
2337
2338  015136  000000                    TMPILL: 0                       ;TEMPORARY ILLEGAL FUNCTION
2339
2340  015140  000000                    TSECC:  0                       ;FLAG TO SAY IF ECC TEST OR NOT
2341                                                                    ;WHEN =177777 IT IS AN ECC TEST
2342                                                                    ;WHEN =0IT IS NOT AN ECC TEST
2343
2344  015142  000000                    TESDTE: 0                       ;FLAG TO SAY IF DRIVE TIMING ERROR OR NOT
2345                                                                    ;WHEN = 177777 IT IS A DTE TEST
2346                                                                    ;WHEN = 0      IT IS NOT A DTE TEST
2347
2348  015144  000000                    TAGDTE: 0                       ;TEMPORARY TAG USED IN DRIVE TIMING
2349                                                                    ;ERROR TEST
2350
```

```
2351
2352
2353                                    ;FUNCTION EQUATES
2354
2355                                    ;TABLE OF COMMAND FUNCTIONS FOR RHCS1
2356                                    ;THEN "GO" BIT HAS TO BE SET
2357
2358  015146                    FUTABL:
2359  015146  000000           NOPERA: 0                       ;NO OPERATION
2360  015150  000002           UNLOAD: 2                       ;UNLOAD (STAND BY)
2361  015152  000006           RECALI: 6                       ;RECALIBRATE
2362  015154  000010           DCLEAR: 10                      ;DRIVE CLEAR
2363  015156  000012           RELEAS: 12                      ;RELEASE (DUAL-PORT OPERATION)
2364  015160  000030           SERCH:  30                      ;SEARCH COMMAND
2365  015162  000050           WRCHEK: 50                      ;WRITE CHECK DATA
2366  015164  000052           WRCHDT: 52                      ;WRITE CHECK HEADER AND DATA
2367  015166  000060           WRIDAT: 60                      ;WRITE DATA
2368  015170  000062           WRIFOR: 62                      ;WRITE HEADER AND DATA (FORMAT)
2369  015172  000070           READAT: 70                      ;READ DATA
2370  015174  000072           REFOR:  72                      ;READ HEADER AND DATA
2371  015176  000004           SEECOM: 4                       ;SEEK COMMAND
2372  015200  000014           OFSETC: 14                      ;OFFSET COMMAND
2373  015202  000016           RETCL:  16                      ;RETURNTO CENTERLINE
2374  015204  000022           PKACK:  22                      ;PACK ACKNOWLEDGE
2375  015206  000020           READIN: 20                      ;READ IN
2376  015210  000000           ILLEGL: .WORD                   ;COMPUTED ILLEGAL FUNCTION
2377
2378
2379
2380                                    ;DATA BUFFER FOR READ WRITE
2381
2382  015212  000422           WRFROM: .BLKW   274.            ;WRITE FROM THIS BUFFER
2383  016256  000422           REINTO: .BLKW   274.            ;READ INTO THIS BUFFER
2384  017322  000000           TSTNM:  0                       ;TEST NUMBER
2385  017324  000000           FIRST:  0                       ;IF ZERO WILL TYPE HEADER
2386                                                           ;IF ONES WILL NOT TYPE HEADER
2387
2388
2389
2390
2391                                    ;TABLE FOR ATTENTION BITS
2392                                    ;ATTENTION TABLE
2393
2394  017326    001     002     004  ATABLE: .BYTE   1,2,4,10,20,40,100,200
2395  017331    010     020     040
2396  017334    100     200
```

```
DZRPTD.SET      .BYTE   1,2,4,10,20,40,100,200

                                                .SBTTL
                                                .SBTTL  ***PROGRAM SETUP & SETUP TESTS***
                                                .SBTTL

017336  012737  177777  015116  BEGIN2: MOV     #-1,@#SELECT    ;SELECT UNIT
017344  000402                  BR      START
017346  005037  015116          BEGIN:  CLR     @#SELECT        ;DO NOT SELECT UNIT
                                                                ;NORMAL RUN

017352                          START:
017352  012737  000340  177776          MOV     #340,@#PS       ;;LOCK OUT ALL INTERRUPTS
017360  012706  001100          MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
017364  005026                  CLR     (R6)+           ;;CLEAR MEMORY LOCATION
017366  022706  001136          CMP     #$TKS,R6        ;;DONE?
017372  001374                  BNE     .-6             ;;LOOP BACK IF NO
017374  012706  001000          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
017400  012737  056306  000020  MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
017406  012737  000340  000022  MOV     #340,@#IOTVEC+2 ;;LEVEL 7
017414  012737  057674  000030  MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
017422  012737  000340  000032  MOV     #340,@#EMTVEC+2 ;;LEVEL 7
017430  012737  060440  000034  MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
017436  012737  000340  000036  MOV     #340,@#TRAPVEC+2;LEVEL 7
017444  012737  060506  000024  MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
017452  012737  000340  000026  MOV     #340,@#PWRVEC+2 ;;LEVEL 7
017460  005067  161520          CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
017464  005067  161516          CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
017470  112767  000001  161417  MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
017476  012767  017476  161402  MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
017504  012767  017504  161376  MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS


017512  012767  000000  160256          MOV     #0,PS           ;SET PROCESSOR STATUS TO 0
017520  012777  056220  175220          MOV     #RPVECT,@RPVEC  ;THIS IS FOR UNTIMELY RP04 INTERRUPTS
017526  004737  057146          JSR     PC,@#$TKINT     ;INITILIZE TTY KEYBOARD
017532  005737  017324          TST     @#FIRST         ;IS THIS FIRST TIME ROUND ?
017536  001001                  BNE     1$              ;DON'T TYPE HEADER IF NOT
017540  000402                  BR      2$              ;TYPE HEADER IF SO
017542  000137  020636          1$:     JMP     @#SND1

017546                          2$:
017546  104400  017554          TYPE    ,.+4            ;;TYPE ASCIZ STRING
017552  000435                  BR      64$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ        <15><12>/RJP04 DISKLESS RH11 TEST-PART II (STATIC 1B) - DZRPT-D/
017646                          64$:
017646  104400  017654          TYPE    ,.+4            ;;TYPE ASCIZ STRING
017652  000416                  BR      65$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ        <15><12>/REVISION DATE: 21-JULY-75/
017710                          65$:
017710  104400  017716          TYPE    ,.+4            ;;TYPE ASCIZ STRING
017714  000402                  BR      66$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ        <15><12>/ /
017722                          66$:
017722  104400  017730          TYPE    ,.+4            ;;TYPE ASCIZ STRING
```

```
2451  017726  000432                        BR      67$             ;;GET OVER THE ASCIZ
2452                                        ;;.ASCIZ    <15><12>/ALL DCL UNDER TEST MUST BE LOCKED ON CORRECT PORT/
2453  020014                        67$:
2454  020014  104400  020022                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2455  020020  000425                        BR      68$             ;;GET OVER THE ASCIZ
2456                                        ;;.ASCIZ    <15><12>/IF CHANGES ARE REQUIRED ON PORT SWITCH,/
2457  020074                        68$:
2458  020074  104400  020102                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2459  020100  000430                        BR      69$             ;;GET OVER THE ASCIZ
2460                                        ;;.ASCIZ    <15><12>/A CYCLE UP SEQUENCE IS REQUIRED FOR STROBING/
2461  020162                        69$:
2462  020162  104400  020170                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2463  020166  000414                        BR      70$             ;;GET OVER THE ASCIZ
2464                                        ;;.ASCIZ    <15><12>/THE PORT SELECT FLOP/
2465  020220                        70$:
2466  020220  104400  020226                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2467  020224  000402                        BR      71$             ;;GET OVER THE ASCIZ
2468                                        ;;.ASCIZ    <15><12>/ /
2469  020232                        71$:
2470  020232  104400  020240                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2471  020236  000427                        BR      72$             ;;GET OVER THE ASCIZ
2472                                        ;;.ASCIZ    <15><12>/ALL DCL NOT UNDER TEST MUST BE SWITCHED OFF/
2473  020316                        72$:
2474  020316  104400  020324                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2475  020322  000402                        BR      73$             ;;GET OVER THE ASCIZ
2476                                        ;;.ASCIZ    <15><12>/ /
2477  020330                        73$:
2478  020330  104400  020336                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2479  020334  000427                        BR      74$             ;;GET OVER THE ASCIZ
2480                                        ;;.ASCIZ    <15><12>/**********************************************/
2481  020414                        74$:
2482  020414  104400  020422                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2483  020420  000427                        BR      75$             ;;GET OVER THE ASCIZ
2484                                        ;;.ASCIZ    <15><12>/IF THIS IS NOT DONE, ERRORS WILL RESULT ON/
2485  020500                        75$:
2486  020500  104400  020506                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2487  020504  000415                        BR      76$             ;;GET OVER THE ASCIZ
2488                                        ;;.ASCIZ    <15><12>/'NED' TESTS (T21 & T36)/
2489  020540                        76$:
2490  020540  104400  020546                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2491  020544  000427                        BR      77$             ;;GET OVER THE ASCIZ
2492                                        ;;.ASCIZ    <15><12>/**********************************************/
2493  020624                        77$:
2494  020624  104400  020632                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2495  020630  000402                        BR      78$             ;;GET OVER THE ASCIZ
2496                                        ;;.ASCIZ    <15><12>/ /
2497  020636                        78$:
2498
2499  020636  012737  177777  017324  SND1: MOV     #-1,@#FIRST             ;NEXT TIME DO NOT GIVE HEADER
2500  020644  005737  015116                TST     @#SELECT                ;WAS IT A 200 START
2501  020650  001435                        BEQ     TST1                    ;BRANCH IF STARTING FROM 200
2502  020652  104400  020660                TYPE    ,.+4            ;;TYPE ASCIZ STRING
2503  020656  000423                        BR      64$             ;;GET OVER THE ASCIZ
2504                                        ;;.ASCIZ    <15><12>/SELECT UNIT NUMBER TO BE TESTED ?  /
```

```
2505  020726                              64$:
2506  020726  104416                              RDOCT
2507  020730  042716  177770                      BIC     #177770,(SP)            ;ONLY KEEP LAST 3 BITS
2508  020734  011637  015110                      MOV     (SP),@#UNIT             ;SAVE UNIT TO BE TESTED
2509  020740  012637  015120                      MOV     (SP)+,@#UNITSL          ;SAVE UNIT TO BE TESTED
2510
2511
2512
```

```
                                ;*****************************************************************
                                ;*TEST 1         REFERENCE EACH REGISTER
                                ;*              REFERENCE EACH REGISTER BY A MOVE INSTRUCTION
                                ;*****************************************************************
020744  000004                  TST1:   SCOPE
020746  012767  000001  160230          MOV     #1,STIMES       ;;DO 1 ITERATION
020754  012706  001000          MOV     #STACK, SP      ;SET UP STACK POINTER
020760  012737  000001  017322  MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
020766  012737  057702  000030  MOV     #REGSA1,@#EMTVEC;ERROR VECTOR SO THAT
                                                        ;NO REGISTERS ARE SAVED
020774  012737  021022  000004  MOV     #2$,    @#ERRVEC ;SET UP FOR BUS TIMEOUT
021002  012700  000024          MOV     #24.,   R0      ;THERE ARE 24 REG TO TEST
021006  012701  014750          MOV     #RHDB,  R1      ;R1 NOW HAS ADDR OF ADDR OF FIRST REG.
021012  013102                  1$:     MOV     @(R1)+, R2      ;READ HARDWARE REG.
021014  005300                  DEC     R0              ;COUNT DOWN
021016  001375                  BNE     1$              ;BRANCH IF 24 NOT DONE
021020  000471                  BR      3$              ;BRANCH IF 24 DONE
021022  012737  000006  000004  2$:     MOV     #ERRVEC+2,@#ERRVEC ;RESTORE TRAP CATCHER
021030  022626                  CMP     (SP)+,  (SP)+   ;CLEAN STACK
021032  016167  177776  160132  MOV     -2(R1), STMP1   ;STORE FAILING REG ADDR
021040  104015                  ERROR   15              ;REGISTER NON EXISTANT
021042  032737  020000  177570  BIT     #SW13,@#SWR     ;INHIBIT ERROR PRINTOUT ?
021050  001053                  BNE     4$              ;BRANCH IF YES
021052  104400  021060          TYPE    ,.+4            ;;TYPE ASCIZ STRING
021056  000431                  BR      64$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ      <15><12>/IF BASE ADDRESS IS TO BE CHANGED HALT PROGRAM /
021142                          64$:
021142  104400  021150          TYPE    ,.+4            ;;TYPE ASCIZ STRING
021146  000411                  BR      65$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ      <15><12>/AND RESTART AT /
021172                          65$:
021172  012746  050576          MOV     #BASECH,-(SP)   ;GET READY TO TYPE STARTING ADDRESS
                                                        ;OF "CHANGE OF BASE ADDRESS" ROUTINE
021176  104402                  TYPOC
021200  000137  043730          4$:     JMP     @#$EOP          ;GO TO END OF PROGRAM
021204  012737  057674  000030  3$:     MOV     #$ERROR,@#EMTVEC;RESTORE ERROR VECTOR
                                                        ;SO THAT REGISTERS ARE SAVED
021212  012737  000006  000004          MOV     #ERRVEC+2,@#ERRVEC ;RESTORE TRAP CATCHER
```

```
2554
2555                                    ;*****************************************************************
2556                                    ;*TEST 2        RHCS2-CONTROL AND STATUS 2
2557
2558                                    ;*      THIS PARTIALLY TESTS RHCS2 TO ENABLE DETERMINATION
2559                                    ;*      OF THE NUMBER OF DRIVES PRESENT
2560
2561                                    ;*****************************************************************
2562  021220  000004                    TST2:   SCOPE
2563  021222  012767  000001  157754            MOV     #1,$TIMES       ;;DO 1 ITERATION
2564  021230  012706  001000                    MOV     #STACK,SP       ;RESET STACK
2565
2566  021234  012737  000002  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
2567  021242  013737  014756  021256            MOV     @#RHCS2,@#UN+2
2568  021250  004537  044720                    JSR     R5,@#BITST      ;TEST BITS IN REGISTER
2569  021254  020017                    UN:     20017                   ;ONLY THESE BITS ARE TEST READ/WRITE
2570  021256  000000                            .WORD   0               ;ADDRESS OF REG. BEING TESTED
2571  021260  104001                            ERROR   1               ;IN CORRECT DATA RECEIVED
2572  021262  000207                            RTS     PC              ;RETURN TO BLT3 ROUTINE
2573
2574
2575
2576
2577
2578
2579                                    ;*****************************************************************
2580                                    ;*TEST 3        PARTIAL TEST FOR RHAS FOR UNIT NUMBERS PRESENT
2581                                    ;*****************************************************************
2582  021264  000004                    TST3:   SCOPE
2583  021266  012767  000001  157710            MOV     #1,$TIMES       ;;DO 1 ITERATION
2584  021274  012737  000003  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
2585  021302  013701  014776                    MOV     @#RHAS,R1       ;R1 HAS ADDRESS OF RHAS
2586  021306  012711  177777                    MOV     #-1,@R1         ;THIS CLEARS RHAS (SURPRISED!)
2587  021312  011137  001126                    MOV     @R1,@#$BDDAT    ;TEST DATA
2588  021316  105737  001126                    TSTB    @#$BDDAT
2589  021322  001405                            BEQ     TST4            ;BRANCH IF GOOD
2590  021324  005037  001124                    CLR     @#$GDDAT        ;GOOD DATA
2591  021330  010137  044716                    MOV     R1,@#REGADR     ;FAILING REG. RHAS
2592  021334  104001                            ERROR   1               ;RHAS DOES NOT CLEAR
2593                                                                    ;WITH ONES
2594
```

```
                                ;*****************************************************************
                                ;*TEST 4        TEST FOR DRIVES PRESENT USING RHAS AND RHCS2
                                ;*****************************************************************
021336  000004                  TST4:   SCOPE
021340  012767  000001  157636          MOV     #1,$TIMES       ;;DO 1 ITERATION
021346  000005                          RESET                   ;START WITH AN INIT
021350  004737  057146          .       JSR     PC,@#$TKINT     ;INITILIZE TK
021354  032737  020000  177570          BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPEOUT?
021362  001030                          BNE     4$              ;BRANCH IF YES
021364  104400  021372                  TYPE    ,.+4            ;;TYPE ASCIZ STRING
021370  000425                          BR      64$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/LOOKING AT RHAS -  RP04 DRIVES PRESENT /
021444                          64$:
021444  013701  014776          4$:     MOV     @#RHAS,R1       ;R1 HAS ADDR. OF RHAS
021450  013702  014756                  MOV     @#RHCS2,R2      ;R2 HAS ADDR. OF RHCS2
021454  005012                          CLR     @R2             ;CLEAR RHCS2
021456  012700  000010                  MOV     #8.,R0          ;COUNT
021462  013704  014762                  MOV     @#RHER1,R4      ;R4 HAS ADDR. OF RHER1
021466  012714  177777          1$:     MOV     #-1,@R4         ;MOVE ERRORS INTO RHER1
021472  005212                          INC     @R2             ;INCREMENT UNIT NO.
021474  005300                          DEC     R0              ;COUNT
021476  001373                          BNE     1$              ;BRANCH IF 0 NOT DONE
021500  111137  015134                  MOVB    @R1,@#TOTALAT   ;SAVE TOTAL ATTENTION
                                                                ;USED IN DRIVE CLEAR TEST
021504  105037  015135                  CLRB    @#TOTALAT+1     ;CLEAR UPPER BYTE
021510  105711                          TSTB    @R1             ;TEST FOR ANY DRIVES PRESENT
021512  001402                          BEQ     2$              ;NONE RESPONDING - TYPE THE MESSAGE
021514  000167  000430                  JMP     XE2             ;SOME THERE - GO FILL "UNITS" TABLE

021520  032737  020000  177570  2$:     BIT     #SW13,@#SWR     ;INHIBIT ERROR TYPE OUT?
021526  001402                          BEQ     3$              ;"NO DRIVES" MESSAGE IF NO
021530  000167  000670                  JMP     SELTST          ;CHECK FOR SELECTED UNIT START AND LOAD
                                                                ;"UNITS" TABLE WITH DESIRED DRIVE IF SO

021534                          3$:
021534  104400  021542                  TYPE    ,.+4            ;;TYPE ASCIZ STRING
021540  000412                          BR      65$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/NO DRIVES-RHAS=0/
021566                          65$:
021566  104400  021574                  TYPE    ,.+4            ;;TYPE ASCIZ STRING
021572  000436                          BR      66$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/WRITING ONES INTO ERROR REGISTER #1 FOR ALL UNIT NUMBERS/
021670                          66$:
021670  104400  021676                  TYPE    ,.+4            ;;TYPE ASCIZ STRING
021674  000441                          BR      67$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/DOES NOT SET ANY BIT IN THE ATTENTION REGISTER SO ABORT P
022000                          67$:
022000  104400  022006                  TYPE    ,.+4            ;;TYPE ASCIZ STRING
022004  000435                          BR      68$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/TO LOOP ON THIS TEST WO PRINTOUT SET SWITCHES 13, 8 & 2/
022100                          68$:

022100  000137  043730                  JMP     @#$EOP          ;GO OUT------------------------------>
```

```
2649
2650  022104  104400  022112              TYPE    .+4             ;;TYPE ASCIZ STRING
2651  022110  000410                      BR      69$             ;;GET OVER THE ASCIZ
2652                                      ;;.ASCIZ    <15><12>/TEST DRIVE 0/
2653  022132                      69$:
2654  022132  005037  015070              CLR     @#UNITS
2655  022136  012767  000001  172746      MOV     #1,NOUNIT       ;NO. UNITS PRESENT=1
2656  022144  005037  015110              CLR     @#UNIT
2657  022150                      XE2:
2658  022150  012700  000010      2$:     MOV     #8.,R0          ;COUNTER
2659  022154  012703  015070              MOV     #UNITS,R3       ;POINTER
2660  022160  012723  177777      3$:     MOV     #-1,(R3)+       ;PRESET BLOCK TO ALL ONES
2661  022164  005300                      DEC     R0              ;COUNT
2662  022166  001374                      BNE     3$              ;BRANCH IF 8 NOT DONE
2663  022170  012703  015070              MOV     #UNITS,R3       ;POINTER
2664  022174  005005                      CLR     R5
2665  022176  005037  015112              CLR     @#NOUNIT        ;NO. OF UNITS PRESENT
2666  022202  012700  000010              MOV     #8.,R0          ;COUNTER
2667  022206  011137  001170              MOV     @R1,@#STMPO     ;TEMPORARY STORAGE
2668  022212  006037  001170      4$:     ROR     @#STMPO ;SET CARRY IF ONE IN  0 BIT
2669
2670  022216  103067                      BCC     5$
2671  022220  010577  :72532             MOV     R5,@RHCS2       ;INSERT UNIT NUMBER
2672  022224  022777  024020  172552      CMP     #24020,@RHDT    ;IS THIS A DUAL PORT RP04
2673  022232  001452                      BEQ     6$              ;BRANCH IF YES
2674  022234  022777  020020  172542      CMP     #20020,@RHDT    ;IS THIS A SINGLE PORT RP04
2675  022242  001446                      BEQ     6$              ;BRANCH IF YES
2676  022244  104400  022252              TYPE    .+4             ;;TYPE ASCIZ STRING
2677  022250  000410                      BR      64$             ;;GET OVER THE ASCIZ
2678                                      ;;.ASCIZ    <15><12>/UNIT NUMBER /
2679  022272                      64$:
2680  022272  010546                      MOV     R5,-(SP)        ;GET READY TO TYPE UNIT NUMBER
2681  022274  104410                      TYPDS
2682  022276  104400  022304              TYPE    .+4             ;;TYPE ASCIZ STRING
2683  022302  000406                      BR      65$             ;;GET OVER THE ASCIZ
2684                                      ;;.ASCIZ    /,  RHDT = /
2685  022320                      65$:
2686  022320  017746  172460              MOV     @RHDT,-(SP)     ;GET READY TO TYPE RHDT
2687  022324  104402                      TYPOC
2688  022326  104400  022334              TYPE    .+4             ;;TYPE ASCIZ STRING
2689  022332  000411                      BR      66$             ;;GET OVER THE ASCIZ
2690                                      ;;.ASCIZ    / --- NOT AN RP04/
2691  022356                      66$:
2692  022356  000407                      BR      5$              ;NO RP04 FOUND SO BRANCH
2693  022360  010523      6$:     MOV     R5,(R3)+
2694  022362  104400  001215              TYPE    $CRLF
2695  022366  010546                      MOV     R5,-(SP)        ;PUT DRIVE NO. ON STACK
2696  022370  104410                      TYPDS                   ;TYPE DRIVE NO.
2697  022372  005237  015112              INC     @#NOUNIT        ;INCR TOTAL NO. OF UNITS
2698
2699  022376  005205      5$:     INC     R5              ;'RHCS2' UNIT ADDRESS
2700  022400  005300              DEC     R0              ;DRIVE COUNTER DOWN ONE
2701  022402  001303              BNE     4$              ;TEST AND DO NEXT UNIT IF 8 NOT DONE
2702
```

```
2703  022404  013737  015070  015110          MOV   @#UNITS,@#UNIT  ;SET UNIT NO. TO FIRST ONE FOUND/OR 0
2704  022412  013737  015112  015114          MOV   @#NOUNIT,@#NUNIT  ;SAVE NO. OF UNITS
2705  022420  005337  015114                  DEC   @#NUNIT          ;IF NUNIT = 0 THEN ONLY ONE UNIT
2706                                                                 ;IF NUNIT > 0 THEN MORE THAN ONE UNIT
2707  022424  005737  015116          SELTST: TST   @#SELECT         ;STARTING ADDRESS 200 ?
2708  022430  001403                  BEQ   TST5             ;BRANCH IF STARTING FROM 200
2709  022432  013737  015120  015110          MOV   @#UNITSL,@#UNIT ;CHANGE UNIT NUMBER TO SELECTED ONE
2710
```

```
                                        ;*****************************************************************
                                        ;*TEST 5         TEST SERIAL NUMBER AND DRIVE TYPEI
                                        ;*              READ SERIAL NUMBER REGISTER AND DRIVE TYPE REGISTER
                                        ;*              TYPE IT OUT AND PROCEED
                                        ;*              TO LOOP HERE SET SWITCH 8 AND THIS TEST NO AND RESTART
                                        ;
                                        ;*****************************************************************
022440  000004                  TST5:   SCOPE
022442  012767  000001  156534          MOV     #1,STIMES       ;;DO 1 ITERATION
022450  012767  022652  156430          MOV     #1$,SLPADR      ;;SET SCOPE LOOP ADDRESS
022456  004737  045152                  JSR     PC,@#CLDISK     ;FILL UNIT NO.
022462  005037  015132                  CLR     @#ATTENT        ;CLEAR
022466  013700  015110                  MOV     @#UNIT,R0       ;R0 CONTAINS UNIT NO
022472  116037  017326  015132          MOVB    ATABLE(R0),@#ATTENT  ;SET APPROPIATE ATTENTION BIT
022500  104400  022506                  TYPE    ,.+4            ;;TYPE ASCIZ STRING
022504  000415                          BR      64$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ      <15><12>/TESTING DRIVE NUMBER  /
022540                          64$:
022540  013746  015110                  MOV     @#UNIT,-(SP)    ;UNIT NO. TO STACK
022544  104402                          TYPOC                   ;TYPE  DRIVE NO.
022546  104400  001215                  TYPE    ,$CRLF
022552  104400  022560                  TYPE    ,.+4            ;;TYPE ASCIZ STRING
022556  000410                          BR      65$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ      <15><12>/SERIAL NO. = /
022600                          65$:
022600  017746  172202                  MOV     @RHSN,-(SP)     ;;SAVE @RHSN FOR TYPEOUT
022604  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
022606  104400  001215                  TYPE    ,$CRLF
022612  104400  022620                  TYPE    ,.+4            ;;TYPE ASCIZ STRING
022616  000410                          BR      66$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ      <15><12>/DRIVE TYPE = /
022640                          66$:
022640  017746  172140                  MOV     @RHDT,-(SP)     ;;SAVE @RHDT FOR TYPEOUT
022644  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
022646  104400  001215                  TYPE    ,$CRLF
022652  005777  172130          1$:     TST     @RHSN           ;READ SERIAL NO. AND DRIVE TYPE
022656  005777  172122                  TST     @RHDT           ;THESE TWO ARE TO HELP SCOPE LOOPS
022662  017737  172120  015126          MOV     @RHSN,@#SAVSN   ;SAVE TO CHECK IF CLR RHCS2 BIT 5 CLEARS ANY BITS
022670  017737  172110  015124          MOV     @RHDT,@#SAVDT   ;SAVE TO CHECK IF CLR RHCS2 BIT 5 CLEARS ANY BITS
```

```
                                ;*****************************************************************
                                ;*TEST 6         CHECK MOL TO BE LOW

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

                                ;*****************************************************************
022676  000004                  TST6:   SCOPE
022700  012737  000006  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
022706  004737  045152          JSR     PC,@#CLDISK     ;GIVE INITILIZE
022712  032713  010000          BIT     #MOL,@R3        ;CHECK MOL IN RHDS1
022716  001550                  BEQ     TST7            ;BRANCH IF MOL LOW

022720  104400  022726          TYPE    ,.+4            ;;TYPE ASCIZ STRING
022724  000421                  BR      64$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ        <15><12>/DRIVE IS ON LINE - MOL IS HIGH/
022770                          64$:
022770  104400  022776          TYPE    ,.+4            ;;TYPE ASCIZ STRING
022774  000424                  BR      65$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ        <15><12>/HIT STOP ON DRIVE TO GET IT OFF LINE/
023046                          65$:
023046  104400  023054          TYPE    ,.+4            ;;TYPE ASCIZ STRING
023052  000430                  BR      66$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ        <15><12>/PROGRAM WILL HANG TESTING MOL TILL MOL IS LOW/
023134                          66$:

023134  032713  010000          1$:     BIT     #MOL,@R3        ;CHECK MOL IN RHDS1
023140  001375                  BNE     1$              ;BRANCH IF MOL IS HIGH
023142  104400  023150          TYPE    ,.+4            ;;TYPE ASCIZ STRING
023146  000434                  BR      67$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ        <15><12>/GOOD - MOL IS NOW LOW . PROGRAM WILL NOW BE EXECUTED/
023240                          67$:
```

```
2788
2789                                    ;*********************************************************** *****
2790                                    ;*TEST 7        PACK ACKNOWLEDGE COMMAND TEST
2791
2792                                    ;*      THE PACK ACKNOWLEDGE COMMAND WILL BE LOADED INTO RHCS1 WITH GO
2793                                    ;*      THEN ALL REGISTERS WILL BE CHECKED
2794                                    ;*      RH CLEAR WILL BE GIVEN
2795                                    ;*      THEN ALL REGISTERS WILL BE CHECKED
2796
2797                                    ;*************************************************************** **
2798  023240  000004                    TST7:   SCOPE
2799  023242  012706  001000                    MOV     #STACK,SP       ;RESET STACK
2800  023246  012737  000007  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
2801
2802  023254  004737  045152                    JSR     PC,@#CLDISK     ;INIT AND SET UP GENERAL REG.
2803                                                                    ;AND UNIT NUMBER
2804  023260  012777  000001  171512            MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE
2805
2806  023266  013777  015204  171464            MOV     @#PKACK,@RHCS1  ;LOAD PACK ACKNOWLEDGE COMMAND INTO RHCS1
2807
2808                                            ;SAVE REGISTERS FOR COMPARISON AFTER GO
2809  023274  004037  045644                    JSR     R0,@#SAVER      ;SAVE
2810  023300  014752                            RHWC                    ;FROM
2811  023302  016256                            REINTO                  ;TO
2812  023304  000023                            19.                     ;NUMBER OF REGISTERS SAVED
2813
2814                                            ;GIVE GO TO PACK ACKNOWLEDGE COMMAND
2815  023306  052777  000001  171444            BIS     #GO,@RHCS1      ;GO TO PACK ACKNOWLEDGE COMMAND
2816
2817                                            ;CHANGE SAVED REGISTERS TO EXPECTED VALUES
2818  023314  052737  000100  016306            BIS     #VV,@#REINTO+30 ;SAVED RHDS1
2819
2820                                            ;AFTER GO HAS BEEN GIVEN TO PACK ACKNOWLEDGE COMMAND
2821                                            ;SAVE REGISTERS AGAIN SO THAT COMPARISONS CAN
2822                                            ;BE DONE
2823  023322  004037  045644                    JSR     R0,@#SAVER      ;SAVE
2824  023326  014752                            RHWC                    ;FROM
2825  023330  015212                            WRFROM
2826  023332  000023                            19.                     ;NUMBER OF REGISTERS SAVED
2827
2828                                            ;AS UPPER BYTE OF RHAS CAN BE CHANGING IN A DUAL PORT
2829                                            ;OPERATION THE UPPER BYTE OF RHAS WILL BE SAVED AS IS
2830                                            ;SO THAT THE COMPARES ARE ONLY VALID FOR THE LOWER BYTE
2831  023334  113737  016303  015237            MOVB    @#REINTO+25,@#WRFROM+25;SAVE UPPER RHAS
2832
2833
2834                                            ;COMPARE REGISTERS BEFORE PACK ACKNOWLEDGE COMMAND
2835                                            ;WITH AFTER GO
2836  023342  004037  046046                    JSR     R0,@#COMPAR     ;COMPARE
2837  023346  016256                            REINTO                  ;GOOD BUFFER
2838  023350  015212                            WRFROM                  ;TEST BUFFER
2839  023352  000023                            19.                     ;NUMBER
2840  023354  023362                            1$                      ;RETURN FOR ERROR
2841  023356  023362                            1$                      ;SAME
```

```
2842  023360  023402                        2$                      ;RETURN FOR GOOD COMPARISON
2843  023362  013705  051722          1$:   MOV     @#ERWORD,R5       ;GETTING READY TO INDEX
2844  023366  060505                        ADD     R5,R5             ;DOUBLE ERROR WORD
2845  023370  016537  014750  044716        MOV     RHMC-2(R5),@#REGADR ;FAILING REGISTER ADDRESS
2846
2847  023376  104001                        ERROR   1                 ;IMPROPER REGISTER CHANGE
2848                                                                  ;AFTER PACK ACKNOWLEDGE COMMAND
2849                                                                  ;WITH GO IS GIVEN
2850  023400  000207                        RTS     PC                ;RETURN TO COMPARISION
2851
2852  023402                          2$:
2853
2854                                  ;*****************************************************************
2855                                  ;*TEST 10       MAKE CURRENT CYLINDER = 0
2856                                  ;*****************************************************************
2857  023402  000004                  TST10:  SCOPE
2858  023404  012706  001000                  MOV     #STACK,SP         ;RESET STACK
2859  023410  004737  045152                  JSR     PC,@#CLDISK       ;INIT DRIVE
2860  023414  012777  000001  171356          MOV     #DMD,@RHMR        ;SET DIAGNOSTIC MODE
2861  023422  004037  047524                  JSR     R0,@#MAKECYL      ;SUBROUTINE TO GIVE A SEEK
2862                                                                  ;COMMAND FOLOWED BY AN INIT
2863  023426  000000                          0                       ;THIS SHUOLD CHANGE RHCC TO 0
2864
2865
2866                                          .SBTTL
2867                                          .SBTTL  ***DIAGNOSTIC CODE***
2868                                          .SBTTL
```

```
2869            000004                  TIMOT=4
2870                                    .REM %
2871                                    THE FOLLOWING TESTS WILL ATTEMPT TO CATCH THOSE BUGS WHICH FAULT
2872                                    INSERTION HAS SHOWN US WE MISSED IN THE FIRST PART OF THIS TEST.
2873
2874                                     THIS TEST WILL ASCERTAIN THAT THE ALL RH11 REGISTERS WIIL
2875                                    RESPOND TO I.E. NOT CAUSE A NON-EXISTANT MEMORY ERROR WHEN ACCESSED
2876                                    BY A "TST" INSRUCTION.
2877                                    %
2878                                    ;*****************************************************************
2879                                    ;*TEST 11       BCTA LEGAL REGISTER RESPONSE TEST
2880                                    ;*****************************************************************
2881  023430  000004                    TST11:  SCOPE
2882  023432  012767  000001  155544            MOV     #1,$TIMES       ;;DO 1 ITERATION
2883  023440  012737  177777  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
2884  023446  012777  000040  171302            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
2885
2886  023454  012705  014760                    MOV     #RHCS1,R5       ;R5=LIST POINTER.
2887
2888  023460  013767  000004  155502            MOV     @#TIMOT,$TMP0   ;SAVE TIMEOUT VECTOR.
2889  023466  012737  023524  000004            MOV     #E00,@#TIMOT    ;SET VECTOR TO E00
2890
2891  023474  012706  001000            LOC:    MOV     #STACK,SP       ;SET STACK POINTER.
2892
2893  023500  011502                    I00:    MOV     (R5),R2         ;R2=RH11 ADDRESS.
2894  023502  010267  021210                    MOV     R2,REGADR
2895  023506  005712                            TST     (R2)            ;DOES THE RH11 REGISTER RESPOND?
2896
2897  023510  062705  000002                    ADD     #2,R5           ;UPDATE ADDRESS
2898  023514  020527  015012                    CMP     R5,#RHEC2       ;AT THE END OF LEGAL RH11 REGISTERS?
2899  023520  101767                            BLOS    I00             ;NOPE
2900  023522  000401                            BR      000             ;YES! GOTO 000.
2901
2902  023524  104042                    E00:    ERROR   42
2903
2904  023526  016737  155436  000004    000:    MOV     $TMP0,@#TIMOT   ;RESTORE TIMEOUT VECTOR.
```

```
2905
```

```
                                .REM %
                                THE FOLLOWING 6 TESTS WILL TEST THE BYTE LOGIC FOR THE RH11 REGISTERS
                                NO ATTEMPT IS MADE TO DETERMINE IF ALL POSSIBLE DATA PATTERNS CAN BE
                                LOADED, ONLY THAT THE RH11 HARDWARE WILL ALLOW THE PROGRAM TO SELECTIVLY
                                MANIPULATE BYTES USING THE FOLLOWING COMMANDS:

                                        1). MOVE BYTE BOTH TO AND FROM THE WORD COUNT REGISTER

                                        2). BIT SET INTO THE WORD COUNT REGISTER.

                                        3). BIT CLEAR INTO THE WORD COUNT REGISTER.

                                %

                                ;*****************************************************************
                                ;*TEST 12       BCTA MOVB LO BYTE TO WC
                                ;*****************************************************************
023534  000004                  TST12:  SCOPE
023536  012767  000001  155440          MOV     #1,$TIMES       ;;DO 1 ITERATION
023544  012737  000012  017322          MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
023552  012777  000040  171176          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

023560  012706  001000                  MOV     #STACK,SP       ;SET STACK POINTER.

023564  016702  171162                  MOV     RHWC,R2         ;R2=RH11 WC ADDRESS.
023570  010267  021122                  MOV     R2,REGADR       ;REGISTER ADDRESS TO REGADR FOR TYPING.
023574  012767  000377  155322          MOV     #377,$GDDAT     ;$GDDAT=5/8.

023602  005012                  LO2:    CLR     (R2)            ;CLEAR RH11 WC.

023604  112712  000377          IO2:    MOVB    #377,(R2)       ;SET WC TO LO BYTE.
023610  011267  155312                  MOV     (R2),$BDDAT     ;$BDDAT=ACTUAL WAS

023614  026767  155306  155302          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS
023622  001401                          BEQ     TST13           ;NEXT TEST
023624  104044                          ERROR   44
```

```
2943
2944                                    ;*****************************************************************
2945                                    ;*TEST 13       BCTA MOVB HI BYTE TO WC
2946                                    ;*****************************************************************
2947  023626  000004                    TST13:  SCOPE
2948  023630  012767  000001  155346            MOV     #1,$TIMES       ;;DO 1 ITERATION
2949  023636  012737  000013  017322            MOV     #T13NO,@#TSTNM  ;THIS SAVES TEST NUMBER
2950  023644  012777  000040  171104            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
2951
2952  023652  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
2953
2954  023656  016702  171070                    MOV     RHWC,R2         ;R2=RH11 WC HI BYTE ADDRESS.
2955  023662  010267  021030                    MOV     R2,REGADR
2956  023666  012767  177400  155230            MOV     #177400,$GDDAT  ;$GDDAT=S/B.
2957
2958  023674  005012                    LO3:    CLR     (R2)            ;CLEAR RH11 WC.
2959
2960  023676  005202                            INC     R2              ;R2=HI BYTE ADDRESS.
2961
2962  023700  112712  000377            IO3:    MOVB    #377,(R2)       ;SET WC HI BYTE.
2963
2964  023704  005302                            DEC     R2              ;R2=FULL WORD ADDRESS.
2965
2966  023706  011267  155214                    MOV     (R2),$BDDAT     ;$BDDAT=ACTUAL.
2967
2968  023712  026767  155210  155204            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
2969  023720  001401                            BEQ     TST14           ;NEXT TEST
2970  023722  104044                            ERROR   44
2971
2972
```

```
2973
2974                                    ;*****************************************************************
2975                                    ;*TEST 14        BCTA BISB LO BYTE TO WC
2976                                    ;*****************************************************************
2977  023724  000004                    TST14:  SCOPE
2978  023726  012767  000001  155250            MOV     #1,$TIMES       ;;DO 1 ITERATION
2979  023734  012737  000014  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
2980  023742  012777  000040  171006            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
2981
2982  023750  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
2983
2984  023754  016702  170772                    MOV     RHWC,R2         ;R2=RH11 WC ADDRESS
2985  023760  010267  020732                    MOV     R2,REGADR
2986  023764  012767  000377  155132            MOV     #377,$GDDAT     ;$GDDAT=S/B.
2987
2988  023772  005012                  LO4:      CLR     (R2)            ;CLEAR RH11 WC.
2989
2990  023774  012712  000252                    MOV     #252,(R2)       ;SET UP WC
2991  024000  152712  000125          IO4:      BISB    #125,(R2)       ;DO A BISB
2992
2993  024004  011267  155116                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
2994
2995  024010  026767  155112  155106            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS
2996  024016  001401                            BEQ     TST15           ;NEXT TEST
2997  024020  104045                            ERROR   45
2998
2999
```

```
3000
3001                                    ;*****************************************************************
3002                                    ;*TEST 15       BCTA BISB HI-BYTE TO WC
3003                                    ;*****************************************************************
3004  024022  000004                    TST15:  SCOPE
3005  024024  012767  000001  155152            MOV     #1,$TIMES       ;;DO 1 ITERATION
3006  024032  012737  000015  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3007  024040  012777  000040  170710            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3008
3009  024046  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3010
3011  024052  016702  170674                    MOV     RHWC,R2         ;R2=RH11 WC ADDRESS.
3012  024056  010267  020634                    MOV     R2,REGADR
3013  024062  012767  177400  155034            MOV     #177400,$GDDAT  ;$GDDAT=S/B.
3014
3015  024070  005012                  LOS:      CLR     (R2)            ;CLEAR RH11 WC.
3016
3017  024072  005202                            INC     R2              ;R2 =HI BYTE.
3018
3019  024074  112712  000125                    MOVB    #125,(R2)       ;SET UP RH11 WC.
3020  024100  152712  000252           IOS:     BISB    #252,(R2)       ;DO A BISB.
3021
3022  024104  005302                            DEC     R2              ;R2=FULL WORD ADDRESS.
3023
3024  024106  011267  155014                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3025
3026  024112  026767  155010  155004            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3027  024120  001401                            BEQ     TST16           ;NEXT TEST
3028  024122  104045                            ERROR   45
3029
3030
```

```
3031
3032                                    ;*****************************************************************
3033                                    ;*TEST 16       BCTA BICB LO-BYTE TO WC
3034                                    ;*****************************************************************
3035  024124  000004                    TST16:  SCOPE
3036  024126  012767  000001  155050            MOV     #1,STIMES       ;;DO 1 ITERATION
3037  024134  012737  000016  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3038  024142  012777  000040  170606            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3039
3040  024150  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3041
3042  024154  016702  170572                    MOV     RHWC,R2         ;R2=RH11 WC ADDRESS.
3043  024160  010267  020532                    MOV     R2,REGADR
3044  024164  012767  000252  154732            MOV     #252,$GDDAT     ;$GDDAT=S/B.
3045
3046  024172  005012                  LO6:      CLR     (R2)            ;CLEAR RH11 WC.
3047
3048  024174  012712  000377                    MOV     #377,(R2)       ;SET WC=0000377
3049
3050  024200  142712  000125          IO6:      BICB    #125,(R2)       ;DO A BICB
3051
3052  024204  011267  154716                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3053
3054  024210  026767  154712  154706            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3055  024216  001401                            BEQ     TST17           ;NEXT TEST
3056  024220  104046                            ERROR   46
3057
3058
```

```
3059
3060                                    ;*****************************************************************
3061                                    ;*TEST 17       BCTA BICB HI- BYTE TO WC
3062                                    ;*****************************************************************
3063  024222  000004                    TST17:  SCOPE
3064  024224  012767  000001  154752            MOV     #1,$TIMES       ;;DO 1 ITERATION
3065  024232  012737  000017  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3066  024240  012777  000040  170510            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3067
3068  024246  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3069
3070  024252  016702  170474                    MOV     RHWC,R2         ;R2=RH11 WC ADDRESS.
3071  024256  010267  020434                    MOV     R2,REGADR
3072  024262  012767  125000  154634            MOV     #125000,$GDDAT  ;$GDDAT=S/B.
3073
3074  024270  005012                    LO7:    CLR     (R2)            ;CLEAR RH11 WC.
3075
3076  024272  005202                            INC     R2              ;R2=HI BYTE.
3077
3078  024274  112712  000377                    MOVB    #377,(R2)       ;SET WC=177400
3079  024300  142712  000125            IO7:    BICB    #125,(R2)       ;DO A BICB
3080
3081  024304  005302                            DEC     R2              ;R2=FULL WORD.
3082
3083  024306  011267  154614                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3084
3085  024312  026767  154610  154604            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3086  024320  001401                            BEQ     TST20           ;NEXT TEST
3087  024322  104046                            ERROR   46
3088
3089
```

```
3090
3091                                    .REM    %
3092                                    THIS TEST ATTEMPT TO ACCESS AN ILLEGAL REGISTER WITHIN THE RANGE
3093                                    OF ADDRESSES SELECTED BY THE XOR'S. THE RH11 ADDRESS DECODE LOGIC WILL ALLOW UP TO 32
3094                                    CONTIGOUS REGISTERS TO EXIST IN OUR CONFIGURATION ONLY 16 WILL REALLY
3095                                    EXIST THIS TEST ATTEMPTS TO ACCESS THE 20(8) REGISTER IF IT RESPONDS
3096                                    THE TEST WILL TYPE OUT AN ERROR
3097                                            %
3098
3099                                    ;*****************************************************************
3100                                    ;*TEST 20        BCTA ILLEGAL REGISTER TEST
3101                                    ;*****************************************************************
3102  024324  000004                    TST20:  SCOPE
3103  024326  012767  000001  154650            MOV     #1,$TIMES       ;;DO 1 ITERATION
3104  024334  012737  000020  017322            MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
3105  024342  012777  000040  170406            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3106
3107  024350  016702  170436                    MOV     RHEC2,R2        ;R2=RH11 LAST POINTER ADDRESS.
3108  024354  062702  000002                    ADD     #2,R2           ;R2=FIRST ILLEGAL ADDRESS.
3109  024360  010267  020332                    MOV     R2,REGADR
3110  024364  005067  154536                    CLR     $BDDAT          ;$BDDAT=WAS.
3111  024370  005067  154530                    CLR     $GDDAT          ;$GDDAT=S/B.
3112
3113  024374  013767  000004  154566            MOV     @#TIMOT,$TMPO   ;SAVE TIMEOUT VECTOR.
3114  024402  012737  024420  000004            MOV     #010,@#†IMOT    ;SET TIMEOUT VECTOR TO 010.
3115
3116  024410  012706  001000          L10:      MOV     #STACK,SP       ;SET THE STACK POINTER.
3117
3118  024414  005712                            TST     (R2)            ;TEST ADDRESS.
3119
3120  024416  104047                            ERROR   47
3121
3122  024420  016737  154544  000004  010:      MOV     $TMPO,@#TIMOT   ;RESTORE TIMEOUT VECTOR.
3123
```

```
                                        ;
                                        ;NOW WE ATTACK BTCB
                                        ;
                                        .REM    %
                                        THE FOLLOWING TWO TESTS DETERMINE IF ALL NON DRIVES SET THE
                                        NED BIT AND THAT ALL EXISTING DRIVES CLEAR THE NED BIT.
                                        THE TESTS LOOK AT TOTALAT TO DETERMINE WHICH DRIVES EXIST AND TEST THAT
                                        THESE DRIVES WILL CLEAR THE NED BIT. AND ALSO THAT NON EXISTANT DRIVES
                                        WILL SET THE NED BIT.
                                        ON FIRST PASS ONLY, IF ALL DRIVES ARE ON LINE A MESSAGE WILL SO ADVISE THE
                                        OPERATOR. THE TEST WILL CONTINUE REGARLESS OF THE OPERATORS ACTION.
                                                %
                                        ;*****************************************************************
                                        ;*TEST 21       BCTB (NED) NON-EXISTANT DRIVE TEST. (SET)
                                        ;*****************************************************************
024426  000004                        TST21:  SCOPE
024430  012767  000001  154546                MOV     #1,$TIMES       ;;DO 1 ITERATION
024436  012737  000021  017322                MOV     #T††NO,@#TSTNM  ;THIS SAVES TEST NUMBER
024444  012777  000040  170304                MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
                                
024452  123727  015134  000377                CMPB    @#TOTALAT,#377          ;ARE ALL DRIVES ON LINE.
024460  001150                                BNE     U11             ;NO GO RUN THE TEST.
                                
024462  026727  154412  000000                CMP     $PASS,#0        ;IF PASS #0 THEN TYPE MESSAGE
                                                                        ;ADVISING OPERATOR
                                                                        ;THAT THIS TEST WILL NOT BE RUN
024470  001002                                BNE     Y11
024472  000167  000406                        JMP     X11
                                
024476                          Y11:
024476  104400  024504                        TYPE    ,.+4            ;;TYPE ASCIZ STRING
024502  000426                                BR      64$             ;;GET OVER THE ASCIZ
                                            ;;.ASCIZ    <15><12>/ALL DRIVES APPEAR TO BE ON LINE THEREFORE/
024560                          64$:
024560  104400  024566                        TYPE    ,.+4            ;;TYPE ASCIZ STRING
024564  000426                                BR      65$             ;;GET OVER THE ASCIZ
                                            ;;.ASCIZ    <15><12>/THE NED NON-EXISTANT DRIVE TEST CANNOT BE/
024642                          65$:
024642  104400  024650                        TYPE    ,.+4            ;;TYPE ASCIZ STRING
024646  000425                                BR      66$             ;;GET OVER THE ASCIZ
                                            ;;.ASCIZ    <15><12>/RUN. TO RUN THIS TEST TAKE ONE OR MORE/
024722                          66$:
024722  104400  024730                        TYPE    ,.+4            ;;TYPE ASCIZ STRING
024726  000425                                BR      67$             ;;GET OVER THE ASCIZ
                                            ;;.ASCIZ    <15><12>/DRIVES OFF-LINE AND RESTART THE PROGRAM/
025002                          67$:
                                
025002  012706  001000          U11:    MOV     #STACK,SP       ;SET STACK POINTER.
                                
025006  016702  167744                  MOV     RHCS2,R2        ;R2=RH11 RHCS2 ADDRESS.
025012  010267  017700                  MOV     R2,REGADR
                                
025016  013700  015134                  MOV     @#TOTALAT,R0
025022  005001                          CLR     R1
```

```
3178  025024  006000                  S11:    ROR     R0
3179  025026  103423                          BCS     N11
3180
3181  025030  010167  154070          R11:    MOV     R1,$GDDAT       ;$GDDAT=S/B.
3182  025034  052767  010000  154062          BIS     #NED,$GDDAT
3183
3184  025042  016705  167712                  MOV     RHCS1,R5        ;ADDRESS OF A DEVICE REGISTER.
3185
3186  025046  010112                  L11:    MOV     R1,(R2)         ;LOAD A NON-EXISTANT DRIVE.
3187
3188  025050  011567  154114                  MOV     (R5),$TMP0      ;ATTEMPT TO READ FROM DEVICE REGISTER.
3189
3190  025054  011267  154046                  MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3191  025060  042767  167770  154040          BIC     #^C<NED!US4!US2!US1>,$BDDAT;$BDDAT=SAVED DATA.
3192
3193  025066  026767  154034  154030          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3194  025074  001005                          BNE     E11
3195
3196  025076  005201                  N11:    INC     R1
3197  025100  020127  000010                  CMP     R1,#8.          ;TESTED ALL DRIVES YET.
3198  025104                          X11:
3199  025104  001402                          BEQ     TST22           ;NEXT TEST
3200  025106  000746                          BR      S11
3201
3202  025110  104050                  E11:    ERROR   50
3203
3204
```

```
                                ;*****************************************************************
                                ;*TEST 22       BCTB (NED) NON-EXISTANT DRIVE TEST. (CLEARED)
                                ;*****************************************************************
025112  000004                  TST22:  SCOPE
025114  012767  000001  154062          MOV     #1,$TIMES       ;;DO 1 ITERATION
025122  012737  000022  017322          MOV     .TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
025130  012777  000040  167620          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

025136  012706  001000                  MOV     #STACK,SP       ;SET STACK POINTER.

025142  016702  167610                  MOV     RHCS2,R2        ;R2=RH11 RHCS2 ADDRESS.
025146  010267  017544                  MOV     R2,REGADR
025152  013700  015134                  MOV     @#TOTALAT,R0
025156  005001                          CLR     R1
025160  006000                  S12:    ROR     R0
025162  103020                          BCC     N12

025164  010167  153734                  MOV     R1,$GDDAT

025170  016705  167564                  MOV     RHCS1,R5        ;ADDRESS OF A DEVICE REGISTER.

025174  010112                  L12:    MOV     R1,(R2)         ;SELECT UNIT.

025176  011567  153766                  MOV     (R5),$TMPO      ;ATTEMPT TO READ FROM DEVICE.

025202  011267  153720                  MOV     (R2),$BDDAT     ;$BDDAT=WAS.
025206  042767  167770  153712          BIC     #^C<NED!US4!US2!US1>,$BDDAT     ;$BDDAT=SAVED DATA.

025214  026767  153706  153702          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
025222  001005                          BNE     E12

025224  005201                  N12:    INC     R1
025226  020127  000010                  CMP     R1,#8.          ;TESTED ALL DRIVES.
025232  001402                          BEQ     TST23           ;NEXT TEST

025234  000751                          BR      S12
025236  104050                  E12:    ERROR   50
```

```
                                        .REM    %
                                        TEST TO SEE IF WE CAN READ FROM THE "AS" REGISTER AND NOT CAUSE
                                        A NED NON-EXISTANT DRIVE ERROR
                                                %
                                        ;*****************************************************************
                                        ;*TEST 23       BCTB AS REGISTER TEST
                                        ;*****************************************************************
025240  000004                          TST23:  SCOPE
025242  012767  000001  153734                  MOV     #1,$TIMES       ;;DO 1 ITERATION
025250  012737  000023  017322                  MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
025256  012777  000040  167472                  MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

025264  012706  001000                          MOV     #STACK,SP       ;SET STACK POINTER.

025270  016702  167462                          MOV     RHCS2,R2        ;R2=RH11 CS2 ADDRESS.
025274  012767  000007  153622                  MOV     #US4!US2!US1,$GDDAT;$GDDAT=S/B.

025302  016705  167452                          MOV     RHCS1,R5        ;ADDRESS OF A DEVICE REGISTER.

025306  012712  000007          L13:    MOV     #US4!US2!US1,(R2);LOAD A NON-EXISTANT DEVICE.

025312  016702  167460                          MOV     RHAS,R2         ;R2= "AS".

025316  011267  153646                          MOV     (R2),$TMP0      ;ATTEMPT TO READ FROM DEVICE AS.

025322  005012                                  CLR     (R2)            ;CLEAR AS REGISTER.
025324  016702  167426                          MOV     RHCS2,R2        ;R2=RH11 CS2 ADDRESS.
025330  010267  017362                          MOV     R2,REGADR

025334  011267  153566                          MOV     (R2),$BDDAT     ;$BDDAT=WAS.
025340  042767  167770  153560                  BIC     #^C<NED!US4!US2!US1>,$BDDAT;SAVE NED AND DEVICE SELECTED.

025346  026767  153554  153550                  CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
025354  001401                                  BEQ     TST24           ;NEXT TEST
025356  104051                                  ERROR   51
```

```
                                .REM    %
                                THE NEXT THREE TESTS WILL TEST THE BUS ADDRESS REGISTER IN BOTH WORD
                                AND BYTE MODE. THE PATTERNS ARE CHOSEN TO PICK UP ANY DROPPED OR STUCK
                                BITS.
                                        %

                                ;*****************************************************************
                                ;*TEST 24        BCTC BUS ADDRESS REGISTER
                                ;*****************************************************************
025360  000004                  TST24:  SCOPE
025362  012767  000001  153614          MOV     #1,$TIMES       ;;DO 1 ITERATION
025370  012737  000024  017322          MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
025376  012777  000040  167352          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

025404  012706  001000                  MOV     #STACK,SP       ;SET STACK POINTER.

025410  016702  167340                  MOV     RHBA,R2         ;R2=RH11 BA ADDRESS.
025414  010267  017276                  MOV     R2,REGADR
025420  012705  025460                  MOV     #LST14A,R5      ;R5=TEST LIST ADDRESS.

025424  012567  153474          L14:    MOV     (R5)+,$GDDAT    ;$GDDAT=S/B.

025430  016712  153470          I14:    MOV     $GDDAT,(R2)     ;SET BUS ADDRESS REGISTER.
025434  011267  153466                  MOV     (R2),$BDDAT     ;READ BUS ADDRESS REGISTER.

025440  026767  153462  153456          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
025446  001401                          BEQ     N14             ;GET NEXT TEST DATA.
025450  104052                          ERROR   52

025452  005715          N14:    TST     (R5)            ;AT END OF LIST
025454  001363                  BNE     L14             ;NO!
025456  000440                  BR      TST25           ;NEXT TEST
025460  000002          LST14A: 2
025462  000004                  4
025464  000010                  10
025466  000020                  20
025470  000040                  40
025472  000100                  100
025474  000200                  200
025476  000400                  400
025500  001000                  1000
025502  002000                  2000
025504  004000                  4000
025506  010000                  10000
025510  020000                  20000
025512  040000                  40000
025514  100000                  100000
025516  177776                  177776
025520  177774                  177774
025522  177772                  177772
025524  177766                  177766
025526  177756                  177756
025530  177736                  177736
025532  177676                  177676
```

```
3337  025534  177576                          177576
3338  025536  177376                          177376
3339  025540  176776                          176776
3340  025542  175776                          175776
3341  025544  173776                          173776
3342  025546  167776                          167776
3343  025550  157776                          157776
3344  025552  137776                          137776
3345  025554  077776                          077776
3346  025556  000000                          0
3347
```

```
3348
3349                                    ;*****************************************************************
3350                                    ;*TEST 25       BCTC BUS ADDRESS REGISTER LO-BYTE
3351                                    ;*****************************************************************
3352  025560  000004                    TST25:  SCOPE
3353  025562  012767  000001  153414            MOV     #1,STIMES       ;;DO 1 ITERATION
3354  025570  012737  000025  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3355  025576  012777  000040  167152            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3356
3357  025604  012706  001000                    MOV     #STACK,SP       ;RESET STACK.
3358
3359  025610  016702  167140                    MOV     RHBA,R2         ;R2=RH11 BA ADDRESS.
3360  025614  010267  017076                    MOV     R2,REGADR
3361  025620  012705  025662                    MOV     #LST15A,R5      ;R5=TEST LIST ADDRESS.
3362
3363  025624  005012                    L15:    CLR     (R2)            ;CLEAR RH11 BA REGISTER.
3364
3365  025626  012567  153272                    MOV     (R5)+,$GDDAT    ;$GDDAT=S/B.
3366
3367  025632  116712  153266            I15:    MOVB    $GDDAT,(R2)     ;SET BUS ADDRESS REGISTER.
3368  025636  011267  153264                    MOV     (R2),$BDDAT     ;READ BUS ADDRESS REGISTER.
3369
3370  025642  026767  153260  153254            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3371  025650  001401                            BEQ     R15
3372
3373  025652  104053                            ERROR   53
3374
3375  025654  005715                    R15:    TST     (R5)            ;AT END OF TEST LIST.
3376  025656  001362                            BNE     L15             ;NO!
3377  025660  000417                            BR      TST26           ;NEXT TEST
3378                                    ;THIS LIST WILL BE USED TO LOAD THE LOWER BYTE OF THE BA REGISTER.
3379                                    ;
3380  025662  000002                    LST15A: 2
3381  025664  000004                            4
3382  025666  000010                            10
3383  025670  000020                            20
3384  025672  000040                            40
3385  025674  000100                            100
3386  025676  000200                            200
3387  025700  000376                            376
3388  025702  000372                            372
3389  025704  000366                            366
3390  025706  000356                            356
3391  025710  000336                            336
3392  025712  000276                            276
3393  025714  000176                            176
3394  025716  000000                            0
```

```
                                        ;*****************************************************************
                                        ;*TEST 26       BCTC BUS ADDRESS REGISTER HI-BYTE
                                        ;*****************************************************************
025720  000004                  TST26:  SCOPE
025722  012767  000001  153254          MOV     #1,$TIMES       ;;DO 1 ITERATION
025730  012737  000026  017322          MOV     #T††NO,@#TSTNM  ;†HIS SAVES TEST NUMBER
025736  012777  000040  167012          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
025744  012706  001000                  MOV     #STACK,SP       ;RESET STACK.
025750  016702  167000                  MOV     RHBA,R2         ;R2=RH11 BA ADDRESS.
025754  010267  016736                  MOV     R2,REGADR
025760  012705  026032                  MOV     #LST16A,R5      ;R5=TEST LIST ADDRESS.
025764  005012                  L16:    CLR     (R2)            ;CLEAR BA REGISTER.
025766  012567  153132                  MOV     (R5)+,$GDDAT    ;$GDDAT=S/B.
025772  005202                          INC     R2              ;R2=HI BYTE ADDRESS.
025774  116712  153124          I16:    MOVB    $GDDAT,(R2)     ;SET BUS ADDRESS REGISTER HI-BYTE.
026000  005302                          DEC     R2              ;R2=FULL WORD ADDRESS.
026002  011267  153120                  MOV     (R2),$BDDAT     ;READ BUS ADDRESS.
026006  000367  153112                  SWAB    $GDDAT          ;ADJUST DATA FOR HI BYTE.
026012  026767  153110  153104          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
026020  001401                          BEQ     R16             ;OKAY
026022  104053                          ERROR   53
026024  005715                  R16:    TST     (R5)            ;AT END OF TEST LIST.
026026  001356                          BNE     L16             ;NOPE
026030  000420                          BR      TST27           ;NEXT TEST
                                        ;THIS LIST WILL BE USED TO LOAD THE UPPER BYTE OF THE BA REGISTER.
                                        ;
026032  000002                  LST16A: 2
026034  000004                          4
026036  000010                          10
026040  000020                          20
026042  000040                          40
026044  000100                          100
026046  000200                          200
026050  000376                          376
026052  000374                          374
026054  000376                          376
026056  000366                          366
026060  000356                          356
026062  000336                          336
026064  000276                          276
026066  000176                          176
026070  000000                          0
```

```
3449
```

```
3450                                    .REM    %
3451                                    THIS TEST CAUSE AN RH11 INTERRUPT VIA THE SPECIAL COMMAND SEQUENCE
3452                                    BIS     #IE,@RHCS2. THIS TEST PROVES ONLY THAT THE HARDWARE CAN HANDLE
3453                                    INTERRUPTS PROPERLY
3454                                            %
3455                                    ;*************************************************************
3456                                    ;*TEST 27        RH11 INTERRUPT TEST
3457                                    ;*************************************************************
3458  026072  000004                   TST27:  SCOPE
3459  026074  012767  000001  153102           MOV     #1,$TIMES       ;;DO 1 ITERATION
3460  026102  012737  000027  017322           MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3461  026110  012777  000040  166640           MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3462
3463  026116  012706  001000                   MOV     #STACK,SP       ;SET STACK POINTER.
3464
3465  026122  016702  166632                   MOV     RHCS1,R2        ;R2=RH11 ADDRESS.
3466  026126  010267  016564                   MOV     R2,REGADR
3467  026132  005067  152770                   CLR     $BDDAT          ;$BDDAT=WAS.
3468  026136  005067  152762                   CLR     $GDDAT          ;$GDDAT=S/B.
3469
3470  026142  017767  166600  153020           MOV     @RPVEC,$TMP0    ;SAVE RH11 INTERRUPT VECTOR.
3471  026150  012777  026174  166570           MOV     #021,@RPVEC     ;SET RH11 INTERRUPT VECTOR TO 021.
3472
3473  026156  052712  000100          L21:     BIS     #IE,(R2)        ;CAUSE INTERRUPT.
3474  026162  000240                           NOP                     ;WAIT FOR INTERRUPT.
3475  026164  000240                           NOP
3476  026166  011267  152732                   MOV     (R2),$GDDAT     ;SAVE CONTENTS OF REGISTER.
3477
3478  026172  104054                           ERROR   54
3479
3480  026174  016777  152770  166544  021:    MOV     $TMP0,@RPVEC    ;RESTORE RH11 INTERRUPT VECTOR.
3481
3482
```

```
3483
3484                                    ;TEST THAT RESET CAN GENERATE THE SIGNAL CLR L.
3485                                    .REM    %
3486                                            THE PROGRAM SETS THE PORT SELECT BIT .THEN DOES A RESET
3487                                            IF THE SIGNAL CLR L WAS GENERATED THE PORT SELECT BIT WILL CLEAR.
3488                                            %
3489                                    ;*****************************************************************
3490                                    ;*TEST 30       BCTD CLR L TEST
3491                                    ;*****************************************************************
3492  026202  000004                    TST30:  SCOPE
3493  026204  012767  000001  152772            MOV     #1,$TIMES       ;;DO 1 ITERATION
3494  026212  012737  000030  017322            MOV     #T1TNO,@#TSTNM  ;THIS SAVES TEST NUMBER
3495  026220  012777  000040  166530            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3496
3497  026226  016702  166526                    MOV     RHCS1,R2        ;R2=RH11 CS1 ADDRESS
3498  026232  010267  016460                    MOV     R2,REGADR
3499  026236  005067  152662                    CLR     $GDDAT          ;$GDDAT=S/B
3500
3501  026242  012706  001000            L22:    MOV     #STACK,SP       ;SET STACK POINTER.
3502  026246  012712  002000                    MOV     #PSEL,(R2)      ;SET PORT SELECT FLOP.
3503  026252  000005                            RESET                   ;DO A BUSA INIT.
3504
3505  026254  011267  152646                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3506  026260  042767  177677  152640            BIC     #1C<1E>,$BDDAT  ;SAVE ONLY I.E. BIT.
3507
3508  026266  026767  152634  152630            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3509  026274  001401                            BEQ     TST31           ;NEXT TEST
3510  026276  104055                            ERROR   55
3511
3512
```

```
                                        .REM    %
                                        SET THE MXF FLOP AND READ IT BACK.
                                                %
                                        ;*****************************************************************
                                        ;*TEST 31        MXF TEST
                                        ;*****************************************************************
026300  000004                          TST31:  SCOPE
026302  012767  000001  152674                  MOV     #1,$TIMES       ;;DO 1 ITERATION
026310  012737  000031  017322                  MOV     #T†NO,@#TSTNM   ;THIS SAVES TEST NUMBER
026316  012777  000040  166432                  MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

026324  012706  001000                          MOV     #STACK,SP       ;SET STACK POINTER.
026330  016702  166422                          MOV     RHCS2,R2        ;R2=RH11 CS2 ADDRESS.
026334  010267  016356                          MOV     R2,REGADR
026340  012767  001000  152556                  MOV     #MXF,$GDDAT     ;$GDDAT=S/B.

026346  012712  001000          I24:    MOV     #MXF,(R2)       ;LOAD MXF

026352  011267  152550                  MOV     (R2),$BDDAT     ;$BDDAT=WAS.

026356  042767  176777  152542          BIC     #†C<MXF>,$BDDAT ;SAVE ONLY MXF

026364  026767  152536  152532          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS
026372  001401                          BEQ     TST32           ;NEXT TEST
026374  104056                          ERROR   56
```

```
3540                                    .REM    %
3541                                    SET THE UNIBUS PARITY ERROR FLOP DIRECTLY VIA A MOV #UPE TO RHCS2
3542                                    ATTEMPT TO READ IT BACK.
3543                                    %
3544                                    ;*****************************************************************
3545                                    ;#TEST 32       CSRB UNIBUS PARITY ERROR SET TEST
3546                                    ;*****************************************************************
3547  026376  000004                    TST32:  SCOPE
3548  026400  012767  000001  152576            MOV     #1,$TIMES       ;;DO 1 ITERATION
3549  026406  012737  000032  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3550  026414  012777  000040  166334            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3551
3552  026422  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3553
3554  026426  016702  166324                    MOV     RHCS2,R2        ;R2=RHCS2 ADDRESS.
3555  026432  010267  016260                    MOV     R2,REGADR
3556  026436  012767  020000  152460            MOV     #UPE,$GDDAT     ;$GDDAT=S/B.
3557
3558  026444  016712  152454            L30:    MOV     $GDDAT,(R2)     ;ATTEMPT TO SET UPE.
3559  026450  000240                            NOP
3560  026452  000240                            NOP
3561
3562  026454  011267  152446                    MOV     (R2),$BDDAT     ;$BDDAT=ACTUAL DATA.
3563  026460  042767  157777  152440            BIC     #^C<UPE>,$BDDAT ;SAVE ONLY UPE.
3564
3565  026466  026767  152434  152430            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3566  026474  001401                            BEQ     TST33           ;NEXT TEST
3567  026476  104057                            ERROR   57
3568
3569
```

```
                                        .REM    %
                                        SET THE UNIBUS PARITY ERROR FLOP AND ATTEMPT TO CLEAR IT WITH A
                                        CONTROLLER CLEAR.
                                                %
                                        ;*****************************************************************
                                        ;*TEST 33       CSRB UNIBUS PARITY ERROR CLEAR TEST
                                        ;*****************************************************************
026500  000004                  TST33:  SCOPE
026502  012767  000001  152474          MOV     #1,$TIMES       ;;DO 1 ITERATION
026510  012737  000033  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
026516  012777  000040  166232          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

026524  012706  001000                  MOV     #STACK,SP       ;SET STACK POINTER.

026530  016702  166222                  MOV     RHCS2,R2        ;R2=RHCS2 ADDRESS.
026534  010267  016156                  MOV     R2,REGADR
026540  005067  152360                  CLR     $GDDAT          ;$GDDAT=S/B.

026544  012712  020000          L31:    MOV     #UPE,(R2)       ;SET UNIBUS PARITY ERROR SET.
026550  000240                          NOP
026552  000240                          NOP

026554  012712  000040                  MOV     #CLR,(R2)       ;CONTROLLER CLEAR.

026560  011267  152342                  MOV     (R2),$BDDAT     ;READ STATUS
026564  042767  157777  152334          BIC     #^C<UPE>,$BDDAT ;SAVE ERROR.

026572  026767  152330  152324          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
026600  001401                          BEQ     TST34           ;NEXT TEST
026602  104057                          ERROR   57
```

```
3603
3604                                    .REM    %
3605                                    SET THE UNIT SELECT REGISTER TO DRIVE #7 ALL BITS SET. GENERATE A
3606                                    CONTROLLER CLEAR AND VERIFY THAT THE UNIT SELECT REGISTER IS CLEARED.
3607                                            %
3608                                    ;*************************************************************
3609                                    ;*TEST 34        CSRB UNIT SELECT CLEAR TEST
3610                                    ;*************************************************************
3611  026604  000004                    TST34:  SCOPE
3612  026606  012767  000001  152370            MOV     #1,$TIMES       ;;DO 1 ITERATION
3613  026614  012737  000034  017322            MOV     #T1NO,@#TSTNM   ;THIS SAVES TEST NUMBER
3614  026622  012777  000040  166126            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3615
3616  026630  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3617
3618  026634  016702  166116                    MOV     RHCS2,R2        ;R2=CS2 ADDRESS.
3619  026640  010267  016052                    MOV     R2,REGADR
3620  026644  005067  152254                    CLR     $GDDAT          ;$GDDAT=S/B.
3621
3622  026650  012712  000007            L34:    MOV     #US4!US2!US1,(R2)  ;LOAD RHCS2 DRIVE SELECT
3623  026654  000240                            NOP
3624  026656  000240                            NOP
3625
3626  026660  012712  000040                    MOV     #CLR,(R2)       ;GENERATE CLR.
3627
3628  026664  011267  152236                    MOV     (R2),$BDDAT     ;READ RHCS2
3629  026670  042767  177770  152230            BIC     #^C<US4!US2!US1>,$BDDAT;SAVE DRIVE SELECT BITS.
3630
3631  026676  026767  152224  152220            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3632  026704  001401                            BEQ     TST35           ;NEXT TEST
3633  026706  104060                            ERROR   60
3634
3635
```

```
3636
3637                                    .REM    %
3638                                    SET THE UPE FLOP UNIBUS PARITY ERROR. VERIFY THAT THE SETTING OF (UPE)
3639                                    ALSO SETS THE TRANSFER ERROR (TRE) FLOP
3640                                            %
3641                                    ;*************************************************************
3642                                    ;*TEST 35        CSRB TRANSFER ERROR (TRE) - UPE
3643                                    ;*************************************************************
3644  026710  000004                    TST35:  SCOPE
3645  026712  012767  000001  152264            MOV     #1,$TIMES       ;;DO 1 ITERATION
3646  026720  012737  000035  017322            MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
3647  026726  012777  000040  166022            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3648
3649  026734  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3650
3651  026740  016702  166012                    MOV     RHCS2,R2        ;R2=RHCS2 ADDRESS.
3652  026744  012767  040000  152152            MOV     #TRE,$GDDAT     ;$GDDAT=S/B.
3653
3654  026752  012712  020000            L35:    MOV     #UPE,(R2)       ;SET UNIBUS PARITY ERROR.
3655
3656  026756  016702  165776                    MOV     RHCS1,R2        ;R2=RHCS1 ADDRESS.
3657  026762  010267  015730                    MOV     R2,REGADR
3658
3659  026766  011267  152134                    MOV     (R2),$BDDAT     ;READ REGISTER
3660  026772  042767  137777  152126            BIC     #†C<†RE>,$BDDAT ;SAVE TRANSFER ERROR.
3661
3662  027000  026767  152122  152116            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS
3663  027006  001401                            BEQ     TST36           ;NEXT TEST
3664  027010  104061                            ERROR   61
3665
3666
```

```
                                        .REM    %
                                        SET THE NED BIT NON EXISTANT DRIVE VERIFY THAT THIS SETS THE (TRE) BIT.
                                                %
                                        ;*************************************************************
                                        ;*TEST 36       CSRB TRANSFER ERROR (TRE) NED
                                        ;*************************************************************
027012  000004                  TST36:  SCOPE
027014  012767  000001  152162          MOV     #1,$TIMES       ;;DO 1 ITERATION
027022  012737  000036  017322          MOV     #T†NO,@#TSTNM   ;†THIS SAVES TEST NUMBER
027030  012777  000040  165720          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

027036  012706  001000                  MOV     #STACK,SP       ;SET STACK POINTER.

027042  016702  165710                  MOV     RHCS2,R2        ;R2=CS2 ADDRESS.
027046  012767  040000  152050          MOV     #TRE,$GDDAT     ;$GDDAT=S/B.

027054  013700  015134                  MOV     @#TOTALAT,R0    ;GET ALL AVAILABLE DRIVES DATA
027060  005001                          CLR     R1
027062  006000                  S36:    ROR     R0
027064  103420                          BCS     N36
027066  010112                  L36:    MOV     R1,(R2)           ;SET NED.

027070  016702  165664                  MOV     RHCS1,R2        ;R2=RHCS1 ADDRESS.
027074  010267  015616                  MOV     R2,REGADR

027100  011267  152022                  MOV     (R2),$BDDAT     ;READ REGISTER.
027104  042767  137777  152014          BIC     #†C<TRE>,$BDDAT ;SAVE TRE.

027112  026767  152010  152004          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
027120  001406                          BEQ     TST37           ;NEXT TEST
027122  104062                          ERROR   62
027124  000404                          BR      TST37           ;NEXT TEST

027126  005201                  N36:    INC     R1
027130  020127  000010                  CMP     R1,#8.
027134  001352                          BNE     S36
```

```
3706
3707                                    .REM    %
3708                                    SET THE PORT SELECT FLOP VERIFY THAT WE CAN READ IT BACK.
3709                                            %
3710                                    ;*****************************************************************
3711                                    ;*TEST 37        CSRA PSEL CLEAR TEST
3712                                    ;*****************************************************************
3713  027136  000004                    TST37:  SCOPE
3714  027140  012767  000001  152036            MOV     #1,$TIMES       ;;DO 1 ITERATION
3715  027146  012737  000037  017322            MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
3716  027154  012777  000040  165574            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3717
3718  027162  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3719
3720  027166  016702  165566                    MOV     RHCS1,R2        ;R2=RHCS1 ADDRESS.
3721  027172  010267  015520                    MOV     R2,REGADR
3722  027176  005067  151722                    CLR     $GDDAT          ;$GDDAT=S/B.
3723
3724  027202  012712  002000            L40:    MOV     #PSEL,(R2)      ;SET P SELECT.
3725
3726  027206  012777  000040  165542            MOV     #CLR,@RHCS2     ;DO A CONTROLLER CLEAR.
3727
3728  027214  011267  151706                    MOV     (R2),$BDDAT     ;READ BACK P SELECT BIT.
3729  027220  042767  175777  151700            BIC     #†C<PSEL>,$BDDAT;SAVE ONLY PORT SELECT.
3730
3731  027226  026767  151674  151670            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3732  027234  001401                            BEQ     TST40           ;NEXT TEST
3733  027236  104064                            ERROR   64
3734
```

E11


```
                                        .REM    %
                                        VERIFY THAT CONTROLLER CLEAR WILL CLEAR THE COMMAND REGISTER.
                                                %

                                        ;*************************************************************
                                        ;*TEST 40        CSRB COMMAND REGISTER CLEAR TEST
                                        ;*************************************************************
027240  000004                          TST40:  SCOPE
027242  012767  000001  151734                  MOV     #1,$TIMES       ;;DO 1 ITERATION
027250  012737  000040  017322                  MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
027256  012777  000040  165472                  MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

027264  012706  001000                          MOV     #STACK,SP       ;SET STACK POINTER.

027270  016702  165464                          MOV     RHCS1,R2        ;R2=RHCS1 ADDRESS.
027274  010267  015416                          MOV     R2,REGADR
027300  005067  151620                          CLR     $GDDAT          ;$GDDAT=S/B.

027304  012712  000011          L41:            MOV     #11,(R2)        ;ISSUE A DRIVE CLR AND GO.

027310  012777  000040  165440                  MOV     #CLR,@RHCS2     ;CONTROLLER CLEAR.

027316  011267  151604                          MOV     (R2),$BDDAT     ;READ COMMAND REGISTER.
027322  042767  177770  151576                  BIC     #^C<7>,$BDDAT   ;SAVE ONLY THE COMMAND BITS.

027330  026767  151572  151566                  CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
027336  001401                                  BEQ     TST41           ;NEXT TEST
027340  104065                                  ERROR   65
```

```
3764
3765                                    .REM    %
3766                                    THE COMMAND REGISTER IS SUPPOSED TO BE SELF CLEARING THAT IS WHEN THE
3767                                    RH11 IS SELECTED WHEATHER OR NOT WE ADDRESS IT DIRECTLY THE LOGIC
3768                                    SHOULD CLEAR THE COMMAND REGISTER.
3769                                    THIS IS TESTED BY LOADING A COMMAND INTO IT READING ANOTHER REGISTER
3770                                    THAN RETURNING TO CHECK THE COMMAND REGISTER TO DETERMINE IF IT CLEARED.
3771                                            %
3772                                    ;*************************************************************
3773                                    ;*TEST 41        CSRB COMMAND REGISTER RESELECT CLEAR TEST
3774                                    ;*************************************************************
3775  027342  000004                    TST41:  SCOPE
3776  027344  012767  000001  151632            MOV     #1,$TIMES       ;;DO 1 ITERATION
3777  027352  012737  000041  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3778  027360  012777  000040  165370            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3779
3780  027366  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3781
3782  027372  016702  165362                    MOV     RHCS1,R2        ;R2=RHCS1 ADDRESS.
3783  027376  010267  015314                    MOV     R2,REGADR
3784  027402  005067  151516                    CLR     $GDDAT          ;$GDDAT=S/B.
3785
3786  027406  012767  000340  150362            MOV     #340,PS         ;SET PRIORITY TO #7.
3787
3788  027414  012712  000011          L42:      MOV     #11,(R2)        ;ISSUE A DRIVE CLR AND GO
3789
3790  027420  011267  151544                    MOV     (R2),$TMPO      ;DO A RESELECT OF THE REGISTER.
3791
3792  027424  011267  151476                    MOV     (R2),$BDDAT     ;READ THE COMMAND REGISTER.
3793  027430  042767  177770  151470            BIC     #^C<7>,$BDDAT   ;SAVE ONLY THE COMMAND BITS.
3794
3795  027436  026767  151464  151460            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3796  027444  001401                            BEQ     TST42           ;NEXT TEST
3797  027446  104066                            ERROR   66
3798
```

```
3799
3800                                    .REM    %
3801                                    HERE WE TEST TO SEE IF SETTING (IE) AND (RDY) WILL CAUSE AN INTERRUPT.
3802                                            %
3803                                    ;*****************************************************************
3804                                    ;*TEST 42        CSRB READY AND IE INTERRUPT TEST
3805                                    ;*****************************************************************
3806  027450  000004                  $ST42:  SCOPE
3807  027452  012767  000001  151524          MOV     #1,$TIMES       ;;DO 1 ITERATION
3808  027460  012737  000042  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3809  027466  012777  000040  165262          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3810
3811  027474  016702  165260                  MOV     RHCS1,R2        ;R2=RPCS1 ADDRESS.
3812  027500  010267  015212                  MOV     R2,REGADR
3813  027504  005067  151416                  CLR     $BDDAT          ;$BDDAT=WAS.
3814  027510  005067  151410                  CLR     $GDDAT          ;$GDDAT=S/B.
3815
3816  027514  017767  165226  151446          MOV     @RPVEC,$TMP0    ;SAVE RH11 INTERRUPT VECTOR.
3817  027522  012777  027556  165216          MOV     #043,@RPVEC     ;SET RH11 INTERRUPT VECTOR 043
3818
3819  027530  012706  001000          L43:    MOV     #STACK,SP       ;SET STACK POINTER.
3820  027534  005067  150236                  CLR     PS
3821
3822  027540  052712  000300                  BIS     #IE!RDY,(R2)    ;THIS WILL CAUSE AN INTERRUPT.
3823  027544  000240                          NOP
3824  027546  000240                          NOP
3825
3826  027550  011267  151350                  MOV     (R2),$GDDAT
3827  027554  104067                          ERROR   67
3828
3829  027556  016777  151406  165162  043:    MOV     $TMP0,@RPVEC    ;RESTORE RH11 INTERRUPT VECTOR.
```

```
                                        .REM    %
                                        THE (IE) BIT IS SET CAUSING AN INTERRUPT. AT THE COMPLETION OF THE INTERRUPT
                                        WE CHECK TO SEE IF THE (IE) BIT HAS CLEARED.
                                                %
                                        ;*****************************************************************
                                        ;*TEST 43       CSRB BOES "IE" CLEAR AFTER AN INTERRUPT
                                        ;*****************************************************************
027564  000004                  TST43:  SCOPE
027566  012767  000001  151410          MOV     #1,$TIMES       ;;DO 1 ITERATION
027574  012737  000043  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
027602  012777  000040  165146          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

027610  016702  165144                  MOV     RHCS1,R2        ;R2=RPCS1 ADDRESS.
027614  010267  015076                  MOV     R2,REGADR
027620  005067  151300                  CLR     $GDDAT          ;$GDDAT=S/B.

027624  017767  165116  151336          MOV     @RPVEC,$TMP0    ;SAVE RH11 INTERRUPT VECTOR.
027632  012777  027662  165106          MOV     #044,@RPVEC     ;SET VECTOR TO 044.

027640  012706  001000          L44:    MOV     #STACK,SP       ;SET STACK POINTER.
027644  005067  150126                  CLR     PS

027650  052712  000100                  BIS     #IE,(R2)        ;THIS WILL CAUSE AN INTERRUPT
027654  000240                          NOP
027656  000240                          NOP

027660  000411                          BR      E44             ;NO INTERRUPT.

027662  011267  151240          044:    MOV     (R2),$BDDAT     ;READ RHCS1.
027666  042767  177677  151232          BIC     #^C<IE>,$BDDAT  ;SAVE ONLY THE "IE" BIT.

027674  026767  151226  151222          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
027702  001401                          BEQ     R44             ;OK!

027704  104070                  E44:    ERROR   70

027706  016777  151256  165032  R44:    MOV     $TMP0,@RPVEC    ;RESTORE RH11 INTERRUPT VECTOR.
```

```
3869
3870                                    .REM    %
3871                                    HERE WE VERIFY THAT WRITING INTO THE "AS" REGISTER OWILL NOT CAUSE
3872                                    AN (NED) ERROR.
3873                                            %
3874                                    ;*****************************************************************
3875                                    ;*TEST 44        BCTB "AS" WRITE TEST
3876                                    ;*****************************************************************
3877  027714  000004                    TST44:  SCOPE
3878  027716  012767  000001  151260            MOV     #1,$TIMES       ;;DO 1 ITERATION
3879  027724  012737  000044  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3880  027732  012777  000040  165016            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3881
3882  027740  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3883
3884  027744  016702  165006                    MOV     RHCS2,R2        ;R2=RH11 CS2 ADDRESS.
3885  027750  012767  000007  151146            MOV     #US4!US2!US1,$GDDAT;$GDDAT=S/B.
3886
3887  027756  016705  164776                    MOV     RHCS1,R5        ;ADDRESS OF A DEVICE REGISTER.
3888
3889  027762  012712  000007            L45:    MOV     #US4!US2!US1,(R2);LOAD A NON EXISTANT DEVICE.
3890
3891  027766  016702  165004                    MOV     RHAS,R2         ;R2="AS" ADDRESS.
3892
3893  027772  012712  000377                    MOV     #377,(R2)       ;ATTEMPT TO LOAD "AS".
3894
3895  027776  005012                            CLR     (R2)            ;CLEAR  "AS".
3896
3897  030000  016702  164752                    MOV     RHCS2,R2        ;R2=RH11 CS2 ADDRESS.
3898  030004  010267  014706                    MOV     R2,REGADR
3899
3900  030010  011267  151112                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3901  030014  042767  167770  151104            BIC     #1C<NED!US4!US2!US1>,$BDDAT;SAVE NED AND DEVICE SELECTED.
3902
3903  030022  026767  151100  151074            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3904  030030  001401                            BEQ     TST45           ;NEXT TEST
3905  030032  104071                            ERROR   71
3906
```

```
                                .SBTTL  EXTENDED MEMORY, DRIVE TIMING & SECTOR SELECT TESTS


                                ;*****************************************************************
                                ;*TEST 45       MAKE CURRENT CYLINDER = 0
                                ;*****************************************************************
030034  000004                  TST45:  SCOPE
030036  012706  001000                  MOV     #STACK,SP       ;RESET STACK
030042  004737  045152                  JSR     PC,@#CLDISK     ;INIT DRIVE
030046  012777  000001  164724          MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE
030054  004037  047524                  JSR     R0,@#MAKECYL    ;SUBROUTINE TO GIVE A SEEK
                                                                ;COMMAND FOLOWED BY AN INIT
030060  000000                          0                       ;THIS SHUOLD CHANGE RHCC TO 0


                                ;*****************************************************************
                                ;*TEST 46       RHCS1 - BITS 8 AND 9 - EXTENDED ADDR (A16 & A 17)

                                ;*      WRITE CYLINDER 0, FORMAT 16 BITS PER WORD
                                ;*      TRACK 0, SECTOR 0, KEYS 0, NUMBER OF WORDS 256
                                ;*      DATA IS THE CONTENTS OF THE TTY READER STATUS REGISTER
                                ;*      THIS WILL USE BITS A16 AND A17 WHEN THERE IS MORE THAN 28K OF MEMORY

                                ;*****************************************************************
030062  000004                  TST46:  SCOPE

030064  012706  001000                  MOV     #STACK,SP       ;RESET STACK
030070  012737  000046  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
030076  004037  045070                  JSR     R0,@#CLAREA     ;CLEAR SIMULATED DISK
030102  053520                          .WORD   DISK            ;FROM
030104  054544                          .WORD   TOLGAP+16       ;TO
030106  000000                          .WORD   0               ;DATA

                                ;THESE ARE SETUP FOR DISKLESS USE ONLY

030110  012737  010000  051602          MOV     #FMT22,@#CYL;CYLINDER 0
                                                                ;16 BITS PER WORD
030116  005037  051604                  CLR     @#SECOTR        ;SECTOR 0 TRACK 0
030122  005037  051606                  CLR     @#KEY1          ;KEY1 0
030126  005037  051610                  CLR     @#KEY2          ;KEY2 0
030132  012737  000400  051650          MOV     #256.,@#NOWORD  ;NO OF DATA WORDS
030140  012737  000001  051612          MOV     #1,@#X          ;WRITE DATA
030146  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
030152  051602                          CYL
030154  053502                          WCRC

                                ;THESE ARE REGULAR SETUPS
```

```
3961  030156  004737  045152            JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
3962  030162  012777  177400  164562    MOV     #-256.,@RHWC    ;256 DATA WORDS
3963  030170  013777  001136  164556    MOV     @#STKS,@RHBA    ;STARTING ADDRESS OF WRITE BUFFER
3964  030176  017737  150734  015136    MOV     @$TKS,@#TMPILL  ;TEMPORARY STORAGE OF DATA
3965  030204  005077  164554            CLR     @RHDST          ;SECTOR 0 TRACK 0
3966  030210  012777  010000  164552    MOV     #FMT22,@RHOF    ;16 BITS PER WORD FORMAT
3967  030216  005077  164550            CLR     @RHCA           ;CYLINDER 0
3968  030222  004737  045206            JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
3969  030226  104400  005116            TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
3970                                                            ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
3971  030232  000000                    HALT                    ;STOP THE TEST
3972  030234  013746  015166            MOV     @#WRIDAT,-(SP)  ;WRITE DATA=60
3973  030240  052716  001400            BIS     #A16!A17,(SP)   ;SET HIGH ORDER UNIBUS BITS
3974  030244  012611                    MOV     (SP)+,@R1       ;FILL RHCS1
3975  030246  052777  000010  164502    BIS     #BAI,@RHCS2     ;SET BUS ADDRESS INHIBIT
3976  030254  005037  015122            CLR     @#ERFLG$        ;CLEAR ERROR FLAG
3977  030260  004737  051456            JSR     PC,@#COMHD      ;WRITE DATA
```

```
                                        ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
                                        ;FROM THE "COMHD" ROUTINE IT MEANS SECTOR GAP, SYNC BYTE
                                        ;HEADER, HEADER CRC, HEADER GAP AND SYNC BYTE HAVE GONE BY
                                        ;AND SYNCS WERE CORRECTLY DETECTED.

                                        ;DATA IS TO BE CHECKED.

030264  004737  044652          JSR     PC,@#PUTREG     ;SAVE REGISTERS
030270  005737  015122          TST     @#ERFLGS        ;HAVE ANY ERRORS OCCURED?
030274  001042                  BNE     TST47           ;       BRANCH OUT IF YES
030276  013700  015136          MOV     @#TMPILL,R0     ;GOOD DATA
030302  012701  053520          MOV     #DISK,R1        ;DATA WRITTEN INTO "DISK"
030306  012702  000400          MOV     #256.,R2        ;COUNTER
030312  012737  000401  051722  1$:     MOV     #257.,@#ERWORD  ;FOR ERROR WORD
030320  020021                  CMP     R0,(R1)+        ;COMPARE GOOD DATA WITH DATA ON DISK
030322  001425                  BEQ     3$              ;BRANCH IF GOOD
030324  013737  015136  001124          MOV     @#TMPILL,@#$GDDAT;GOOD DATA
030332  014137  001126          MOV     -(R1),@#$BDDAT  ;BAD DATA
030336  160237  051722          SUB     R2,@#ERWORD     ;ERROR WORD NO
030342  005737  015122          TST     @#ERFLGS        ;ANY ERRORS ALREADY THERE?
030346  001002                  BNE     2$              ;BRANCH IF YES
030350  104037                  ERROR   37              ;ERROR ON WRITE DATA COMMAND
                                                        ;SEE NEXT ERROR COMMENTS
030352  000401                  BR      64$             ;BRANCH TO AVOID PRINTING NEXT ERROR
030354  104040          2$:     ERROR   40              ;WORD NO GIVES WORD IN ERROR
                                                        ;ERROR OCCURED WHILE WRITING
                                                        ;WITH A16 A17 OF RHCS1 SET
030356  005721          64$:    TST     (R1)+           ;UNDO -(R1) FOR BAD DATA
030360  013746  177570          MOV     @#SWR,-(SP)     ;GET SWITCH SETTING
030364  042716  177177          BIC     #177177,(SP)    ;KEEP ONLY SWITCH 7 AND 8
030370  022726  000200          CMP     #SW07,(SP)+     ;IS 7 SET AND 8 RESET
030374  001402                  BEQ     TST47           ;       BRANCH OUT IF YES
030376  005302          3$:     DEC     R2              ;IF NOT COUNT 256 WORDS
030400  001344                  BNE     1$              ;BRANCH IF 256 NOT DONE
```

```
4013
4014                                    ;*****************************************************************
4015                                    ;*TEST 47       DRIVE TIMING ERROR
4016
4017                                    ;*      A READ HEADER AND DATA IS STARTED ON CYLINDER 0, SECTOR
4018                                    ;*      0, TRACK 0, 260 WORDS.  AFTER THE HEADER IS READ IN CORRECTLY,
4019                                    ;*      NO SYNC BYTE (DATA SYNC) IS GIVEN.
4020                                    ;*      THEN NORMAL DIAGNOSTIC DATA CLOCKS AND DIAGNOSTIC
4021                                    ;*      SECTOR CLOCKS ARE GIVEN FOR 24 BYTES.
4022                                    ;*
4023                                    ;*      THEN 536 BYTES OF SECTOR CLOCKS ONLY ARE GIVEN.
4024                                    ;*      THIS IS TO TO BRING SECTOR PULSE UP WHICH SHOULD
4025                                    ;*      SET "DRIVE TIMING ERROR" - 'DTE'
4026                                    ;*****************************************************************
4027  030402  000004                    TST47:  SCOPE
4028  030404  012706  001000                    MOV     #STACK,SP       ;RESET STACK
4029  030410  012737  000047  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
4030
4031                                            ;THESE ARE TO SETUP FOR DISKLESS USE
4032
4033  030416  012737  010000  051602            MOV     #FMT22,@#CYL    ;16 BITS PER WORD
4034                                                                    ;CYLINDER 0
4035  030424  005037  051604                    CLR     @#SECOTR        ;SECTOR 0
4036                                                                    ;TRACK 0
4037  030430  005037  051606                    CLR     @#KEY1          ;KEY1 = 0
4038  030434  005037  051610                    CLR     @#KEY2          ;KEY2 = 0
4039  030440  005037  051612                    CLR     @#X             ;THIS IS A READ COMMAND
4040  030444  004537  046360                    JSR     R5,@#CRC        ;GO TO CALCULATE CRC
4041  030450  051602                            CYL
4042  030452  053502                            WCRC
4043
4044                                            ; THESE ARE REGULAR SETUPS
4045
4046  030454  004737  045152                    JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
4047  030460  012777  177374  164264            MOV     #-260.,@RHWC    ;256 DATA WORDS, 4 HEADER WORDS
4048  030466  012777  016256  164260            MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF BUFFER
4049  030474  005077  164264                    CLR     @RHDST          ;TRACK = 0
4050                                                                    ;SECTOR = 0
4051  030500  012777  014000  164262            MOV     #FMT22!ECI,@RHOF ;16 BITS PER WORD
4052                                                                    ;ECC CORRECTION INHIBITED
4053  030506  005077  164260                    CLR     @RHCA           ;CYLINDER = 0
4054  030512  004737  045206                    JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
4055  030516  104400  005116                    TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
4056                                                                    ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
4057  030522  000000                            HALT                    ;STOP THE TEST
4058  030524  013711  015174                    MOV     @#REFOR,@R1     ;READ HEADER AND DATA = 72
4059
4060                                            ;READ & SAVE REGISTERS FOR COMPARISON AFTER SIMULATED 'DTE'
4061
4062  030530  004037  045644                    JSR     R0,@#SAVER      ;READ IN SEQUENCE
4063  030534  014752                            RHWC                    ;FROM HARDWARE REGISTER
4064  030536  015022                            WC                      ;INTO CORE AT LOCATION
4065  030540  000023                            19.                     ;NUMBER OF REGISTERS TO READ
4066
```

```
4067
4068                                        ;NOW 'GO' WILL BE GIVEN, EVERYTHING WILL BE TREATED
4069                                        ;NORMALLY FOR THE HEADER. BUT WHEN IT IS TIME TO READ
4070                                        ;DATA, ONLY SECTOR CLOCKS WILL BE GIVEN. NO DIAGNOSTIC DATA
4071                                        ;CLOCKS WILL BE GIVEN. THIS SHOULD BRING SECTOR PULSE HIGH
4072                                        ;WITHOUT PUTTING "READ" DOWN HENCE 'DTE' WILL COME UP.
4073
4074  030542  012737  177777  015142        MOV     #-1,@#TESDTE    ;SET DTE TEST
4075  030550  012737  177777  015122        MOV     #-1,@#ERFLGS    ;THIS WILL BRING THE READ HEADER
4076                                                                ;AND DATA PROCESS OUT AFTER THE
4077                                                                ;HEADER HAS BEEN CORRECTLY READ
4078
4079  030556  004737  051456                JSR     PC,@#COMHD      ;ISSUE 'GO', SEARCH FOR THE SECTOR
4080                                                                ;AND READ THE HEADER
4081
4082  030562  017737  164172  001170  SETCK1: MOV     @RHCS1,@#$TMPO  ;READ CS1 TO CHECK FOR ANY READ ERRORS
4083  030570  032737  100000  001170        BIT     #SC,@#$TMPO     ;TEST FOR "SPECIAL CONDITION" - 'SC'
4084  030576  001405                        BEQ     8$              ;CONTINUE WITH TEST IF 'SC' = 0 (NO ERRORS)
4085  030600  004737  044652                JSR     PC,@#PUTREG     ;READ & SAVE ALL REGISTERS AGAIN IF AN
4086                                                                ;UNDEFINED DATA TRANSFER ERROR OCCURRED
4087  030604  104040                        ERROR   40              ;READ/WRITE HEADER & DATA ERROR DURING
4088  030606  000167  000262                JMP     TST50           ;       'DTE' TEST - ABORT THE TEST
4089
4090  030612                          8$:   ;NOW THE HEADER HAS BEEN READ OK
4091                                        ;NOW 560 SECTOR CLOCKS WILL BE GIVEN
4092                                        ;GAP 11 BYTES, SYNC 1 BYTE, DATA 512, ECC 4 BYTES
4093                                        ;GAP 2 BYTES, TOLERANCE 28 BYTES, EXTRA 2
4094
4095                                        ;THESE 560 SECTOR CLOCKS ARE DIVIDED INTO TWO GROUPS
4096                                        ;24 SECTOR CLOCKS WITH NORMAL DIAGNOSTIC DATA CLOCKS,
4097                                        ;AND 536 SECTOR CLOCKS WITHOUT ANY DIAGNOSTIC DATA CLOCKS.
4098
4099
4100                                        ;THIS GIVES 24 SECTOR CLOCKS WITH DIAGNOSTIC DATA CLOCKS
4101                                        ;WHICH EQUALS 3 BYTES OF DATA
4102
4103  030612  012701  000030                MOV     #24.,R1         ;LOAD COUNTER
4104  030616  013700  015000                MOV     @#RHMR,R0       ;GET RHMR ADDRESS
4105  030622  012710  000001                MOV     #DMD,@R0        ;SET DIAGNOSTIC MODE
4106  030626  052710  000012          1$:   BIS     #MSTCK!MCLK,@R0 ;SET SECTOR CLOCK AND DATA CLOCK
4107  030632  042710  000012                BIC     #MSTCK!MCLK,@R0 ;CLEAR SECTOR CLOCK AND DATA CLOCK
4108  030636  012702  000007                MOV     #7,R2           ;LOAD COUNTER FOR DIAGNOSTIC CLOCKS
4109  030642  052710  000002          4$:   BIS     #MCLK,@R0       ;SET CLOCK
4110  030646  042710  000002                BIC     #MCLK,@R0       ;CLEAR CLOCK
4111  030652  005302                        DEC     R2              ;COUNT TO 7
4112  030654  001372                        BNE     4$              ;BRANCH IF 7 NOT DONE
4113  030656  005301                        DEC     R1              ;COUNT TO 24
4114  030660  001362                        BNE     1$              ;BRANCH IF 24 NOT DONE
4115
4116                                        ;THIS GIVES 536 SECTOR CLOCKS WITHOUT DIAGNOSTIC DATA CLOCKS
4117
4118  030662  012701  001030                MOV     #536.,R1        ;LOAD SECTOR CLOCK COUNTER
4119  030666  052710  000010          5$:   BIS     #MSTCK,@R0      ;SET SECTOR CLOCK
4120  030672  042710  000010                BIC     #MSTCK,@R0      ;CLEAR SECTOR CLOCK
```

```
4121  030676  005301                          DEC     R1              ;COUNT
4122  030700  001372                          BNE     5$              ;BRANCH IF 536 NOT DONE
4123
4124
4125                                          ;NOW 'DTE' SHOULD BE SET
4126                                          ;CHANGE SAVED REGISTERS TO EXPECTED VALUES
4127
4128  030702  012737  177400  015022          MOV     #-256.,@#WC     ;SAVED RHWC
4129  030710  012737  016266  015024          MOV     #REINTO+<4.*2>,@#BA ;SAVED RHBA
4130  030716  052737  140000  015030          BIS     #SC!TRE,@#CS1   ;SAVED RHCS1
4131  030724  052737  010000  015032          BIS     #DTE,@#ER1      ;SAVED RHER1
4132  030732  012737  000401  015050          MOV     #401,@#MR       ;SAVED RHMR
4133  030740  052737  140000  015052          BIS     #ATA!ERR,@#DS1  ;SAVED RHDS1
4134  030746  012737  000100  015064          MOV     #100,@#LA       ;SAVED RHLA
4135  030754  012737  000001  015034          MOV     #1,@#DST        ;SAVED RHDST
4136  030762  013737  015132  015046          MOV     @#ATTENT,@#AS   ;SAVED RHAS
4137
4138
4139                                          ;NOW READ & SAVE REGISTERS AGAIN SO THAT COMPARISONS
4140                                          ;CAN BE DONE (USE THE 'WRFROM' SAVE BUFFER THIS TIME)
4141
4142  030770  004037  045644                  JSR     R0,@#SAVER      ;READ IN SEQUENCE
4143  030774  014752                          RHWC                    ;FROM HARDWARE REGISTER
4144  030776  015212                          WRFROM                  ;INTO CORE BUFFER
4145  031000  000023                          19.                     ;NUMBER OF REGISTERS TO READ
4146
4147                                          ;FOR RHAS UPPER BYTE
4148  031002  113737  015047  015237          MOVB    @#AS+1,@#WRFROM+25 ;UPPER RHAS
4149
4150                                          ;COMPARE THE HEADER READ
4151
4152  031010  004037  046046                  JSR     R0,@#COMPAR     ;COMPARE
4153  031014  051602                          CYL                     ;GOOD BUFFER
4154  031016  016256                          REINTO                  ;TEST BUFFER
4155  031020  000004                          4.                      ;NUMBER
4156  031022  031030                          6$                      ;RETURN FOR ERROR
4157  031024  031030                          6$                      ;SAME
4158  031026  031034                          7$                      ;RETURN FOR GOOD COMPARISON
4159  031030  104010          6$:             ERROR   10              ;HEADER READ IN DURING THIS TEST IS
4160                                                                  ;IN ERROR
4161
4162  031032  000207                          RTS     PC              ;RETURN
4163
4164  031034                  7$:                                     ;GOOD COMPARISON, CONTINUE
4165
4166
4167                                          ;COMPARE REGISTERS BEFORE COMMAND WITH REGISTERS AFTER COMMAND
4168
4169  031034  004037  046046                  JSR     R0,@#COMPAR     ;COMPARE
4170  031040  015022                          WC                      ;INITIAL SNAPSHOT BUFFER (CHANGED)
4171  031042  015212                          WRFROM                  ;TEST SNAPSHOT BUFFER
4172  031044  000022                          18.                     ;NUMBER OF REGISTERS
4173  031046  031054                          2$                      ;RETURN FOR ERROR
4174  031050  031054                          2$                      ;SAME
```

```
4175  031052  031074                          3$                      ;RETURN FOR GOOD COMPARISON
4176
4177  031054  013705  051722          2$:     MOV     @#ERWORD,R5     ;GETTING READY TO INDEX
4178  031060  060505                          ADD     R5,R5           ;DOUBLE ERROR WORD
4179  031062  016537  014750  044716          MOV     RH#C-2(R5),@#REGADR ;FAILING REGISTER
4180  031070  104001                          ERROR   1               ;IMPROPER REGISTER
4181                                                                  ;CHANGE AFTER FORCING
4182                                                                  ;'DTE' ERROR
4183  031072  000207                          RTS     PC              ;RETURN
4184
4185  031074                          3$:                             ;GOOD - REGISTERS OK, GO ON TO NEXT TEST
4186
4187
```

```
                                ;*****************************************************************
                                ;*TEST 50       DRIVE TIMING ERROR

                                ;*      A WRITE DATA COMMAND IS STARTED ON CYLINDER 0, SECTOR
                                ;*      0, TRACK 0, 256 WORDS.
                                ;*
                                ;*      THE SECTOR IS SEARCHED FOR AND
                                ;*      AFTER THE HEADER IS READ IN CORRECTLY,
                                ;*      NO SYNC BYTE (DATA SYNC) IS GIVEN.
                                ;*      NORMAL DIAGNOSTIC DATA CLOCKS AND DIAGNOSTIC
                                ;*      SECTOR CLOCKS ARE GIVEN FOR 24 BYTES,
                                ;*      THEN 536 BYTES OF SECTOR CLOCKS ONLY, ARE GIVEN.
                                ;*
                                ;*      THIS IS TO TO BRING SECTOR PULSE UP
                                ;*      WHICH SHOULD SET "DRIVE TIMING ERROR" - 'DTE'
                                ;*****************************************************************
031074  000004                  TST50:  SCOPE
031076  012706  001000                  MOV     #STACK,SP       ;RESET STACK
031102  012737  000050  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                        ;THESE ARE TO SETUP FOR DISKLESS USE
031110  012737  010000  051602          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
                                                                ;CYLINDER 0
031116  005037  051604                  CLR     @#SECOTR        ;SECTOR 0
                                                                ;TRACK 0
031122  005037  051606                  CLR     @#KEY1          ;KEY1 = 0
031126  005037  051610                  CLR     @#KEY2          ;KEY2 = 0
031132  012737  177777  051612          MOV     #-1,@#X         ;THIS IS FOR WRITE DATA COMMAND
031140  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
031144  051602                          CYL
031146  053502                          WCRC

                                ; THESE ARE REGULAR SETUPS & CHECKS

031150  004737  045152                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
031154  012777  177400  163570          MOV     #-256.,@RHWC    ;256 DATA WORDS
031162  012777  015212  163564          MOV     #WRFROM,@RHBA   ;STARTING ADDRESS OF BUFFER
031170  005077  163570                  CLR     @RHDST          ;TRACK = 0
                                                                ;SECTOR = 0
031174  012777  010000  163566          MOV     #FMT22,@RHOF    ;16 BITS PER WORD
                                                                ;ECC CORRECTION INHIBITED
031202  005077  163564                  CLR     @RHCA           ;CYLINDER = 0
031206  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
031212  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
031216  000000                          HALT                    ;STOP THE TEST
031220  013711  015166                  MOV     @#WRIDAT,@R1    ;WRITE DATA = 60

                                ;READ & SAVE REGISTERS FOR COMPARISON AFTER SIMULATED 'DTE'

031224  004037  045644                  JSR     R0,@#SAVER      ;READ REGISTERS IN SEQUENCE
031230  014752                          RHWC                    ;FROM HARDWARE REGISTER
031232  015022                          WC                      ;INTO CORE BUFFER LOCATION
```

```
 4242  031234  000023                    19.                    ;NUMBER OF REGISTERS TO READ
```

```
                                        ;NOW 'GO' WILL BE GIVEN, EVERYTHING WILL BE TREATED
                                        ;NORMALLY FOR THE HEADER.  WHEN IT IS TIME TO WRITE
                                        ;DATA, ONLY SECTOR CLOCKS WILL BE GIVEN, NO DIAGNOSTIC DATA
                                        ;CLOCKS WILL BE GIVEN. THIS SHOULD BRING SECTOR PULSE HIGH
                                        ;WITHOUT PUTTING READ DOWN, HENCE 'DTE' WILL COME UP.

031236  012737  177777  015142        MOV     #-1,@#TESDTE    ;SET DTE TEST
031244  012737  177777  015122        MOV     #-1,@#ERFLG$    ;THIS WILL BRING THE READ HEADER
                                                                ;AND DATA PROCESS OUT AFTER THE
                                                                ;HEADER HAS BEEN CORRECTLY READ

031252  004737  051456                JSR     PC,@#COMHD      ;ISSUE 'GO', SEARCH FOR SECTOR,
                                                                ;READ HEADER AND DATA.

031256  017737  163476  001170  SETCK2: MOV     @RHCS1,@#$TMPO  ;READ CS1 TO CHECK FOR READ ERRORS
031264  032737  100000  001170        BIT     #SC,@#$TMPO     ;TEST FOR "SPECIAL CONDITION" - 'SC'
031272  001405                        BEQ     6$              ;CONTINUE TESTING IF NO ERROR
031274  004737  044652                JSR     PC,@#PUTREG     ;READ & SAVE REGISTERS AGAIN IF UNDE-
                                                                ;FINED ERROR HAS OCCURRED
031300  104040                        ERROR   40              ;THERE WAS A READ/WRITE HEADER ERROR
                                                                ;DURING 'DTE' TEST SETUP
031302  000167  000260                JMP     TST51           ;       ABORT THE TEST

031306                          6$:     ;NOW THE HEADER HAS BEEN READ,
                                        ;560 SECTOR CLOCKS WILL BE GIVEN -
                                        ;GAP 11 BYTES, SYNC 1 BYTE, DATA 512, ECC 4 BYTES
                                        ;GAP 2 BYTES, TOLERANCE 28 BYTES, EXTRA 2

                                        ;THESE 560 SECTOR CLOCKS ARE DIVIDED INTO TWO GROUPS
                                        ;24 SECTOR CLOCKS WITH NORMAL DIAGNOSTIC DATA CLOCKS
                                        ;AND 536 SECTOR CLOCKS WITHOUT ANY DIAGNOSTIC DATA CLOCKS


                                        ;THIS GIVES 24 SECTOR CLOCKS WITH DIAGNOSTIC DATA CLOCKS

031306  012701  000030                MOV     #24.,R1         ;LOAD SECTOR CLOCK COUNTER
031312  013700  015000                MOV     @#RHMR,R0       ;GET RHMR ADDRESS
031316  012710  000001                MOV     #DMD,@R0        ;SET DIAGNOSTIC MODE
031322  052710  000012          1$:   BIS     #MSTCK!MCLK,@R0 ;SET SECTOR CLOCK AND DATA CLOCK
031326  042710  000012                BIC     #MSTCK!MCLK,@R0 ;CLEAR SECTOR CLOCK AND DATA CLOCK
031332  012702  000007                MOV     #7,R2           ;LOAD COUNTER FOR DIAGNOSTIC DATA CLOCKS
031336  052710  000002          4$:   BIS     #MCLK,@R0       ;SET CLOCK (DATA)
031342  042710  000002                BIC     #MCLK,@R0       ;CLEAR CLOCK (DATA)
031346  005302                        DEC     R2              ;COUNT
031350  001372                        BNE     4$              ;BRANCH IF 7 NOT DONE
031352  005301                        DEC     R1              ;COUNT
031354  001362                        BNE     1$              ;BRANCH IF 24 NOT DONE

                                        ;THIS GIVES 536 SECTOR CLOCKS WITHOUT DIAGNOSTIC DATA CLOCKS

031356  012701  001030                MOV     #536.,R1        ;LOAD SECTOR CLOCK COUNTER
031362  052710  000010          5$:   BIS     #MSTCK,@R0      ;SET SECTOR CLOCK
031366  042710  000010                BIC     #MSTCK,@R0      ;CLEAR SECTOR CLOCK
```

```
4297  031372  005301                          DEC     R1              ;COUNT
4298  031374  001372                          BNE     5$              ;BRANCH IF 536 NOT DONE
4299
4300
4301
4302                                          ;ECC PATTERN REGISTER IS NOT CHECKED
4303  031376  017737  163410  015062          MOV     @RHEC2,@#EC2    ;RHEC2 IS NOT CHECKED
4304
4305
4306                                          ;NOW 'DTE' SHOULD BE SET, CHANGE SAVED REGISTERS TO EXPECTED VALUES
4307
4308  031404  012737  177511  015022          MOV     #-183.,@#WC     ;SAVED RHWC
4309  031412  012737  015434  015024          MOV     #WRFROM+<73.*2>,@#BA ;SAVED RHBA
4310  031420  052737  140000  015030          BIS     #SC!TRE,@#CS1   ;SAVED RHCS1
4311  031426  042737  000100  015026          BIC     #IR,@#CS2       ;SAVED RHCS2
4312  031434  052737  000200  015026          BIS     #OR,@#CS2       ;SAVED RHCS2
4313  031442  052737  010000  015032          BIS     #DTE,@#ER1      ;SAVED RHER1
4314  031450  012737  000201  015050          MOV     #DENVL!DMD,@#MR ;SAVED RHMR
4315  031456  052737  140000  015052          BIS     #ATA!ERR,@#DS1 ;SAVED RHDS1
4316  031464  012737  000100  015064          MOV     #100,@#LA       ;SAVED RHLA
4317  031472  012737  000001  015034          MOV     #1,@#DST        ;SAVED RHDST
4318  031500  013737  015132  015046          MOV     @#ATTENT,@#AS   ;SAVED RHAS
4319
4320                                          ;NOW READ & SAVE REGISTERS AGAIN SO THAT COMPARISONS
4321                                          ;CAN BE DONE (USING 'WRFROM' BUFFER THIS TIME)
4322
4323  031506  004037  045644                  JSR     R0,@#SAVER      ;READ IN SEQUENCE
4324  031512  014752                          RHWC                    ;FROM HARDWARE REGISTER
4325  031514  016256                          REINTO                  ;INTO CORE BUFFER LOCATION
4326  031516  000023                          19.                     ;NUMBER OF REGISTERS TO READ
4327
4328                                          ;FOR RHAS UPPER BYTE
4329  031520  113737  015047  016303          MOVB    @#AS+1,@#REINTO+25 ;UPPER RHAS
4330
4331
4332                                          ;COMPARE CHANGED REGISTER SNAPSHOT BEFORE COMMAND WITH
4333                                          ;SNAPSHOT AFTER COMMAND
4334
4335  031526  004037  046046                  JSR     R0,@#COMPAR     ;COMPARE
4336  031532  015022                          WC                      ;CHANGED INITIAL SNAPSHOT BUFFER
4337  031534  016256                          REINTO                  ;SNAPSHORT BUFFER AFTER COMMAND
4338  031536  000022                          18.                     ;NUMBER OF REGISTERS TO COMPARE
4339  031540  031546                          2$                      ;RETURN FOR ERROR
4340  031542  031546                          2$                      ;SAME
4341  031544  031566                          3$                      ;RETURN FOR GOOD COMPARISON
4342
4343  031546  013705  051722          2$:     MOV     @#ERWORD,R5     ;GETTING READY TO INDEX
4344  031552  060505                          ADD     R5,R5           ;DOUBLE ERROR WORD
4345  031554  016537  014750  044716          MOV     RHWC-2(R5),@#REGADR ;FAILING REGISTER
4346  031562  104001                          ERROR   1               ;IMPROPER REGISTER
4347                                                                  ;CHANGE AFTER FORCING
4348                                                                  ;'DTE' ERROR
4349  031564  000207                          RTS     PC              ;RETURN
4350
```

H12


```
4351  031566                    3$:                    ;GOOD, REGISTERS OK - GO ON TO NEXT TEST
4352
4353
```

```
4354
4355                                    ;*****************************************************************
4356                                    ;#TEST 51       DRIVE TIMING ERROR
4357
4358                                    ;*      A WRITE HEADER AND DATA COMMAND IS GIVEN
4359                                    ;*      TO CYLINDER 0, SECTOR 0, TRACK 0, 256. WORDS.
4360                                    ;*
4361                                    ;*      AFTER SECTOR IS FOUND (THE SECTOR FOUND FLOP IS HIGH),
4362                                    ;*      NO MORE DIAGNOSTIC DATA CLOCKS ARE GIVEN,
4363                                    ;*      ONLY SECTOR CLOCKS ARE GIVEN TILL SECTOR PULSE IS HIGH.
4364                                    ;*      THIS SHOULD SET "DRIVE TIMING ERROR" - 'DTE'
4365                                    ;*****************************************************************
4366  031566  000004                  TST51:  SCOPE
4367  031570  012706  001000                  MOV     #STACK,SP       ;RESET STACK
4368  031574  012737  000051  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
4369
4370                                          ;THESE ARE TO SET UP FOR DISKLESS USE ONLY
4371
4372  031602  012737  010000  054724          MOV     #FMT22,@#WCYL   ;FORMAT 22=16 BITWORDS AND
4373                                                                  ;CYLINDER 0
4374  031610  005037  054726                  CLR     @#WSECTR        ;TRACK=0, SECTOR=0
4375  031614  005037  054730                  CLR     @#WKEY1         ;KEY1=0
4376  031620  005037  054732                  CLR     @#WKEY2         ;KEY2=0
4377  031624  012737  000400  054764          MOV     #256.,@#FNWORD  ;256 DATAWORDS
4378  031632  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
4379  031636  054724                          WCYL
4380  031640  054734                          GCRC
4381
4382                                          ; THESE ARE REGULAR SETUPS & CHECKS
4383
4384  031642  004737  045152                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
4385  031646  012777  177374  163076          MOV     #-260.,@RHWC    ;256 DATA WORDS & 4 HEADER WORDS
4386  031654  012777  015212  163072          MOV     #WRFROM,@RHBA   ;STARTING ADDRESS OF BUFFER
4387  031662  005077  163076                  CLR     @RHDST          ;TRACK = 0
4388                                                                  ;SECTOR = 0
4389  031666  012777  014000  163074          MOV     #FMT22!ECI,@RHOF ;16 BITS PER WORD
4390                                                                  ;ECC CORRECTION INHIBITED
4391  031674  005077  163072                  CLR     @RHCA           ;CYLINDER = 0
4392  031700  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
4393  031704  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
4394                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
4395  031710  000000                          HALT                    ;STOP THE TEST
4396  031712  013711  015170                  MOV     @#WRIFOR,@R1    ;WRITE HEADER AND DATA = 62
4397
4398                                          ;READ & SAVE REGISTERS FOR COMPARISON AFTER SIMULATED 'DTE'
4399
4400  031716  004037  045644                  JSR     R0,@#SAVER      ;READ IN SEQUENCE
4401  031722  014752                          RHWC                    ;FROM HARDWARE REGISTER
4402  031724  015022                          WC                      ;INTO CORE BUFFER LOCATION
4403  031726  000023                          19.                     ;NUMBER OF REGISTERS TO READ
```

```
                                        ;NOW 'GO' WILL BE GIVEN. EVERYTHING WILL BE TREATED
                                        ;NORMALLY TILL HEADER IS TO BE GIVEN, THEN ONLY
                                        ;SECTOR CLOCKS WILL BE GIVEN. NO DIAGNOSTIC DATA
                                        ;CLOCKS WILL BE GIVEN, THIS SHOULD BRING SECTOR PULSE HIGH
                                        ;WITHOUT PUTTING "READ" DOWN, HENCE 'DTE' WILL COME UP.

031730  012737  177777  015142        MOV     #-1,@#TESDTE    ;SET DTE TEST
031736  012737  177777  015122        MOV     #-1,@#ERFLGS    ;THIS WILL BRING THE READ HEADER
                                                                ;AND DATA PROCESS OUT AFTER THE
                                                                ;HEADER HAS BEEN CORRECTLY READ

031744  004737  054564                JSR     PC,@#COMWHD     ;ISSUE 'GO', SEARCH FOR SECTOR,
                                                                ;WRITE HEADER AND DATA.

031750  017737  163004  001170  SETCK3: MOV     @RHCS1,@#$TMP0  ;READ CS1 TO CHECK FOR ERRORS DURING WRITE
031756  032737  100000  001170        BIT     #SC,@#$TMP0     ;TEST FOR "SPECIAL CONDITION" - 'SC'
031764  001405                        BEQ     4$              ;CONTINUE TEST IF NO ERROR ('SC' = 0)
031766  004737  044652                JSR     PC,@#PUTREG     ;READ & SAVE REGISTERS AGAIN IF ERROR
031772  104040                        ERROR   40              ;THERE WAS A READ/WRITE HEADER ERROR
                                                                ;DURING 'DTE' TEST SETUP
031774  000167  000202                JMP     TST52           ;       ABORT THE TEST AT THAT POINT

032000                          4$:     ;NOW SECTOR HAS BEEN FOUND OK

                                        ;609 SECTOR CLOCKS WILL BE GIVEN,
                                        ;39 BYTES FOR SECTOR GAP,
                                        ;1 BYTE FOR HEADER SYNC,
                                        ;8 BYTES FOR HEADER,
                                        ;GAP 11 BYTES, SYNC 1 BYTE, DATA 512, ECC 4 BYTES
                                        ;GAP 2 BYTES, TOLERANCE 28 BYTES, EXTRA 3


                                        ;THIS GIVES 609 SECTOR CLOCKS WITHOUT DIAGNOSTIC DATA CLOCKS

032000  012701  001141          5$:     MOV     #609.,R1        ;LOAD SECTOR CLOCK COUNTER
032004  052710  000010                  BIS     #MSTCK,@R0      ;SET SECTOR CLOCK
032010  042710  000010                  BIC     #MSTCK,@R0      ;CLEAR SECTOR CLOCK
032014  005301                          DEC     R1              ;COUNT
032016  001372                          BNE     5$              ;BRANCH IF 536 NOT DONE

                                        ;NOW 'DTE' SHOULD BE SET, CHANGE SAVED REGISTERS
                                        ;TO EXPECTED VALUES

032020  012737  177477  015022        MOV     #-193.,@#WC     ;SAVED RHWC
032026  012737  015420  015024        MOV     #WRFROM+<67.*2>,@#BA ;SAVED RHBA
032034  052737  140000  015030        BIS     #SC!TRE,@#CS1   ;SAVED RHCS1
032042  042737  000100  015026        BIC     #IR,@#CS2       ;SAVED RHCS2
032050  052737  000200  015026        BIS     #OR,@#CS2       ;SAVED RHCS2
032056  052737  040000  015032        BIS     #DTE,@#ER1      ;SAVED RHER1
032064  012737  000401  015050        MOV     #401,@#MR       ;SAVED RHMR
032072  052737  140000  015052        BIS     #ATA!ERR,@#DS1  ;SAVED RHDS1
032100  012737  000100  015064        MOV     #100,@#LA       ;SAVED RHLA
032106  012737  000001  015034        MOV     #1,@#DST        ;SAVED RHDST
```

```
4458  032114  013737  015132  015046          MOV     @#ATTENT,@#AS   ;SAVED RHAS
4459
4460                                          ;NOW READ & SAVE REGISTERS AGAIN SO THAT COMPARISONS CAN BE DONE
4461
4462  032122  004037  045644                  JSR     R0,@#SAVER      ;READ IN SEQUENCE
4463  032126  014752                          RHWC                    ;FROM HARDWARE REGISTER
4464  032130  016256                          REINTO                  ;INTO CORE BUFFER LOCATION
4465  032132  000023                          19.                     ;NUMBER OF REGISTERS TO READ
4466
4467                                          ;FOR RHAS UPPER BYTE
4468  032134  113737  015047  016303          MOVB    @#AS+1,@#REINTO+25 ;UPPER RHAS
4469
4470                                          ;COMPARE CHANGED REGISTER SNAPSHOT BEFORE COMMAND
4471                                          ;WITH REGISTER SNAPSHOT AFTER COMMAND
4472
4473  032142  004037  046046                  JSR     R0,@#COMPAR     ;COMPARE
4474  032146  015022                          WC                      ;CHANGED REGISTER SNAPSHOT
4475  032150  016256                          REINTO                  ;SNAPSHOT AFTER COMMAND
4476  032152  000022                          18.                     ;NUMBER OF REGISTERS TO COMPARE
4477  032154  032162                          2$                      ;RETURN FOR ERROR
4478  032156  032162                          2$                      ;SAME
4479  032160  032202                          3$                      ;RETURN FOR GOOD COMPARISON
4480
4481  032162  013705  051722          2$:     MOV     @#ERWORD,R5     ;GETTING READY TO INDEX
4482  032166  060505                  ADD     R5,R5                   ;DOUBLE ERROR WORD
4483  032170  016537  014750  044716          MOV     RHWC-2(R5),@#REGADR ;FAILING REGISTER
4484  032176  104001                          ERROR   1               ;IMPROPER REGISTER
4485                                                                  ;CHANGE AFTER FORCING
4486                                                                  ;'DTE' ERROR
4487  032200  000207                  RTS     PC                      ;RETURN
4488
4489  032202                          3$:                             ;GOOD, REGISTERS COMPARE OK
4490                                                                  ;GO ON TO THE NEXT TEST
4491
```

```
                        ;*****************************************************************
                        ;*TEST 52        SECTOR SELECTION

                        ;*      THE SECTOR SELECTION LOGIC IS CHECKED HERE
                        ;*      EACH SECTOR ON TRACK ZERO IS WRITTEN INTO.
                        ;*
                        ;*      DATA IS - 19 WORDS OF ZEROS - SYNC WORDS, 4 HEADER WORDS
                        ;*      1 CRC WORD, 5 WORDS OF ZEROS, 1 SYNC WORD, 100 ZEROS
                        ;*      (DATA), 1 SYNC WORD, 70 SECTOR NUMBER TO VARY
                        ;*
                        ;*      THE WRITTEN DATA IS CHECKED IN MEMORY

                        ;*****************************************************************
032202  000004          TST52:  SCOPE
032204  012706  001000          MOV     #STACK,SP       ;RESET STACK
032210  012737  000052  017322  MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER

032216  012737  000026  015144  MOV     #22.,@#TAGDTE   ;22 SECTORS
                                                        ;THIS TEST REPEATS
                                                        ;ITSELF 22 TIMES

                                ;THE FOLLOWING INITIALIZES FOR SECTOR 0

032224  005037  032334          CLR     @#SS3+2         ;HEADER (SECTOR)
032230  012737  000025  032340  MOV     #21.,@#SS4+2    ;HEADER (KEY1)
032236  012737  000025  032344  MOV     #21.,@#SS5+2    ;HEADER (KEY2)
032244  005037  032372          CLR     @#SS7+2         ;DATA (SECTOR)
032250  005037  032454          CLR     @#SS10+2        ;DATA
032254  005037  032504          CLR     @#SS12+2        ;SECTOR (SIMULATED DISK)
032260  012737  0GJ025  032512  MOV     #21.,@#SS13+2   ;KEY1 (SIMULATED DISK)
032266  012737  000025  032520  MOV     #21.,@#SS14+2   ;KEY2 (SIMULATED DISK) .
032274  005037  032560          CLR     @#SS15+2        ;SECTOR (RHDST)

                                ;CLEAR SIMULATED DISK AREA
032300                  SS1:
032300  012700  053422  1$:     MOV     #SECGAP,R0      ;POINTER
032304  012701  000460          MOV     #304.,R1        ;COUNTER
032310  005020          2$:     CLR     (R0)+           ;CLEAR SIMULATED DISK AREA
032312  005301          DEC     R1                      ;COUNT
032314  001375          BNE     2$

                                ;SETUP GENERAL REGISTERS
032316  004737  045152          JSR     PC,@#CLDISK

                                ;SETUP WRITE FROM BUFFER
032322  012700  015212          MOV     #WRFROM,R0

                                ;HEADER
032326  012720  010000          MOV     #FMT22,(R0)+    ;FORMAT 16 BITS PER WORD
                                                        ;CYLINDER 0
032332  012720  000000  SS3:    MOV     #0,(R0)+        ;SECTOR TO VARY
032336  012720  000025  SS4:    MOV     #21.,(R0)+      ;KEY1 TO VARY
032342  012720  000025  SS5:    MOV     #21.,(R0)+      ;KEY2 TO VARY
```

```
                                        ;DATA IN WRITE FROM BUFFER ALTHOUGH THIS IS DATA AND NOT
                                        ;HEADER, THE SECTOR WITH SYNC BYTES WILL BE GIVEN AS DATA.

                                        ;DATA IS - 19 WORDS OF ZEROS - SYNC WORDS, 4 HEADER WORDS
                                        ;1 CRC WORD, 5 WORDS OF ZEROS, 1 SYNC WORD, 100 ZEROS
                                        ;(DATA), 1 SYNC WORD, 70 SECTOR NUMBER TO VARY

032346  012705  000023          MOV     #19.,R5         ;COUNTER
032352  005020          6$:     CLR     (R0)+           ;19 ZEROS
032354  005305                  DEC     R5              ;COUNT
032356  001375                  BNE     6$              ;19 DONE?
032360  013720  051704          MOV     @#RSYNC,(R0)+   ;SYNC = 14400
032364  012720  010000          MOV     #FMT22,(R0)+    ;CYLINDER 0
032370  012720  000000  SS7:    MOV     #0,(R0)+        ;SECTOR TO VARY
032374  005020                  CLR     (R0)+
032376  005020                  CLR     (R0)+
032400  004537  046360          JSR     R5,@#CRC        ;CALCULATE CRC FOR ABOVE 4 WORDS
032404  015262                  WRFROM+50               ;4 WORDS START FROM HERE
032406  015272                  WRFROM+60               ;PUT CRC HERE

032410  005720                  TST     (R0)+           ;INCREMENT R0

032412  012705  000005          MOV     #5.,R5
032416  005020          8$:     CLR     (R0)+           ;5 WORDS OF ZEROS
032420  005305                  DEC     R5              ;COUNT
032422  001375                  BNE     8$              ;BRANCH IF 5 NOT DONE

032424  013720  051704          MOV     @#RSYNC,(R0)+   ;SYNC = 14400

032430  012705  000144          MOV     #100.,R5
032434  005020          9$:     CLR     (R0)+           ;100 WORDS OF ZEROS
032436  005305                  DEC     R5
032440  001375                  BNE     9$

032442  013720  051704          MOV     @#RSYNC,(R0)+   ;SYNC = 14400
032446  012705  000106          MOV     #70.,R5
032452  012720  000000  SS10:   MOV     #0,(R0)+        ;SECTOR TO VARY
032456  005305                  DEC     R5
032460  001374                  BNE     SS10

                                        ;CLEAR REST OF 256 WORDS THAT IS 54 WORDS OF ZEROS

032462  012705  000066          MOV     #54.,R5
032466  005020          11$:    CLR     (R0)+
032470  005305                  DEC     R5
032472  001375                  BNE     11$

                                        ;THESE ARE TO BE SET UP FOR DISKLESS USE ONLY

032474  012737  010000  054724  MOV     #FMT22,@#WCYL   ;FORMAT = 16 BIT WORDS
                                                        ;CYLINDER = 0
032502  012737  000000  054726  SS12:   MOV     #0,@#WSECTR     ;SECTOR TO VARY
032510  012737  000025  054730  SS13:   MOV     #21.,@#WKEY1    ;KEY1 TO VARY
032516  012737  000025  054732  SS14:   MOV     #21.,@#WKEY2    ;KEY2 TO VARY
```

```
4600  032524  012737  000312  054764          MOV     #202.,@#FNWORD  ;202 DATA WORDS
4601  032532  004537  046360                  JSR     R5,@#CRC        ;CALCULATE CRC
4602  032536  054724                          WCYL                    ;FIRST WORD
4603  032540  054734                          GCRC                    ;PUT HERE
4604
4605                                          ;THESE ARE REGULAR SETUPS
4606
4607  032542  012777  177400  162202          MOV     #-256.,@RHWC    ;202 DATA, 4 HEADER
4608  032550  012777  015212  162176          MOV     #WRFROM,@RHBA   ;FILL BUS ADDRESS
4609  032556  012777  000000  162200  SS15:   MOV     #0,@RHDST       ;SECTOR TO VARY
4610  032564  013777  015170  162166          MOV     @#WRIFOR,@RHCS1 ;GET READY TO DO
4611                                                                  ;WRITE HEADER AND DATA
4612                                                                  ;WITH 62 FUNCTION CODE IN RHCS1
4613  032572  012777  010000  162170          MOV     #FMT22,@RHOF    ;16 BITS PER WORD FORMAT
4614  032600  005077  162166                  CLR     @RHCA           ;CYLINDER = 0
4615
4616  032604  005037  015122                  CLR     @#ERFLGS        ;CLEAR ERROR FLAG
4617
4618  032610  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
4619  032614  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
4620                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
4621  032620  000000                          HALT                    ;STOP THE TEST
4622
4623  032622  004737  054564                  JSR     PC,@#COMMND     ;ISSUE 'GO', SEARCH FOR SECTOR,
4624                                                                  ;WRITE HEADER AND DATA
4625  032626  005737  015122                  TST     @#ERFLGS        ;HAVE ANY ERRORS OCCURRED ?
4626  032632  001051                          BNE     TST53           ;       BRANCH IF YES*****************
4627
4628  032634  004737  045376                  JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
4629  032640  104400  005116                - TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
4630  032644  000000                          HALT                    ;STOP THE TEST AND RESTART PROGRAM
4631
4632                                          ;NOW COMPARE "DISK" BUFFER WITH "REINTO" BUFFER
4633  032646  004037  046046                  JSR     R0,@#COMPAR     ;CHECK
4634  032652  015222                          WRFROM+8.               ;GOOD BUFFER
4635  032654  053520                          DISK                    ;TEST BUFFER
4636  032656  000400                          256.                    ;NUMBER OF WORDS
4637  032660  032666                          16$                     ;RETURN POINT FOR ERROR  HEADER
4638  032662  032672                          17$                     ;RETURN POINT FOR ERROR DATA
4639  032664  032676                          18$                     ;RETURN FOR GOOD COMPARISON
4640  032666  104007                16$:      ERROR   7
4641  032670  000207                          RTS     PC
4642  032672  104010                17$:      ERROR   10
4643  032674  000207                          RTS     PC
4644
4645                                          ;THE FOLLOWING INCREMENTS ARE TO CHANGE THE ABOVE SET UP
4646                                          ;TO WRITE ON THE NEXT SECTOR
4647
4648  032676  005237  032334        18$:      INC     @#SS3+2         ;HEADER (SECTOR)
4649  032702  005337  032340                  DEC     @#SS4+2         ;HEADER (KEY1)
4650  032706  005337  032344                  DEC     @#SS5+2         ;HEADER (KEY2)
4651  032712  005237  032372                  INC     @#SS7+2         ;DATA (SECTOR)
4652  032716  005237  032454                  INC     @#SS10+2        ;DATA
4653  032722  005237  032504                  INC     @#SS12+2        ;SECTOR (SIMULATED DISK)
```

```
4654  032726  005337  032512              DEC   @#SS13+2      ;KEY1 (SIMULATED DISK)
4655  032732  005337  032520              DEC   @#SS14+2      ;KEY2 (SIMULATED DISK)
4656  032736  005237  032560              INC   @#SS15+2      ;SECTOR (RHDST)
4657
4658  032742  005337  015144  SS2:        DEC   @#TAGDTE      ;COUNT DOWN FOR 22 SECTORS
4659  032746  001001                      BNE   1$            ;BRANCH IF 22 SECTORS NOT DONE
4660  032750  000402                      BR    TST53         ;ALL DONE - GO TO NEXT TEST
4661  032752  000137  032300  1$:         JMP   @#SS1         ;GO BACK TO NEXT SECTOR
4662
4663
4664
```

```
                                        .SBTTL  DATA TRANSFER TESTS USING ECC


                                ;*****************************************************************
                                ;*TEST 53        WRITE ECC TEST 1

                                ;*      THIS IS A WRITE ECC TEST
                                ;*      WRITE CYLINDER0, FORMAT 16 BITS PER WORD
                                ;*      TRACK 0, SECTOR 1, KEYS 0, NUMBER OF WORDS 256
                                ;*      OF ALL ZEROS.

                                ;*****************************************************************
032756  000004                  TST53:  SCOPE
032760  012706  001000                  MOV     #STACK,SP       ;RESET STACK

032764  012737  000053  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
032772  012700  053422                  MOV     #SECGAP,R0      ;POINTER
032776  012701  000402                  MOV     #258.,R1        ;COUNTER
033002  012720  177777          1$:     MOV     #-1,(R0)+       ;FILL SIMULATER DISK WITH ONES
033006  005301                          DEC     R1
033010  001374                          BNE     1$
033012  004767  012134                  JSR     PC,CLDISK       ;THIS IS USED TO SET GENERAL REGISTERS

                                        ;THESE ARE FOR ECC TEST ONLY

033016  012737  177777  015140          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
033024  005037  047660                  CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
033030  013737  047654  047656          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
033036  013737  047662  047670          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
033044  005037  047646                  CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
033050  005037  047650                  CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
033054  005037  047664                  CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
033060  005037  047666                  CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT


                                        ;THESE ARE TO BE SETUP FOR DISKLESS USE ONLY

033064  012737  010000  054724          MOV     #FMT22,@#WCYL   ;FORMAT22=16BIT WORDS AND
                                                                ;CYLINDER 0
033072  012737  000001  054726          MOV     #1,@#WSECTR     ;TRACK=0, SECTOR=1
033100  005037  054730                  CLR     @#WKEY1         ;KEY1=0
033104  005037  054732                  CLR     @#WKEY2         ;KEY2=0
033110  012737  000400  054764          MOV     #256.,@#FNWORD  ;256 DATA WORDS
033116  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
033122  054724                          WCYL
033124  054734                          GCRC

                                        ;THESE ARE REGULAR SETUPS

033126  012777  177374  161616          MOV     #-260.,@RHWC    ;256 DATA WORDS 4 HEADER WORDS
033134  012700  015212                  MOV     #WRFROM,R0      ;THESE TWO INSTRUCTIONS GETS
```

```
4719  033140  010077  161610              MOV     R0,@RH8A        ;ADDR. OF WRFROM INTO R0 AND
4720                                                              ;BUS ADDRESS REGISTER
4721  033144  012720  010000              MOV     #FMT22,(R0)+    ;FORMAT=16 BIT WORDS
4722                                                              ;CYLINDER=0
4723  033150  012720  000001        2$:   MOV     #1,(R0)+        ;TRACK=0, SECTOR=1, KEYS=0
4724  033154  005020                      CLR     (R0)+           ;KEY1=0
4725  033156  005020                      CLR     (R0)+           ;KEY2=0
4726  033160  012705  000400              MOV     #256.,R5        ;COUNTER
4727  033164  012720  000000        3$:   MOV     #0,(R0)+        ;MOVE ALL ZEROS FOR DATA
4728  033170  005305                      DEC     R5
4729  033172  001374                      BNE     3$              ;BRANCH IF DATA NOT COMPLETE
4730  033174  012777  000001  161562      MOV     #1,@RHDST       ;TRACK=0 SECTOR=1
4731
4732  033202  004737  045206              JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
4733  033206  104400  005116              TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
4734                                                              ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
4735  033212  000000                      HALT                    ;STOP THE TEST
4736
4737  033214  013711  015170              MOV     @#WRIFOR,@R1    ;GET READY FOR WRITE HEADER AND
4738                                                              ;DATA WITH 62 IN RHCS1
4739  033220  005037  015122              CLR     @#ERFLG$        ;CLEAR ERROR FLAG
4740  033224  012777  010000  161536      MOV     #FMT22,@RHOF    ;FORMAT BIT=1 (16 BIT WORDS)
4741  033232  005077  161534              CLR     @RHCA           ;CYLINDER =0
4742  033236  004737  054564              JSR     PC,@#COM%HD     ;WRITE HEADER AND DATA
4743
4744                                      ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
4745                                      ;FROM THE "COM%HD" ROUTINE THAT MEANS ALL HEADER ON DISK
4746                                      ;IS GOOD IE. ONLY DATA IS TO BE CHECKED TO SEE IF THEY ARE
4747                                      ;ALL ZEROS AND WRITE DATA GAP AND TOLERANCE GAP TO SEE IF
4748                                      ;THEY ARE ALL ZEROS
4749
4750  033242  005737  015122              TST     @#ERFLG$        ;HAS ANY ERRORS OCCURED?
4751                                                              ;IF WRITE ERROR OCCURS ECC IS NOT CHECKED
4752  033246  001056                      BNE     TST54           ;;BRANCH IF YES
4753
4754
4755                                      ;COMPARE SOFTWARE GENERATED ECC WITH THAT GENERATED BY HARDWARE
4756
4757  033250  023737  047646  054520      CMP     @#GECC1,@#WECC1;COMPARE SOFTWARE ECC WITH HARDWARE ECC
4758  033256  001402                      BEQ     6$              ;BRANCH IF GOOD
4759  033260  104031                      ERROR   31              ;LOW ORDER ECC IN ERROR
4760  033262  000405                      BR      7$              ;BRANCH TO CONTINUE
4761  033264  023737  047650  054522  6$: CMP     @#GECC2,@#WECC2;COMPARE SOFTWARE ECC WITH HARDWARE ECC
4762  033272  001401                      BEQ     7$              ;BRANCH IF GOOD
4763  033274  104031                      ERROR   31              ;HIGH ORDER ECC IN ERROR
4764
4765
4766  033276                          7$:
4767  033276  004737  045376              JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
4768  033302  104400  005116              TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
4769  033306  000000                      HALT                    ;STOP THE TEST AND RESTART PROGRAM
4770
4771
4772
```

```
4773                                        ;FILL "REINTO" BUFFER WITH EXPECTED DATA
4774
4775  033310  004037  045070                JSR     R0,@#CLAREA     ;FILL REINTO BUFFER
4776  033314  016256                        REINTO                  ;FROM
4777  033316  017254                        REINTO+<255.*2>         ;TO
4778  033320  000000                        .WORD   0               ;DATA
4779
4780  033322  013737  047646  017256        MOV     @#GECC1,@#REINTO+<256.*2>;FILL ECC1
4781  033330  013737  047650  017260        MOV     @#GECC2,@#REINTO+<257.*2>;FILL ECC2
4782  033336  004037  045070                JSR     R0,@#CLAREA     ;FILL REST
4783  033342  017262                        REINTO+<258.*2>         ;FROM
4784  033344  017316                        REINTO+<272.*2>         ;TO
4785  033346  000000                        0                       ;DATA
4786
4787
4788  033350  005037  015122                CLR     @#ERFLGS        ;CLEAR ERROR FLAG
4789
4790
4791                                        ;NOW COMPARE "DISK" BUFFER WITH "REINTO"
4792
4793  033354  004037  046046                JSR     R0,@#COMPAR     ;CHECK
4794  033360  016256                        REINTO                  ;GOOD BUFFER
4795  033362  053520                        DISK                    ;TEST BUFFER
4796  033364  000402                        258.                    ;NUMBER OF WORDS CHECKED
4797  033366  033374                        4$                      ;RETURN POINT FOR ERROR HEADER
4798  033370  033400                        5$                      ;RETURN POINT FOR ERROR DATA
4799
4800  033372  033404                        TST54                   ;RETURN FOR GOOD COMPARISON
4801
4802  033374  104007            4$:         ERROR   7               ;READ ERROR 10 NEXT
4803  033376  000207                        RTS     PC              ;RETURN TO COMPARE
4804  033400  104010            5$:         ERROR   10              ;WORD NOS 1 TO 256 ARE
4805                                                                ;DATA WORDS
4806                                                                ;WORD NOS 257 AND 258
4807                                                                ;ARE ECC WHICH ARE CHECKED
4808                                                                ;WORD NOS 259
4809                                                                ;IS DATA GAP
4810                                                                ;WORD NOS 260 TO 273
4811                                                                ;ARE TOLERANCE GAP
4812  033402  000207                        RTS     PC              ;RETURN TO COMPARE
4813
4814
4815
4816
4817
```

```
                                ;*****************************************************************
                                ;*TEST 54        READ ECC ENABLED 1A
                                ;
                                ;*       THIS IS AN ECC READ DATA TEST
                                ;*       ERROR CORRECTION IS ENABLED
                                ;*       NO ERROR IS INSERTED
                                ;*       GOOD DATA USED IS 256 WORDS OF 0
                                ;*       COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                                ;*       TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
                                ;
                                ;*****************************************************************
033404  000004                  TST54:  SCOPE
033406  012706  001000                  MOV     #STACK,SP       ;RESET STACK
033412  012737  000054  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                ;
                                ;       SETUP FOR WHAT IS TO BE READ
                                ;       HEADER CRC IS RESTORED FROM A SUBROUTINE
033420  012746  000000                  MOV     #0,-(SP)        ;DATA TO BE READ
033424  012705  000400                  MOV     #256.,R5        ;COUNTER
033430  012700  053520                  MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
033434  011620                  1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
033436  005305                          DEC     R5              ;COUNT
033440  001375                          BNE     1$              ;BRANCH IF 256 NOT COMPLETE
033442  005726                          TST     (SP)+           ;UNDO -(SP)
033444  022020                          CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
033446  012705  000017                  MOV     #15.,R5         ;1 DATA GAP
                                                                ;14 TOLERANCE GAP
033452  005020                  2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
033454  005305                          DEC     R5              ;TOLERANCE GAP
033456  001375                          BNE     2$              ;BRANCH IF NOT COMPLETE
                                
033460  004737  050442                  JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
                                                                ;IN THE CORRECT PLACE
                                
                                ;THESE ARE FOR ECC TEST ONLY
                                
033464  012737  177777  015140          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
033472  005037  047660                  CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
033476  013737  047654  047656          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
033504  013737  047662  047670          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
033512  005037  047646                  CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
033516  005037  047650                  CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
033522  005037  047664                  CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
033526  005037  047666                  CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
                                
                                ;THESE ARE TO SETUP FOR DISKLESS USE ONLY
                                
033532  012737  010000  051602          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
4872                                                    ;CYLINDER 0, FORMAT 16 BITS
4873  033540  112737  000000  051605        MOVB    #0,@#SECOTR+1   ;TRACK 0
4874  033546  112737  000000  051604        MOVB    #0,@#SECOTR     ;SECTOR 0
4875  033554  012737  000000  051606        MOV     #0,@#KEY1       ;KEY1=0
4876  033562  012737  000000  051610        MOV     #0,@#KEY2       ;KEY2=0
4877  033570  012737  000400  051662        MOV     #256.,  @#DAWORD ;NO. OF DATA WORDS
4878  033576  005037  051612                CLR     @#X             ;THIS IS A READ COMMAND
4879  033602  004537  046360                JSR     R5,@#CRC        ;GO TO CALCULATE CRC
4880  033606  051602                        CYL
4881  033610  053502                        WCRC
4882
4883
4884
4885
4886                                                    ;THESE ARE REGULAR SETUPS
4887
4888  033612  004737  045152                JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
4889  033616  012777  177374  161126        MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
4890  033624  012777  016256  161122        MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
4891  033632  112746  000000                MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
4892  033636  112766  000000  000001        MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
4893  033644  012677  161114                MOV     (SP)+,  @RHDST  ;TRACK/SECTOR IN RHDST
4894  033650  012777  010000  161112        MOV     #FMT22,@RHOF    ;16 BITS PER WORD
4895                                                    ;ECC CORRECTION NOT INHIBIT
4896                                                    ;BECAUSE ECC IS NOT GOING
4897                                                    ;TO BE CHECKED
4898  033656  005077  161110                CLR     @RHCA           ;CYLINDER 0
4899
4900  033662  004737  045206                JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
4901  033666  104400  005116                TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
4902                                                    ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
4903  033672  000000                        HALT                    ;STOP THE TEST
4904
4905  033674  013711  015174                MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
4906  033700  005037  015122                CLR     @#ERFLG$        ;CLEAR ERROR FLAG
4907  033704  004737  051456                JSR     PC,@#COMHD      ;READ HEADER AND DATA
4908                                                    ;IF THERE ARE READ ERRORS THEN
4909                                                    ;ECC WILL NOT BE CHECKED
4910
4911
4912                                        ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
4913                                        ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
4914                                        ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
4915                                        ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
4916                                        ;DETECTED
4917                                        ;HEADER AND DATA ARE TO BE CHECKED.
4918                                        ;IN CHECKING READ DATA THE WRITE FROM BUFFER
4919                                        ;"WRFROM" IS FILLED WITH EXPECTED DATA AND
4920                                        ;COMPARISONS ARE MADE
4921
4922  033710  005737  015122                TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
4923  033714  001102                        BNE     TST55           ;BRANCH IF YES
4924  033716  004737  044652                JSR     PC,@#PUTREG     ;SAVE REGISTERS
4925  033722  005737  015032                TST     @#ER1           ;NO ERRORS SHOULD BE SET
```

```
4926  033726  001401                        BEQ     6$              ;BRANCH IF NO ERRORS SET
4927  033730  104032                        ERROR   32              ;32 BIT ECC REGISTER SHOULD BE ZERO
4928                                                                ;ONLY 11 OF THE 32 BITS CAN BE SEEN
4929                                                                ;IN THE PATERN REGISTER
4930                                                                ;DCK SHOULD BE SET IN RHER1
4931  033732  013746  047646          6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
4932  033736  042716  174000                  BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
4933  033742  022637  015062                  CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
4934  033746  001401                        BEQ     7$              ;BRANCH IF GOOD
4935  033750  104032                        ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT
4936
4937
4938
4939
4940                                        ;ADD 16 MAINTENANCE CLOCKS TO
4941                                        ;BRING EBL DOWN
4942
4943  033752  012700  000020          7$:     MOV     #16.,R0         ;COUNTER
4944  033756  052777  000002  161014  8$:     BIS     #MCLK,@RHMR     ;SET CLOCK
4945  033764  042777  000002  161006          BIC     #MCLK,@RHMR     ;CLEAR CLOCK
4946  033772  005300                        DEC     R0              ;COUNT
4947  033774  001370                        BNE     8$              ;BRANCH IF 16 CLOCKS NOT DONE
4948  033776  004737  045376                JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
4949  034002  104400  005116                TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
4950  034006  000000                        HALT                    ;STOP THE TEST AND RESTART PROGRAM
4951  034010  012700  015212                MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
4952  034014  012720  010000                MOV     #0!FMT22,(R0)+  ;CYLINDER 0
4953  034020  112746  000000                MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
4954  034024  112766  000000  000001        MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
4955  034032  012620                        MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
4956  034034  012720  000000                MOV     #0,(R0)+        ;KEY1 IN BUFFER
4957  034040  012720  000000                MOV     #0,(R0)+        ;KEY2 IN BUFFER
4958  034044  012701  000400                MOV     #256.,R1        ;DATA WORD COUNTER
4959  034050  012702  000000                MOV     #0,R2           ;DATA
4960  034054  010220                  3$:   MOV     R2,(R0)+        ;DATA INTO BUFFER
4961  034056  005301                        DEC     R1              ;COUNT
4962  034060  001375                        BNE     3$              ;BRANCH IF 256 NOT DONE
4963
4964
4965  034062  005037  015122                CLR     @#ERFLG$        ;CLEAR ERROR FLAG
4966  034066  004737  044652                JSR     PC,@#PUTREG     ;SAVE REGISTERS
4967
4968
4969
4970                                        ;NOW READ DATA BUFFER WILL BE CHECKED
4971
4972  034072  004037  046046                JSR     R0,@#COMPAR     ;CHECK
4973  034076  015212                        WRFROM                  ;GOOD BUFFER
4974  034100  016256                        REINTO                  ;TEST BUFFER
4975  034102  000404                        4+256.                  ;NUMBER OF WORDS CHECKED
4976  034104  034112                        4$                      ;RETURN POINT FOR ERROR HEADER
4977  034106  034116                        5$                      ;RETURN POINT FOR ERROR DATA
4978
4979  034110  034122                        TST55                   ;RETURN FOR GOOD COMPARISON
```

```
4980
4981  034112  104004                  4$:     ERROR   4               ;READ NEXT ERROR
4982  034114  000207                          RTS     PC              ;RETURN TO "COMPAR"
4983  034116  104005                  5$:     ERROR   5               ;WORD NOS 1 TO 4 ARE
4984                                                                  ;HEADER WORDS
4985                                                                  ;5 TO 260 ARE DATA WORDS
4986  034120  000207                          RTS     PC              ;RETURN TO "COMPAR"
4987
4988
4989
4990
```

```
                                ;*********************************************************************
                                ;*TEST 55        READ ECC ENABLED 1B
                                ;
                                ;*       THIS IS AN ECC READ DATA TEST
                                ;*       ERROR CORRECTION IS ENABLED
                                ;*       A CORRECTABLE ERROR IS INSERTED IN BIT POSITION 32
                                ;*       GOOD DATA USED IS 256 WORDS OF 0
                                ;*       COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                                ;*       TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
                                ;
                                ;*********************************************************************
034122  000004                TST55:  SCOPE
034124  012706  001000                MOV     #STACK,SP       ;RESET STACK
                                ;
034130  012737  000055  017322        MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                ;
                                ;
                                ;SETUP FOR WHAT IS TO BE READ
                                ;HEADER CRC IS RESTORED FROM A SUBROUTINE
                                ;
034136  012746  000000                MOV     #0,-(SP)        ;DATA TO BE READ
034142  012705  000400                MOV     #256.,R5        ;COUNTER
034146  012700  053520                MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
034152  011620                1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
034154  005305                        DEC     R5              ;COUNT
034156  001375                        BNE     1$              ;BRANCH IF 256 NOT COMPLETE
034160  005726                        TST     (SP)+           ;UNDO -(SP)
034162  022020                        CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
034164  012705  000017                MOV     #15.,   R5      ;1 DATA GAP
                                                              ;14 TOLERANCE GAP
034170  005020                2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
034172  005305                        DEC     R5              ;TOLERANCE GAP
034174  001375                        BNE     2$              ;BRANCH IF NOT COMPLETE
                                ;
                                ;
034176  004737  050442                JSR     PC,@#FILLEC     ;INSERT ECC IN PROPER PLACE ON DISK
                                ;
                                ;
                                ;THESE ARE FOR ECC TEST ONLY
                                ;
034202  012737  177777  015140        MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
034210  005037  047660                CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
034214  013737  047654  047656        MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
034222  013737  047662  047670        MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
034230  005037  047646                CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
034234  005037  047650                CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
034240  005037  047664                CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
034244  005037  047666                CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
                                ;
                                ;
                                ;THESE ARE TO SETUP FOR DISKLESS USE ONLY
                                ;
```

```
5045  034250  012737  010000  051602          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
5046                                                                    ;CYLINDER 0, FORMAT 16 BITS
5047  034256  112737  000000  051605          MOVB    #0,@#SECOTR+1   ;TRACK 0
5048  034264  112737  000000  051604          MOVB    #0,@#SECOTR     ;SECTOR 0
5049  034272  012737  000000  051606          MOV     #0,@#KEY1       ;KEY1=0
5050  034300  012737  000000  051610          MOV     #0,@#KEY2       ;KEY2=0
5051  034306  012737  000400  051662          MOV     #256.,  @#DAWORD ;NO. OF DATA WORDS
5052  034314  005037  051612                  CLR     @#X             ;THIS IS A READ COMMAND
5053  034320  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
5054  034324  051602                          CYL
5055  034326  053502                          WCRC
5056
5057
5058                                          ;THIS IS TO INSERT ERROR
5059                                          ;THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
5060                                          ;THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
5061                                          ;THIS MOVE
5062
5063  034330  012737  100000  053522          MOV     #100000,@#DISK+2 ;FORCE ERROR ON BIT NUMBER 32
5064                                                                    ;SO ERROR POSITION REGISTER WILL SHOW
5065                                                                    ;22
5066  034336  012737  000026  034512          MOV     #22.,@#8$       ;INSERT POSITION REG.
5067
5068
5069                                          ;THESE ARE REGULAR SETUPS
5070
5071  034344  004737  045152                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
5072  034350  012777  177374  160374          MOV     #-256.-4.,@RH#WC ;256. DATA 4 HEADER WORDS
5073  034356  012777  016256  160370          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
5074  034364  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
5075  034370  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
5076  034376  012677  160362                  MOV     (SP)+,  @RHDST  ;TRACK/SECTOR IN RHDST
5077  034402  012777  010000  160360          MOV     #FMT22,@RHOF    ;16 BITS PER WORD
5078                                                                    ;ECC CORRECTION NOT INHIBIT
5079                                                                    ;BECAUSE ECC IS NOT GOING
5080                                                                    ;TO BE CHECKED
5081  034410  005077  160356                  CLR     @RHCA           ;CYLINDER 0
5082
5083  034414  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
5084  034420  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
5085                                                                    ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
5086  034424  000000                          HALT                    ;STOP THE TEST
5087
5088  034426  013711  015174                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
5089  034432  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
5090  034436  004737  051456                  JSR     PC,@#COMHD      ;READ HEADER AND DATA
5091                                                                    ;IF THERE ARE READ ERRORS THEN
5092                                                                    ;ECC WILL NOT BE CHECKED
5093
5094
5095                                          ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
5096                                          ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
5097                                          ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
5098                                          ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
```

```
                                        ;DETECTED
                                        ;HEADER AND DATA ARE TO BE CHECKED.
                                        ;IN CHECKING READ DATA THE WRITE FROM BUFFER
                                        ;"WRFROM" IS FILLED WITH EXPECTED DATA AND
                                        ;COMPARISONS ARE MADE

034442  005737  015122                  TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
034446  001077                          BNE     TST56           ;BRANCH IF YES
034450  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
034454  022737  100000  015032          CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
034462  001401                          BEQ     6$              ;BRANCH IF YES
034464  104032                          ERROR   32              ;32 BIT ECC REGISTER SHOULD BE NON
                                                                ;ZERO
                                                                ;ONLY 11 OF THE 32 BITS CAN BE SEEN
                                                                ;IN THE PATERN REGISTER
                                                                ;DCK SHOULD BE SET IN RHER1
034466  013746  047646          6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
034472  042716  174000                  BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
034476  022637  015062                  CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
034502  001401                          BEQ     7$              ;BRANCH IF GOOD
034504  104032                          ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT

034506  004037  050270          7$:     JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
034512  000026                  8$:     22.                     ;EXPECTED POSITION REG. WHEN CORRECTION
                                                                ;IS COMPLETE


034514  004737  045376                  JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
034520  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
034524  000000                          HALT                    ;STOP THE TEST AND RESTART PROGRAM
034526  012700  015212                  MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
034532  012720  010000                  MOV     #0!FMT22,(R0)+  ;CYLINDER 0
034536  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
034542  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
034550  012620                          MOV     (SP)+,  (R0)+   ;GET TRACK/SECTOR IN BUFFER
034552  012720  000000                  MOV     #0,(R0)+        ;KEY1 IN BUFFER
034556  012720  000000                  MOV     #0,(R0)+        ;KEY2 IN BUFFER
034562  012701  000400                  MOV     #256.,  R1      ;DATA WORD COUNTER
034566  012702  000000                  MOV     #0,R2           ;DATA
034572  010220          3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
034574  005301                  DEC     R1              ;COUNT
034576  001375                  BNE     3$              ;BRANCH IF 256 NOT DONE

                                        ;ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
                                        ;NOW THE INSERTED ERROR WILL BE PUT IN
034600  012737  100000  015224          MOV     #100000,@#WRFROM+<5*2>  ;INSERTED ERROR


034606  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
034612  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
```

```
                                                ;NOW READ DATA BUFFER WILL BE CHECKED
                                                
034616  034037  046046                          JSR     R0,@#COMPAR     ;CHECK
034622  015212                                  WRFROM                  ;GOOD BUFFER
034624  016256                                  REINTO                  ;TEST BUFFER
034626  000404                                  4+256.                  ;NUMBER OF WORDS CHECKED
034630  034636                                  4$                      ;RETURN POINT FOR ERROR HEADER
034632  034642                                  5$                      ;RETURN POINT FOR ERROR DATA
                                                
034634  034646                                  TST56                   ;RETURN FOR GOOD COMPARISON
                                                
034636  104004                          4$:     ERROR   4               ;READ NEXT ERROR
034640  000207                                  RTS     PC              ;RETURN TO "COMPAR"
034642  104005                          5$:     ERROR   5               ;WORD NOS 1 TO 4 ARE
                                                                        ;HEADER WORDS
                                                                        ;5 TO 260 ARE DATA WORDS
034644  000207                                  RTS     PC              ;RETURN TO "COMPAR"
                                                
```

```
                                ;*****************************************************************
                                ;*TEST 56        READ ECC ENABLED 1C
                                ;
                                ;*      THIS IS AN ECC READ DATA TEST
                                ;*      ERROR CORRECTION IS ENABLED
                                ;*      A NON CORRECTABLE ERROR IS INSERTED IN BIT POSITION 21 THRU 32
                                ;*      GOOD DATA USED IS 256 WORDS OF 0
                                ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                                ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
                                ;
                                ;*****************************************************************
034646  000004                 TST56:  SCOPE
034650  012706  001000                 MOV     #STACK,SP       ;RESET STACK
                                ;
034654  012737  000056  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                ;
                                ;
                                ;       SETUP FOR WHAT IS TO BE READ
                                ;       HEADER CRC IS RESTORED FROM A SUBROUTINE
                                ;
034662  012746  000000                  MOV     #0,-(SP)        ;DATA TO BE READ
034666  012705  000400                  MOV     #256.,R5        ;COUNTER
034672  012700  053520                  MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
034676  011620                 1$:      MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
034700  005305                          DEC     R5              ;COUNT
034702  001375                          BNE     1$              ;BRANCH IF 256 NOT COMPLETE
034704  005726                          TST     (SP)+           ;UNDO -(SP)
034706  022020                          CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
034710  012705  000017                  MOV     #15.,R5         ;1 DATA GAP
                                                                ;14 TOLERANCE GAP
034714  005020                 2$:      CLR     (R0)+           ;CLEAR DATA GAP, AND
034716  005305                          DEC     R5              ;TOLERANCE GAP
034720  001375                          BNE     2$              ;BRANCH IF NOT COMPLETE
                                ;
                                ;
034722  004737  050442                  JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
                                                                ;IN THE CORRECT PLACE
                                ;
                                ;THESE ARE FOR ECC TEST ONLY
                                ;
034726  012737  177777  015140          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
034734  005037  047660                  CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
034740  013737  047654  047656          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
034746  013737  047662  047670          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
034754  005037  047646                  CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
034760  005037  047650                  CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
034764  005037  047664                  CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
034770  005037  047666                  CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
                                ;
                                ;
                                ;THESE ARE TO SETUP FOR DISKLESS USE ONLY
                                ;
034774  012737  010000  051602          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
                                                        ;CYLINDER 0, FORMAT 16 BITS
035002  112737  000000  051605        MOVB    #0,@#SECOTR+1   ;TRACK 0
035010  112737  000000  051604        MOVB    #0,@#SECOTR     ;SECTOR 0
035016  012737  000000  051606        MOV     #0,@#KEY1       ;KEY1=0
035024  012737  000000  051610        MOV     #0,@#KEY2       ;KEY2=0
035032  012737  000400  051662        MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
035040  005037  051612                CLR     @#X             ;THIS IS A READ COMMAND
035044  004537  046360                JSR     R5,@#CRC        ;GO TO CALCULATE CRC
035050  051602                        CYL
035052  053502                        WCRC


                                        ;THIS IS TO INSERT ERROR
                                        ;THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
                                        ;THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
                                        ;THIS MOVE
035054  012737  177760  053522        MOV     #177760,@#DISK+2  ;FORCE ERROR ON BIT NUMBER 21 THRU 32
                                                                ;SO ERROR POSITION REGISTER WILL SHOW
                                                                ;22
035062  012737  010040  035236        MOV     #4128.,@#BS     ;INSERT POSITION REG.


                                        ;THESE ARE REGULAR SETUPS

035070  004737  045152                JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
035074  012777  177374  157650        MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
035102  012777  016256  157644        MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
035110  112746  000000                MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
035114  112766  000000  000001        MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
035122  012677  157636                MOV     (SP)+,  @RHDST  ;TRACK/SECTOR IN RHDST
035126  012777  010000  157634        MOV     #FMT22,@RHOF    ;16 BITS PER WORD
                                                                ;ECC CORRECTION NOT INHIBIT
                                                                ;BECAUSE ECC IS NOT GOING
                                                                ;TO BE CHECKED
035134  005077  157632                CLR     @RHCA           ;CYLINDER 0
035140  004737  045206                JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
035144  104400  005116                TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
035150  000000                        HALT                    ;STOP THE TEST
035152  013711  015174                MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
035156  005037  015122                CLR     @#ERFLG$        ;CLEAR ERROR FLAG
035162  004737  051456                JSR     PC,     @#COMHD ;READ HEADER AND DATA
                                                                ;IF THERE ARE READ ERRORS THEN
                                                                ;ECC WILL NOT BE CHECKED
```

```
5270
5271                                        ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
5272                                        ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
5273                                        ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
5274                                        ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
5275                                        ;DETECTED
5276                                        ;HEADER AND DATA ARE TO BE CHECKED.
5277                                        ;IN CHECKING READ DATA THE WRITE FROM BUFFER
5278                                        ;"WRFROM" IS FILLED WITH EXPECTED DATA AND
5279                                        ;COMPARISONS ARE MADE
5280
5281  035166  005737  015122              TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
5282  035172  001106                      BNE     TST57           ;BRANCH IF YES
5283  035174  004737  044652              JSR     PC,@#PUTREG     ;SAVE REGISTERS
5284  035200  022737  100000  015032      CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
5285  035206  001401                      BEQ     6$              ;BRANCH IF YES
5286  035210  104032                      ERROR   32              ;32 BIT ECC REGISTER SHOULD BE NON
5287                                                              ;ZERO
5288                                                              ;ONLY 11 OF THE 32 BITS CAN BE SEEN
5289                                                              ;IN THE PATERN REGISTER
5290                                                              ;DCK SHOULD BE SET IN RHER1
5291  035212  013746  047646        6$:   MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
5292  035216  042716  174000              BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
5293  035222  022637  015062              CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
5294  035226  001401                      BEQ     7$              ;BRANCH IF GOOD
5295  035230  104032                      ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT
5296
5297  035232  004037  050270        7$:   JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
5298  035236  000000        8$:   .WORD                           ;EXPECTED POSITION REG. WHEN CORRECTION
5299                                                              ;IS COMPLETE
5300
5301
5302
5303  035240  004737  044652              JSR     PC,@#PUTREG     ;SAVE REGISTERS
5304  035244  022737  100100  015032      CMP     #DCK!ECH,@#ER1  ;WITH ERRORS INSERTED IN BIT POSITION 21
5305                                                              ;THRU 32 HARD ERROR BIT SHOULD SET
5306  035252  001401                      BEQ     9$              ;BRANCH IF GOOD
5307  035254  104036                      ERROR   36              ;WITH ERROR INSERTED IN BIT POSITION 21 THRU
5308                                                              ;32 ECH SHOULD SET
5309
5310
5311
5312  035256                        9$:
5313  035256  004737  045376              JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
5314  035262  104400  005116              TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
5315  035266  000000                      HALT                    ;STOP THE TEST AND RESTART PROGRAM
5316  035270  012700  015212              MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
5317  035274  012720  010000              MOV     #0!FMT22,(R0)+  ;CYLINDER 0
5318  035300  112746  000000              MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
5319  035304  112766  000000  000001      MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
5320  035312  012620                      MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
5321  035314  012720  000000              MOV     #0,(R0)+        ;KEY1 IN BUFFER
5322  035320  012720  000000              MOV     #0,(R0)+        ;KEY2 IN BUFFER
5323  035324  012701  000400              MOV     #256.,R1        ;DATA WORD COUNTER
```

```
 5324  035330  012702  000000            MOV     #0,R2           ;DATA
 5325  035334  010220              3$:   MOV     R2,(R0)+        ;DATA INTO BUFFER
 5326  035336  005301                    DEC     R1              ;COUNT
 5327  035340  001375                    BNE     3$              ;BRANCH IF 256 NOT DONE
 5328
```

```
                                        ;ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
                                        ;NOW THE INSERTED ERROR WILL BE PUT IN

035342  012737  177760  015224        MOV     #177760,@#WRFROM+(5*2)  ;INSERTED ERROR


035350  005037  015122                CLR     @#ERFLG$                ;CLEAR ERROR FLAG
035354  004737  044652                JSR     PC,@#PUTREG     ;SAVE REGISTERS


                                        ;NOW READ DATA BUFFER WILL BE CHECKED

035360  004037  046046                JSR     R0,@#COMPAR     ;CHECK
035364  015212                       WRFROM                  ;GOOD BUFFER
035366  016256                       REINTO                  ;TEST BUFFER
035370  000404                       4+256.                  ;NUMBER OF WORDS CHECKED
035372  035400                       4$                      ;RETURN POINT FOR ERROR HEADER
035374  035404                       5$                      ;RETURN POINT FOR ERROR DATA

035376  035410                       TST57                   ;RETURN FOR GOOD COMPARISON

035400  104004          4$:         ERROR   4               ;READ NEXT ERROR
035402  000207                      RTS     PC              ;RETURN TO "COMPAR"
035404  104005          5$:         ERROR   5               ;WORD NOS 1 TO 4 ARE
                                                            ;HEADER WORDS
                                                            ;5 TO 260 ARE DATA WORDS
035406  000207                      RTS     PC              ;RETURN TO "COMPAR"
```

```
5363
5364                                    ;*****************************************************************
5365                                    ;*TEST 57        WRITE ECC TEST 2
5366
5367                                    ;*      THIS IS A WRITE ECC TEST
5368                                    ;*      WRITE CYLINDER 0, FORMAT 16 BITS PER WORD
5369                                    ;*      TRACK 0, SECTOR 1, KEYS 0, NUMBER OF WORDS 256
5370                                    ;*      OF ALL ONES.
5371
5372                                    ;*****************************************************************
5373  035410  000004                    TST57:  SCOPE
5374  035412  012706  001000                    MOV     #STACK,SP       ;RESET STACK
5375
5376  035416  012737  000057  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
5377  035424  012700  053422                    MOV     #SECGAP,R0      ;POINTER
5378  035430  012701  000460                    MOV     #304.,R1        ;COUNTER
5379  035434  005020                    1$:     CLR     (R0)+           ;CLEAR SIMULATED DISK AREA
5380  035436  005301                            DEC     R1
5381  035440  001375                            BNE     1$
5382  035442  004767  007504                    JSR     PC,CLDISK       ;THIS IS USED TO SET GENERAL REGISTERS
5383
5384                                            ;THESE ARE FOR ECC TEST ONLY
5385
5386  035446  012737  177777  015140            MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
5387  035454  005037  047660                    CLR     @#POSITI        ;CLEAR ERPOR POSITION COUNTER
5388  035460  013737  047654  047656            MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
5389  035466  013737  047662  047670            MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
5390  035474  005037  047646                    CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
5391  035500  005037  047650                    CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
5392  035504  005037  047664                    CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
5393  035510  005037  047666                    CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
5394
5395
5396
5397
5398                                            ;THESE ARE TO BE SETUP FOR DISKLESS USE ONLY
5399
5400  035514  012737  010000  054724            MOV     #FMT22,@#WCYL   ;FORMAT22=16BIT WORDS AND
5401                                                                    ;CYLINDER 0
5402  035522  012737  000001  054726            MOV     #1,@#WSECTR     ;TRACK=0, SECTOR=1
5403  035530  005037  054730                    CLR     @#WKEY1         ;KEY1=0
5404  035534  005037  054732                    CLR     @#WKEY2         ;KEY2=0
5405  035540  012737  000400  054764            MOV     #256.,@#FNWORD  ;256 DATA WORDS
5406  035546  004537  046360                    JSR     R5,@#CRC        ;GO TO CALCULATE CRC
5407  035552  054724                            WCYL
5408  035554  054734                            GCRC
5409
5410                                            ;THESE ARE REGULAR SETUPS
5411
5412  035556  012777  177374  157166            MOV     #-260.,@RHWC    ;256 DATA WORDS 4 HEADER WORDS
5413  035564  012700  015212                    MOV     #WRFROM,R0      ;THESE TWO INSTRUCTIONS GETS
5414  035570  010077  157160                    MOV     R0,@RHBA        ;ADDR. OF WRFROM INTO R0 AND
5415                                                                    ;BUS ADDRESS REGISTER
5416  035574  012720  010000                    MOV     #FMT22,(R0)+    ;FORMAT=16 BIT WORDS
```

```
5417
5418  035600  012720  000001          2$:   MOV   #1,(R0)+     ;CYLINDER=0
5419  035604  005020                        CLR   (R0)+         ;TRACK=0, SECTOR=1, KEYS=0
5420  035606  005020                        CLR   (R0)+         ;KEY1=0
5421  035610  012705  000400                MOV   #256.,R5      ;KEY2=0
5422  035614  012720  177777          3$:   MOV   #-1,(R0)+     ;COUNTER
5423  035620  005305                        DEC   R5            ;MOVE ALL ONES FOR DATA
5424  035622  001374                        BNE   3$            ;BRANCH IF DATA NOT COMPLETE
5425  035624  012777  000001  157132        MOV   #1,@RHDST     ;TRACK=0 SECTOR=1
5426
5427  035632  004737  045206                JSR   PC,@#CHECKT   ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
5428  035636  104400  005116                TYPE  ,CPHALT       ;CANNOT CONTINUE TESTING IF ANY OF THE
5429                                                            ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
5430  035642  000000                        HALT                ;STOP THE TEST
5431
5432  035644  013711  015170                MOV   @#WRIFOR,@R1  ;GET READY FOR WRITE HEADER AND
5433                                                            ;DATA WITH 62 IN RHCS1
5434  035650  005037  015122                CLR   @#ERFLG$      ;CLEAR ERROR FLAG
5435  035654  012777  010000  157106        MOV   #FMT22,@RHOF  ;FORMAT BIT=1 (16 BIT WORDS)
5436  035662  005077  157104                CLR   @RHCA         ;CYLINDER =0
5437  035666  004737  054564                JSR   PC,@#COM%HD   ;WRITE HEADER AND DATA
5438
5439                                        ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
5440                                        ;FROM THE "COM%HD" ROUTINE THAT MEANS ALL HEADER ON DISK
5441                                        ;IS GOOD IE. ONLY DATA IS TO BE CHECKED TO SEE IF THEY ARE
5442                                        ;ALL ONES AND WRITE DATA GAP AND TOLERANCE GAP TO SEE IF
5443                                        ;THEY ARE ALL ZEROS
5444
5445  035672  005737  015122                TST   @#ERFLG$      ;HAS ANY ERRORS OCCURED?
5446                                                            ;IF WRITE ERROR OCCURS ECC IS NOT CHECKED
5447  035676  001056                        BNE   TST60         ;;BRANCH IF YES
5448
5449
5450                                        ;COMPARE SOFTWARE GENERATED ECC WITH THAT GENERATED BY HARDWARE
5451
5452  035700  023737  047646  054520        CMP   @#GECC1,@#WECC1;COMPARE SOFTWARE ECC WITH HARDWARE ECC
5453  035706  001402                        BEQ   6$            ;BRANCH IF GOOD
5454  035710  104031                        ERROR 31            ;LOW ORDER ECC IN ERROR
5455  035712  000405                        BR    7$            ;BRANCH TO CONTINUE
5456  035714  023737  047650  054522  6$:   CMP   @#GECC2,@#WECC2;COMPARE SOFTWARE ECC WITH HARDWARE ECC
5457  035722  001401                        BEQ   7$            ;BRANCH IF GOOD
5458  035724  104031                        ERROR 31            ;HIGH ORDER ECC IN ERROR
5459
5460
5461  035726                          7$:
5462  035726  004737  045376                JSR   PC,@#CHECKE   ;CHECK THAT DVA,RDY,DPR,DRY = 1
5463  035732  104400  005116                TYPE  ,CPHALT       ;CANNOT CONTINUE IF THEY DON'T
5464  035736  000000                        HALT                ;STOP THE TEST AND RESTART PROGRAM
5465
5466
5467
5468
5469                                        ;FILL "REINTO" BUFFER WITH EXPECTED DATA
5470
```

```
5471  035740  004037  045070                  JSR     R0,@#CLAREA     ;FILL REINTO BUFFER
5472  035744  016256                          REINTO                  ;FROM
5473  035746  017254                          REINTO+<255.*2>         ;TO
5474  035750  177777                  .WORD   -1                      ;DATA
5475
5476  035752  013737  047646  017256  MOV     @#GECC1,@#REINTO+<256.*2>;FILL ECC1
5477  035760  013737  047650  017260  MOV     @#GECC2,@#REINTO+<257.*2>;FILL ECC2
5478  035766  004037  045070          JSR     R0,@#CLAREA     ;FILL REST
5479  035772  017262                  REINTO+<258.*2>         ;FROM
5480  035774  017316                  REINTO+<272.*2>         ;TO
5481  035776  000000                  0                       ;DATA
5482
5483
5484  036000  005037  015122          CLR     @#ERFLG$        ;CLEAR ERROR FLAG
5485
5486
5487                                  ;NOW COMPARE "DISK" BUFFER WITH "REINTO"
5488
5489  036004  004037  046046          JSR     R0,@#COMPAR     ;CHECK
5490  036010  016256                  REINTO                  ;GOOD BUFFER
5491  036012  053520                  DISK                    ;TEST BUFFER
5492  036014  000402                  258.                    ;NUMBER OF WORDS CHECKED
5493  036016  036024                  4$                      ;RETURN POINT FOR ERROR HEADER
5494  036020  036030                  5$                      ;RETURN POINT FOR ERROR DATA
5495
5496  036022  036034                  TST60                   ;RETURN FOR GOOD COMPARISON
5497
5498  036024  104007          4$:     ERROR   7               ;READ ERROR 10 NEXT
5499  036026  000207                  RTS     PC              ;RETURN TO COMPARE
5500  036030  104010          5$:     ERROR   10              ;WORD NOS 1 TO 256 ARE
5501                                                          ;DATA WORDS
5502                                                          ;WORD NOS 257 AND 258
5503                                                          ;ARE ECC WHICH ARE CHECKED
5504                                                          ;WORD NOS 259
5505                                                          ;IS DATA GAP
5506                                                          ;WORD NOS 260 TO 273
5507                                                          ;ARE TOLERANCE GAP
5508  036032  000207                  RTS     PC              ;RETURN TO COMPARE
5509
5510
5511
5512
5513
```

```
5514
5515                                    ;*****************************************************************
5516                                    ;*TEST 60        READ ECC ENABLED 2A
5517
5518                                    ;*      THIS IS AN ECC READ DATA TEST
5519                                    ;*      ERROR CORRECTION IS ENABLED
5520                                    ;*      NO ERROR IS INSERTED
5521                                    ;*      GOOD DATA USED IS 256 WORDS OF 177777
5522                                    ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
5523                                    ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
5524
5525                                    ;*****************************************************************
5526  036034  000004                    TST60:  SCOPE
5527  036036  012706  001000                    MOV     #STACK,SP       ;RESET STACK
5528
5529  036042  012737  000060  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
5530
5531
5532                                    ;       SETUP FOR WHAT IS TO BE READ
5533                                    ;       HEADER CRC IS RESTORED FROM A SUBROUTINE
5534
5535  036050  012746  177777                    MOV     #-1,-(SP)       ;DATA TO BE READ
5536  036054  012705  000400                    MOV     #256.,R5        ;COUNTER
5537  036060  012700  053520                    MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
5538  036064  011620                    1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
5539  036066  005305                            DEC     R5              ;COUNT
5540  036070  001375                            BNE     1$              ;BRANCH IF 256 NOT COMPLETE
5541  036072  005726                            TST     (SP)+           ;UNDO -(SP)
5542  036074  022020                            CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
5543  036076  012705  000017                    MOV     #15.,R5         ;1 DATA GAP
5544                                                                    ;14 TOLERANCE GAP
5545  036102  005020                    2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
5546  036104  005305                            DEC     R5              ;TOLERANCE GAP
5547  036106  001375                            BNE     2$              ;BRANCH IF NOT COMPLETE
5548
5549
5550  036110  004737  050442                    JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
5551                                                                    ;IN THE CORRECT PLACE
5552
5553                                    ;THESE ARE FOR ECC TEST ONLY
5554
5555  036114  012737  177777  015140            MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
5556  036122  005037  047660                    CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
5557  036126  013737  047654  047656            MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
5558  036134  013737  047662  047670            MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
5559  036142  005037  047646                    CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
5560  036146  005037  047650                    CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
5561  036152  005037  047664                    CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
5562  036156  005037  047666                    CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
5563
5564
5565                                    ;THESE ARE TO SETUP FOR DISKLESS USE ONLY
5566
5567  036162  012737  010000  051602            MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
                                                                ;CYLINDER 0, FORMAT 16 BITS
036170  112737  000000  051605          MOVB    #0,@#SECOTR+1   ;TRACK 0
036176  112737  000000  051604          MOVB    #0,@#SECOTR     ;SECTOR 0
036204  012737  000000  051606          MOV     #0,@#KEY1       ;KEY1=0
036212  012737  000000  051610          MOV     #0,@#KEY2       ;KEY2=0
036220  012737  000400  051662          MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
036226  005037  051612                  CLR     @#X             ;THIS IS A READ COMMAND
036232  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
036236  051602                          CYL
036240  053502                          WCRC


                                        ;THESE ARE REGULAR SETUPS

036242  004737  045152                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
036246  012777  177374  156476          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
036254  012777  016256  156472          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
036262  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
036266  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
036274  012677  156464                  MOV     (SP)+,@RHDST    ;TRACK/SECTOR IN RHDST
036300  012777  010000  156462          MOV     #FMT22,@RHOF    ;16 BITS PER WORD
                                                                ;ECC CORRECTION NOT INHIBIT
                                                                ;BECAUSE ECC IS NOT GOING
                                                                ;TO BE CHECKED
036306  005077  156460                  CLR     @RHCA           ;CYLINDER 0

036312  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
036316  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
036322  000000                          HALT                    ;STOP THE TEST

036324  013711  015174                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
036330  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
036334  004737  051456                  JSR     PC,@#COMHD      ;READ HEADER AND DATA
                                                                ;IF THERE ARE READ ERRORS THEN
                                                                ;ECC WILL NOT BE CHECKED


                                        ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
                                        ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
                                        ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
                                        ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
                                        ;DETECTED
                                        ;HEADER AND DATA ARE TO BE CHECKED.
                                        ;IN CHECKING READ DATA THE WRITE FROM BUFFER
                                        ;"WRFROM" IS FILLED WITH EXPECTED DATA AND
                                        ;COMPARISONS ARE MADE

036340  005737  015122                  TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
036344  001102                          BNE     TST61           ;BRANCH IF YES
036346  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
036352  005737  015032                  TST     @#ER1           ;NO ERRORS SHOULD BE SET
```

```
5622  036356  001401                          BEQ     6$              ;BRANCH IF NO ERRORS SET
5623  036360  104032                          ERROR   32              ;32 BIT ECC REGISTER SHOULD BE ZERO
5624                                                                  ;ONLY 11 OF THE 32 BITS CAN BE SEEN
5625                                                                  ;IN THE PATERN REGISTER
5626                                                                  ;DCK SHOULD BE SET IN RHER1
5627  036362  013746  047640          6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
5628  036366  042716  174000                  BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
5629  036372  022637  015062                  CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
5630  036376  001401                          BEQ     7$              ;BRANCH IF GOOD
5631  036400  104032                          ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT
5632
5633
5634
5635
5636                                          ;ADD 16 MAINTENANCE CLOCKS TO
5637                                          ;BRING EBL DOWN
5638
5639  036402  012700  000020          7$:     MOV     #16.,R0         ;COUNTER
5640  036406  052777  000002  156364  8$:     BIS     #MCLK,@RHMR     ;SET CLOCK
5641  036414  042777  000002  156356          BIC     #MCLK,@RHMR     ;CLEAR CLOCK
5642  036422  005300                          DEC     R0              ;COUNT
5643  036424  001370                          BNE     8$              ;BRANCH IF 16 CLOCKS NOT DONE
5644  036426  004737  045376                  JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
5645  036432  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
5646  036436  000000                          HALT                    ;STOP THE TEST AND RESTART PROGRAM
5647  036440  012700  015212                  MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
5648  036444  012720  010000                  MOV     #0!FMT22,(R0)+  ;CYLINDER 0
5649  036450  112746  000000                  MOVB    #0,     -(SP)   ;IN LOWER BYTE GET SECTOR
5650  036454  112766  000000  000001          MOVB    #0,     1(SP)   ;GET TRACK IN HIGHER BYTE
5651  036462  012620                          MOV     (SP)+,  (R0)+   ;GET TRACK/SECTOR IN BUFFER
5652  036464  012720  000000                  MOV     #0,     (R0)+   ;KEY1 IN BUFFER
5653  036470  012720  000000                  MOV     #0,     (R0)+   ;KEY2 IN BUFFER
5654  036474  012701  000400                  MOV     #256.,  R1      ;DATA WORD COUNTER
5655  036500  012702  177777                  MOV     #-1,    R2      ;DATA
5656
5657  036504  010220                  3$:     MOV     R2,     (R0)+   ;DATA INTO BUFFER
5658  036506  005301                          DEC     R1              ;COUNT
5659  036510  001375                          BNE     3$              ;BRANCH IF 256 NOT DONE
5660  036512  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
5661  036516  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
5662
5663                                          ;NOW READ DATA BUFFER WILL BE CHECKED
5664
5665  036522  004037  046046                  JSR     R0,@#COMPAR     ;CHECK
5666  036526  015212                          WRFROM                  ;GOOD BUFFER
5667  036530  016256                          REINTO                  ;TEST BUFFER
5668  036532  000404                          4+256.                  ;NUMBER OF WORDS CHECKED
5669  036534  036542                          4$                      ;RETURN POINT FOR ERROR HEADER
5670  036536  036546                          5$                      ;RETURN POINT FOR ERROR DATA
5671
5672  036540  036552                          TST61                   ;RETURN FOR GOOD COMPARISON
5673
5674  036542  104004                  4$:     ERROR   4               ;READ NEXT ERROR
5675  036544  000207                          RTS     PC              ;RETURN TO "COMPAR"
```

L14


```
5676  036546  104005                  5$:     ERROR   5           ;WORD NOS 1 TO 4 ARE
5677                                                              ;HEADER WORDS
5678                                                              ;5 TO 260 ARE DATA WORDS
5679  036550  000207                          RTS     PC          ;RETURN TO "COMPAR"
5680
5681
5682
5683
```

```
5684
5685                            ;*****************************************************************
5686                            ;*TEST 61        READ ECC ENABLED 2B
5687
5688                            ;*      THIS IS AN ECC READ DATA TEST
5689                            ;*      ERROR CORRECTION IS ENABLED
5690                            ;*      A CORRECTABLE ERROR IS INSERTED IN BIT POSITION 32
5691                            ;*      GOOD DATA USED IS 256 WORDS OF 177777
5692                            ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
5693                            ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
5694
5695                            ;*****************************************************************
5696  036552  000004            TST61:  SCOPE
5697  036554  012706  001000            MOV     #STACK,SP       ;RESET STACK
5698
5699  036560  012737  000061  017322    MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
5700
5701
5702                                    ;SETUP FOR WHAT IS TO BE READ
5703                                    ;HEADER CRC IS RESTORED FROM A SUBROUTINE
5704
5705  036566  012746  177777            MOV     #-1,-(SP)       ;DATA TO BE READ
5706  036572  012705  000400            MOV     #256.,R5        ;COUNTER
5707  036576  012700  053520            MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
5708  036602  011620            1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
5709  036604  005305                    DEC     R5              ;COUNT
5710  036606  001375                    BNE     1$              ;BRANCH IF 256 NOT COMPLETE
5711  036610  005726                    TST     (SP)+           ;UNDO -(SP)
5712  036612  022020                    CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
5713  036614  012705  000017            MOV     #15.,   R5      ;1 DATA GAP
5714                                                            ;14 TOLERANCE GAP
5715  036620  005020            2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
5716  036622  005305                    DEC     R5              ;TOLERANCE GAP
5717  036624  001375                    BNE     2$              ;BRANCH IF NOT COMPLETE
5718
5719
5720  036626  004737  050442            JSR     PC,@#FILLEC     ;INSERT ECC IN PROPER PLACE ON DISK
5721
5722
5723
5724                                    ;THESE ARE FOR ECC TEST ONLY
5725
5726  036632  012737  177777  015140    MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
5727  036640  005037  047660            CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
5728  036644  013737  047654  047656    MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
5729  036652  013737  047662  047670    MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
5730  036660  005037  047646            CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
5731  036664  005037  047650            CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
5732  036670  005037  047664            CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
5733  036674  005037  047666            CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
5734
5735
5736                                    ;THESE ARE TO SETUP FOR DISKLESS USE ONLY
5737
```

```
5738  036700  012737  010000  051602          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
5739                                                                  ;CYLINDER 0, FORMAT 16 BITS
5740  036706  112737  000000  051605          MOVB    #0,@#SECOTR+1   ;TRACK 0
5741  036714  112737  000000  051604          MOVB    #0,@#SECOTR     ;SECTOR 0
5742  036722  012737  000000  051606          MOV     #0,@#KEY1       ;KEY1=0
5743  036730  012737  000000  051610          MOV     #0,@#KEY2       ;KEY2=0
5744  036736  012737  000400  051662          MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
5745  036744  005037  051612                  CLR     @#X             ;THIS IS A READ COMMAND
5746  036750  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
5747  036754  051602                          CYL
5748  036756  053502                          WCRC
5749
5750
5751                                          ;THIS IS TO INSERT ERROR
5752                                          ;THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
5753                                          ;THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
5754                                          ;THIS MOVE
5755
5756  036760  012737  077777  053522          MOV     #77777,@#DISK+2 ;FORCE ERROR ON BIT NUMBER 32
5757                                                                  ;SO ERROR POSITION REGISTER WILL SHOW
5758                                                                  ;22
5759  036766  012737  000026  037142          MOV     #22.,@#8$       ;INSERT POSITION REG.
5760
5761
5762                                          ;THESE ARE REGULAR SETUPS
5763
5764  036774  004737  045152                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
5765  037000  012777  177374  155744          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
5766  037006  012777  016256  155740          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
5767  037014  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
5768  037020  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
5769  037026  012677  155732                  MOV     (SP)+,@RHDST    ;TRACK/SECTOR IN RHDST
5770  037032  012777  010000  155730          MOV     #FMT22,@RHOF    ;16 BITS PER WORD
5771                                                                  ;ECC CORRECTION NOT INHIBIT
5772                                                                  ;BECAUSE ECC IS NOT GOING
5773                                                                  ;TO BE CHECKED
5774  037040  005077  155726                  CLR     @RHCA           ;CYLINDER 0
5775  037044  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
5776  037050  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
5777                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
5778  037054  000000                          HALT                    ;STOP THE TEST
5779  037056  013711  015174                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
5780  037062  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
5781  037066  004737  051456                  JSR     PC,@#COMHD      ;READ HEADER AND DATA
5782                                                                  ;IF THERE ARE READ ERRORS THEN
5783                                                                  ;ECC WILL NOT BE CHECKED
5784
5785
5786                                          ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
5787                                          ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
5788                                          ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
5789                                          ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
5790                                          ;DETECTED
5791                                          ;HEADER AND DATA ARE TO BE CHECKED.
```

```
                                        ;IN CHECKING READ DATA THE WRITE FROM BUFFER
                                        ;"WRFROM" IS FILLED WITH EXPECTED DATA AND
                                        ;COMPARISONS ARE MADE

037072  005737  015122                  TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
037076  001077                          BNE     TST62           ;BRANCH IF YES
037100  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
037104  022737  100000  015032          CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
037112  001401                          BEQ     6$              ;BRANCH IF YES
037114  104032                          ERROR   32              ;32 BIT ECC REGISTER SHOULD BE NON
                                                                ;ZERO
                                                                ;ONLY 11 OF THE 32 BITS CAN BE SEEN
                                                                ;IN THE PATERN REGISTER
                                                                ;DCK SHOULD BE SET IN RHER1
037116  013746  047646          6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
037122  042716  174000                  BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
037126  022637  015062                  CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
037132  001401                          BEQ     7$              ;BRANCH IF GOOD
037134  104032                          ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT

037136  004037  050270          7$:     JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
037142  000026                  8$:     22.                     ;EXPECTED POSITION REG. WHEN CORRECTION
                                                                ;IS COMPLETE


037144  004737  045376                  JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
037150  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
037154  000000                          HALT                    ;STOP THE TEST AND RESTART PROGRAM
037156  012700  015212                  MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
037162  012720  010000                  MOV     #0!FMT22,(R0)+  ;CYLINDER 0
037166  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
037172  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
037200  012620                          MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
037202  012720  000000                  MOV     #0,(R0)+        ;KEY1 IN BUFFER
037206  012720  000000                  MOV     #0,(R0)+        ;KEY2 IN BUFFER
037212  012701  000400                  MOV     #256.,R1        ;DATA WORD COUNTER
037216  012702  177777                  MOV     #-1,R2          ;DATA
037222  010220                  3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
037224  005301                          DEC     R1              ;COUNT
037226  001375                          BNE     3$              ;BRANCH IF 256 NOT DONE

                                        ;ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
                                        ;NOW THE INSERTED ERROR WILL BE PUT IN

037230  012737  077777  015224          MOV     #77777,@#WRFROM+<5*2>   ;INSERTED ERROR
037236  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
037242  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG


                                        ;NOW READ DATA BUFFER WILL BE CHECKED

037246  004037  046046                  JSR     R0,@#COMPAR     ;CHECK
037252  015212                          WRFROM                  ;GOOD BUFFER
```

```
5846  037254  016256                          REINTO                  ;TEST BUFFER
5847  037256  000404                          4+256.                  ;NUMBER OF WORDS CHECKED
5848  037260  037266                          4$                      ;RETURN POINT FOR ERROR HEADER
5849  037262  037272                          5$                      ;RETURN POINT FOR ERROR DATA
5850
5851  037264  037276                          TST62                   ;RETURN FOR GOOD COMPARISON
5852
5853  037266  104004                  4$:     ERROR   4               ;READ NEXT ERROR
5854  037270  000207                          RTS     PC              ;RETURN TO "COMPAR"
5855  037272  104005                  5$:     ERROR   5               ;WORD NOS 1 TO 4 ARE
5856                                                                  ;HEADER WORDS
5857                                                                  ;5 TO 260 ARE DATA WORDS
5858  037274  000207                          RTS     PC              ;RETURN TO "COMPAR"
5859
```

```
5860
5861                                    ;*****************************************************************
5862                                    ;*TEST 62        READ ECC ENABLED 2C
5863
5864                                    ;*      THIS IS AN ECC READ DATA TEST
5865                                    ;*      ERROR CORRECTION IS ENABLED
5866                                    ;*      A NON CORRECTABLE ERROR IS INSERTED IN BIT POSITION 32 AND 21
5867                                    ;*      GOOD DATA USED IS 256 WORDS OF 177777
5868                                    ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
5869                                    ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
5870
5871                                    ;*****************************************************************
5872  037276  000004                    TST62:  SCOPE
5873  037300  012706  001000                    MOV     #STACK,SP       ;RESET STACK
5874
5875  037304  012737  000062  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
5876
5877
5878                                    ;       SETUP FOR WHAT IS TO BE READ
5879                                    ;       HEADER CRC IS RESTORED FROM A SUBROUTINE
5880
5881  037312  012746  177777                   MOV     #-1,-(SP)       ;DATA TO BE READ
5882  037316  012705  000400                   MOV     #256.,R5        ;COUNTER
5883  037322  012700  053520                   MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
5884  037326  011620                    1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
5885  037330  005305                           DEC     R5              ;COUNT
5886  037332  001375                           BNE     1$              ;BRANCH IF 256 NOT COMPLETE
5887  037334  005726                           TST     (SP)+           ;UNDO -(SP)
5888  037336  022020                           CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
5889  037340  012705  000017                   MOV     #15.,R5         ;1 DATA GAP
5890                                                                   ;14 TOLERANCE GAP
5891  037344  005020                    2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
5892  037346  005305                           DEC     R5              ;TOLERANCE GAP
5893  037350  001375                           BNE     2$              ;BRANCH IF NOT COMPLETE
5894
5895
5896  037352  004737  050442                   JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
5897                                                                   ;IN THE CORRECT PLACE
5898
5899                                    ;THESE ARE FOR ECC TEST ONLY
5900
5901  037356  012737  177777  015140           MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
5902  037364  005037  047660                   CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
5903  037370  013737  047654  047656           MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
5904  037376  013737  047662  047670           MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
5905  037404  005037  047646                   CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
5906  037410  005037  047650                   CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
5907  037414  005037  047664                   CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
5908  037420  005037  047666                   CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
5909
5910
5911                                    ;THESE ARE TO SETUP FOR DISKLESS USE ONLY
5912
5913  037424  012737  010000  051602           MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
                                                                ;CYLINDER 0, FORMAT 16 BITS
037432  112737  000000  051605          MOVB    #0,@#SECOTR+1   ;TRACK 0
037440  112737  000000  051604          MOVB    #0,@#SECOTR     ;SECTOR 0
037446  012737  000000  051606          MOV     #0,@#KEY1       ;KEY1=0
037454  012737  000000  051610          MOV     #0,@#KEY2       ;KEY2=0
037462  012737  000400  051662          MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
037470  005037  051612                  CLR     @#X             ;THIS IS A READ COMMAND
037474  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
037500  051602                          CYL
037502  053502                          WCRC

                                        ;THIS IS TO INSERT ERROR
                                        ;THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
                                        ;THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
                                        ;THIS MOVE

037504  012737  077757  053522          MOV     #77757,@#DISK+2 ;FORCE ERROR ON BIT NUMBER 32 AND 21
                                                                ;SO ERROR POSITION REGISTER WILL SHOW
                                                                ;22
037512  012737  010040  037666          MOV     #4128.,@#8S     ;INSERT POSITION REG.

                                        ;THESE ARE REGULAR SETUPS

037520  004737  045152                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
037524  012777  177374  155220          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
037532  012777  016256  155214          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
037540  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
037544  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
037552  012677  155206                  MOV     (SP)+, @RHDST   ;TRACK/SECTOR IN RHDST
037556  012777  010000  155204          MOV     #FMT22,@RHOF    ;16 BITS PER WORD
                                                                ;ECC CORRECTION NOT INHIBIT
                                                                ;BECAUSE ECC IS NOT GOING
                                                                ;TO BE CHECKED
037564  005077  155202                  CLR     @RHCA           ;CYLINDER 0

037570  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
037574  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
037600  000000                          HALT                    ;STOP THE TEST

037602  013711  015174                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
037606  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
037612  004737  051456                  JSR     PC,@#COMHD      ;READ HEADER AND DATA
                                                                ;IF THERE ARE READ ERRORS THEN
                                                                ;ECC WILL NOT BE CHECKED


                                        ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
                                        ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
                                        ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
                                        ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
                                        ;DETECTED
```

```
                                        ;HEADER AND DATA ARE TO BE CHECKED.
                                        ;IN CHECKING READ DATA THE WRITE FROM BUFFER
                                        ;"WRFROM" IS FILLED WITH EXPECTED DATA AND
                                        ;COMPARISONS ARE MADE

037616  005737  015122          TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
037622  001106                  BNE     TST63           ;BRANCH IF YES
037624  004737  044652          JSR     PC,@#PUTREG     ;SAVE REGISTERS
037630  022737  100000  015032  CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
037636  001401                  BEQ     6$              ;BRANCH IF YES
037640  104032                  ERROR   32              ;32 BIT ECC REGISTER SHOULD BE NON
                                                        ;ZERO
                                                        ;ONLY 11 OF THE 32 BITS CAN BE SEEN
                                                        ;IN THE PATERN REGISTER
                                                        ;DCK SHOULD BE SET IN RHER1
037642  013746  047646  6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
037646  042716  174000          BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
037652  022637  015062          CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
037656  001401                  BEQ     7$              ;BRANCH IF GOOD
037660  104032                  ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT

037662  004037  050270  7$:     JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
037666  000000  8$:     .WORD                           ;EXPECTED POSITION REG. WHEN CORRECTION
                                                        ;IS COMPLETE

037670  004737  044652          JSR     PC,@#PUTREG     ;SAVE REGISTERS


037674  022737  100100  015032  CMP     #DCK!ECH,@#ER1  ;WITH ERRORS INSERTED IN BIT POSITION 21
                                                        ;AND 32 HARD ERROR BIT SHOULD SET
037702  001401                  BEQ     9$              ;BRANCH IF GOOD
037704  104036                  ERROR   36              ;WITH ERROR INSERTED IN BIT POSITION 21 THRU
                                                        ;32 HCE SHOULD SET


037706          9$:
037706  004737  045376          JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
037712  104400  005116          TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
037716  000000                  HALT                    ;STOP THE TEST AND RESTART PROGRAM
037720  012700  015212          MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
037724  012720  010000          MOV     #0!FMT22,(R0)+  ;CYLINDER 0
037730  112746  000000          MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
037734  112766  000000  000001  MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
037742  012620                  MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
037744  012720  000000          MOV     #0,(R0)+        ;KEY1 IN BUFFER
037750  012720  000000          MOV     #0,(R0)+        ;KEY2 IN BUFFER
037754  012701  000400          MOV     #256.,R1        ;DATA WORD COUNTER
037760  012702  177777          MOV     #-1,R2          ;DATA
037764  010220          3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
037766  005301                  DEC     R1              ;COUNT
037770  001375                  BNE     3$              ;BRANCH IF 256 NOT DONE
```

```
                                        ;ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
                                        ;NOW THE INSERTED ERROR WILL BE PUT IN

037772  012737  077757  015224        MOV     #77757,@#WRFROM+<5*2>   ;INSERTED ERROR
040000  004737  044652                JSR     PC,@#PUTREG     ;SAVE REGISTERS
040004  005037  015122                CLR     @#ERFLG$        ;CLEAR ERROR FLAG


                                        ;NOW READ DATA BUFFER WILL BE CHECKED

040010  004037  046046                JSR     R0,@#COMPAR     ;CHECK
040014  015212                        WRFROM                  ;GOOD BUFFER
040016  016256                        REINTO                  ;TEST BUFFER
040020  000404                        4+256.                  ;NUMBER OF WORDS CHECKED
040022  040030                        4$                      ;RETURN POINT FOR ERROR HEADER
040024  040034                        5$                      ;RETURN POINT FOR ERROR DATA

040026  040040                        TST63                   ;RETURN FOR GOOD COMPARISON

040030  104004            4$:         ERROR   4               ;READ NEXT ERROR
040032  000207                        RTS     PC              ;RETURN TO "COMPAR"
040034  104005            5$:         ERROR   5               ;WORD NOS 1 TO 4 ARE
                                                            ;HEADER WORDS
                                                            ;5 TO 260 ARE DATA WORDS
040036  000207                        RTS     PC              ;RETURN TO "COMPAR"
```

```
                                ;*****************************************************************
                                ;*TEST 63        WRITE ECC TEST 3

                                ;*      THIS IS A WRITE ECC TEST
                                ;*      WRITE CYLINDER 0, FORMAT 16 BITS PER WORD
                                ;*      TRACK 0, SECTOR 1, KEYS 0, NUMBER OF WORDS 256
                                ;*      OF ALL 52525.

                                ;*****************************************************************
040040  000004                  TST63:  SCOPE
040042  012706  001000                  MOV     #STACK,SP       ;RESET STACK

040046  012737  000063  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
040054  012700  053422          MOV     #SECGAP,R0      ;POINTER
040060  012701  000460          MOV     #304.,R1        ;COUNTER
040064  005020                  1$:     CLR     (R0)+           ;CLEAR SIMULATED DISK AREA
040066  005301                  DEC     R1
040070  001375                  BNE     1$
040072  004767  005054          JSR     PC,CLDISK       ;THIS IS USED TO SET GENERAL REGISTERS

                                ;THESE ARE FOR ECC TEST ONLY

040076  012737  177777  015140          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
040104  005037  047660          CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
040110  013737  047654  047656          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
040116  013737  047662  047670          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
040124  005037  047646          CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
040130  005037  047650          CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
040134  005037  047664          CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
040140  005037  047666          CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT


                                ;THESE ARE TO BE SETUP FOR DISKLESS USE ONLY

040144  012737  010000  054724          MOV     #FMT22,@#WCYL   ;FORMAT22=16BIT WORDS AND
                                                                ;CYLINDER 0
040152  012737  000001  054726          MOV     #1,@#WSECTR     ;TRACK=0, SECTOR=1
040160  005037  054730          CLR     @#KEY1          ;KEY1=0
040164  005037  054732          CLR     @#KEY2          ;KEY2=0
040170  012737  000400  054764          MOV     #256.,@#FNWORD  ;256 DATA WORDS
040176  004537  046360          JSR     R5,@#CRC        ;GO TO CALCULATE CRC
040202  054724                  WCYL
040204  054734                  GCRC

                                ;THESE ARE REGULAR SETUPS

040206  012777  177374  154536          MOV     #-260.,@RHWC    ;256 DATA WORDS 4 HEADER WORDS
040214  012700  015212          MOV     #WRFROM,R0      ;THESE TWO INSTRUCTIONS GETS
040220  010077  154530          MOV     R0,@RHBA        ;ADDR. OF WRFROM INTO R0 AND
                                                        ;BUS ADDRESS REGISTER
040224  012720  010000          MOV     #FMT22,(R0)+    ;FORMAT=16 BIT WORDS
```

```
                                                        ;CYLINDER=0
040230  012720  000001          2$:   MOV     #1,(R0)+  ;TRACK=0, SECTOR=1, KEYS=0
040234  005020                CLR     (R0)+             ;KEY1=0
040236  005020                CLR     (R0)+             ;KEY2=0
040240  012705  000400        MOV     #256.,R5          ;COUNTER
040244  012720  052525        3$:   MOV     #52525,(R0)+ ;MOVE ALL 52525 FOR DATA
040250  005305                DEC     R5
040252  001374                BNE     3$                ;BRANCH IF DATA NOT COMPLETE
040254  012777  000001  154502 MOV     #1,@RHDST         ;TRACK=0 SECTOR=1

040262  004737  045206        JSR     PC,@#CHECKT       ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
040266  104400  005116        TYPE    ,CPHALT           ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                        ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
040272  000000                HALT                      ;STOP THE TEST

040274  013711  015170        MOV     @#WRIFOR,@R1      ;GET READY FOR WRITE HEADER AND
                                                        ;DATA WITH 62 IN RHCS1
040300  005037  015122        CLR     @#ERFLG$          ;CLEAR ERROR FLAG
040304  012777  010000  154456 MOV     #FMT22,@RHOF      ;FORMAT BIT=1 (16 BIT WORDS)
040312  005077  154454        CLR     @RHCA             ;CYLINDER =0
040316  004737  054564        JSR     PC,@#COM&HD       ;WRITE HEADER AND DATA

                        ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
                        ;FROM THE "COM&HD" ROUTINE THAT MEANS ALL HEADER ON DISK
                        ;IS GOOD IE. ONLY DATA IS TO BE CHECKED TO SEE IF THEY ARE
                        ;ALL 52525 AND WRITE DATA GAP AND TOLERANCE GAP TO SEE IF
                        ;THEY ARE ALL ZEROS

040322  005737  015122        TST     @#ERFLG$          ;HAS ANY ERRORS OCCURED?
                                                        ;IF WRITE ERROR OCCURS ECC IS NOT CHECKED
040326  001056                BNE     TST64             ;;BRANCH IF YES


                        ;COMPARE SOFTWARE GENERATED ECC WITH THAT GENERATED BY HARDWARE
040330  023737  047646  054520        CMP     @#GECC1,@#WECC1;COMPARE SOFTWARE ECC WITH HARDWARE ECC
040336  001402                BEQ     6$                ;BRANCH IF GOOD
040340  104031                ERROR   31                ;LOW ORDER ECC IN ERROR
040342  000405                BR      7$                ;BRANCH TO CONTINUE
040344  023737  047650  054522 6$:   CMP     @#GECC2,@#WECC2 ;COMPARE SOFTWARE ECC WITH HARDWARE ECC
040352  001401                BEQ     7$                ;BRANCH IF GOOD
040354  104031                ERROR   31                ;HIGH ORDER ECC IN ERROR

040356                        7$:
040356  004737  045376        JSR     PC,@#CHECKE       ;CHECK THAT DVA,RDY,DPR,DRY = 1
040362  104400  005116        TYPE    ,CPHALT           ;CANNOT CONTINUE IF THEY DON'T
040366  000000                HALT                      ;STOP THE TEST AND RESTART PROGRAM


                        ;FILL "REINTO" BUFFER WITH EXPECTED DATA

040370  004037  045070        JSR     R0,@#CLAREA       ;FILL REINTO BUFFER
```

```
6155  040374  016256                          REINTO              ;FROM
6156  040376  017254                          REINTO+<255.*2>     ;TO
6157  040400  052525                  .WORD   52525               ;DATA
6158
6159  040402  013737  047646  017256  MOV     @#GECC1,@#REINTO+<256.*2>;FILL ECC1
6160  040410  013737  047650  017260  MOV     @#GECC2,@#REINTO+<257.*2>;FILL ECC2
6161  040416  004037  045070          JSR     R0,@#CLAREA         ;FILL REST
6162  040422  017262                  REINTO+<258.*2>             ;FROM
6163  040424  017316                  REINTO+<272.*2>             ;TO
6164  040426  000000                  0                           ;DATA
6165
6166
6167  040430  005037  015122          CLR     @#ERFLGS            ;CLEAR ERROR FLAG
6168
6169
6170                                  ;NOW COMPARE "DISK" BUFFER WITH "REINTO"
6171
6172  040434  004037  046046          JSR     R0,@#COMPAR         ;CHECK
6173  040440  016256                  REINTO                      ;GOOD BUFFER
6174  040442  053520                  DISK                        ;TEST BUFFER
6175  040444  000402                  258.                        ;NUMBER OF WORDS CHECKED
6176  040446  040454                  4$                          ;RETURN POINT FOR ERROR HEADER
6177  040450  040460                  5$                          ;RETURN POINT FOR ERROR DATA
6178
6179  040452  040464                  TST64                       ;RETURN FOR GOOD COMPARISON
6180
6181  040454  104007          4$:     ERROR   7                   ;READ ERROR 10 NEXT
6182  040456  000207                  RTS     PC                  ;RETURN TO COMPARE
6183  040460  104010          5$:     ERROR   10                  ;WORD NOS 1 TO 256 ARE
6184                                                              ;DATA WORDS
6185                                                              ;WORD NOS 257 AND 258
6186                                                              ;ARE ECC WHICH ARE CHECKED
6187                                                              ;WORD NOS 259
6188                                                              ;IS DATA GAP
6189                                                              ;WORD NOS 260 TO 273
6190                                                              ;ARE TOLERANCE GAP
6191  040462  000207                  RTS     PC                  ;RETURN TO COMPARE
```

```
                                ;*****************************************************************
                                ;#TEST 64       READ ECC ENABLED 3A

                                ;#      THIS IS AN ECC READ DATA TEST
                                ;#      ERROR CORRECTION IS ENABLED
                                ;#      NO ERROR IS INSERTED
                                ;#      GOOD DATA USED IS 256 WORDS OF 52525
                                ;#      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                                ;#      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA

                                ;*****************************************************************
040464  000004                  TST64:  SCOPE
040466  012706  001000                  MOV     #STACK,SP       ;RESET STACK
040472  012737  000064  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER

                                        ;SETUP FOR WHAT IS TO BE READ
                                        ;HEADER CRC IS RESTORED FROM A SUBROUTINE

040500  012746  052525                  MOV     #52525,-(SP)    ;DATA TO BE READ
040504  012705  000400                  MOV     #256.,R5        ;COUNTER
040510  012700  053520                  MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
040514  011620                  1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
040516  005305                          DEC     R5              ;COUNT
040520  001375                          BNE     1$              ;BRANCH IF 256 NOT COMPLETE
040522  005726                          TST     (SP)+           ;UNDO -(SP)
040524  022020                          CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
040526  012705  000017                  MOV     #15.,R5         ;1 DATA GAP
                                                                ;14 TOLERANCE GAP
040532  005020                  2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
040534  005305                          DEC     R5              ;TOLERANCE GAP
040536  001375                          BNE     2$              ;BRANCH IF NOT COMPLETE

040540  004737  050442                  JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
                                                                ;IN THE CORRECT PLACE

                                ;THESE ARE FOR ECC TEST ONLY

040544  012737  177777  015140          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
040552  005037  047660                  CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
040556  013737  047654  047656          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
040564  013737  047662  047670          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
040572  005037  047646                  CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
040576  005037  047650                  CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
040602  005037  047664                  CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
040606  005037  047666                  CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT

                                ;THESE ARE TO SETUP FOR DISKLESS USE ONLY

040612  012737  010000  051602          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
                                                                ;CYLINDER 0, FORMAT 16 BITS
040620  112737  000000  051605          MOVB    #0,@#SECOTR+1   ;TRACK 0
```

```
6246  040626  112737  000000  051604          MOVB    #0,@#SECOTR     ;SECTOR 0
6247  040634  012737  000000  051606          MOV     #0,@#KEY1       ;KEY1=0
6248  040642  012737  000000  051610          MOV     #0,@#KEY2       ;KEY2=0
6249  040650  012737  000400  051662          MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
6250  040656  005037  051612                  CLR     @#X             ;THIS IS A READ COMMAND
6251  040662  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
6252  040666  051602                          CYL
6253  040670  053502                          WCRC
6254
6255
6256
6257
6258                                          ;THESE ARE REGULAR SETUPS
6259
6260  040672  004737  045152                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
6261  040676  012777  177374  154046          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
6262  040704  012777  016256  154042          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
6263  040712  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
6264  040716  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
6265  040724  012677  154034                  MOV     (SP)+, @RHDST   ;TRACK/SECTOR IN RHDST
6266  040730  012777  010000  154032          MOV     #FMT22,@RHOF ;16 BITS PER WORD
6267                                                                  ;ECC CORRECTION NOT INHIBIT
6268                                                                  ;BECAUSE ECC IS NOT GOING
6269                                                                  ;TO BE CHECKED
6270  040736  005077  154030                  CLR     @RHCA           ;CYLINDER 0
6271
6272  040742  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
6273  040746  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
6274                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
6275  040752  000000                          HALT                    ;STOP THE TEST
6276
6277  040754  013711  015174                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
6278  040760  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
6279  040764  004737  051456                  JSR     PC,@#COMHD      ;READ HEADER AND DATA
6280                                                                  ;IF THERE ARE READ ERRORS THEN
6281                                                                  ;ECC WILL NOT BE CHECKED
6282
6283
6284                                          ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
6285                                          ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
6286                                          ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
6287                                          ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
6288                                          ;DETECTED
6289                                          ;HEADER AND DATA ARE TO BE CHECKED.
6290                                          ;IN CHECKING READ DATA THE WRITE FROM BUFFER
6291                                          ;"WRFROM" IS FILLED WITH EXPECTED DATA AND
6292                                          ;COMPARISONS ARE MADE
6293
6294  040770  005737  015122                  TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
6295  040774  001102                          BNE     TST65           ;BRANCH IF YES
6296  040776  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
6297  041002  005737  015032                  TST     @#ER1           ;NO ERRORS SHOULD BE SET
6298  041006  001401                          BEQ     6$              ;BRANCH IF NO ERRORS SET
6299  041010  104032                          ERROR   32              ;32 BIT ECC REGISTER SHOULD BE ZERO
```

```
                                                        ;ONLY 11 OF THE 32 BITS CAN BE SEEN
                                                        ;IN THE PATERN REGISTER
                                                        ;DCK SHOULD BE SET IN RHER1
041012  013746  047646          6$:   MOV   @#GECC1,-(SP)    ;GET PATTERN REGISTER
041016  042716  174000                BIC   #174000,(SP)     ;KEEP ONLY 11 BITS
041022  022637  015062                CMP   (SP)+,@#EC2      ;COMPARE PATTERN REGISTER
041026  001401                        BEQ   7$               ;BRANCH IF GOOD
041030  104032                        ERROR 32               ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT


                                                        ;ADD 16 MAINTENANCE CLOCKS TO
                                                        ;BRING EBL DOWN

041032  012700  000020          7$:   MOV   #16.,R0          ;COUNTER
041036  052777  000002  153734  8$:   BIS   #MCLK,@RHMR     ;SET CLOCK
041044  042777  000002  153726        BIC   #MCLK,@RHMR     ;CLEAR CLOCK
041052  005300                        DEC   R0               ;COUNT
041054  001370                        BNE   8$               ;BRANCH IF 16 CLOCKS NOT DONE
041056  004737  045376                JSR   PC,@#CHECKE      ;CHECK THAT DVA,RDY,DPR,DRY = 1
041062  104400  005116                TYPE  ,CPHALT          ;CANNOT CONTINUE IF THEY DON'T
041066  000000                        HALT                   ;STOP THE TEST AND RESTART PROGRAM
041070  012700  015212                MOV   #WRFROM,R0       ;GETTING READY TO FILL EXPECTED DATA
041074  012720  010000                MOV   #0!FMT22,(R0)+   ;CYLINDER 0
041100  112746  000000                MOVB  #0,-(SP)         ;IN LOWER BYTE GET SECTOR
041104  112766  000000  000001        MOVB  #0,1(SP)         ;GET TRACK IN HIGHER BYTE
041112  012620                        MOV   (SP)+,(R0)+      ;GET TRACK/SECTOR IN BUFFER
041114  012720  000000                MOV   #0,(R0)+         ;KEY1 IN BUFFER
041120  012720  000000                MOV   #0,(R0)+         ;KEY2 IN BUFFER
041124  012701  000400                MOV   #256.,R1         ;DATA WORD COUNTER
041130  012702  052525                MOV   #52525$,R2       ;DATA
041134  010220                3$:     MOV   R2,(R0)+         ;DATA INTO BUFFER
041136  005301                        DEC   R1               ;COUNT
041140  001375                        BNE   3$               ;BRANCH IF 256 NOT DONE
041142  005037  015122                CLR   @#ERFLG$         ;CLEAR ERROR FLAG
041146  004737  044652                JSR   PC,@#PUTREG      ;SAVE REGISTERS

                                                        ;NOW READ DATA BUFFER WILL BE CHECKED

041152  004037  046046                JSR   R0,@#COMPAR      ;CHECK
041156  015212                        WRFROM                 ;GOOD BUFFER
041160  016256                        REINTO                 ;TEST BUFFER
041162  000404                        4+256.                 ;NUMBER OF WORDS CHECKED
041164  041172                        4$                     ;RETURN POINT FOR ERROR HEADER
041166  041176                        5$                     ;RETURN POINT FOR ERROR DATA

041170  041202                        TST65                  ;RETURN FOR GOOD COMPARISON

041172  104004                4$:     ERROR 4                ;READ NEXT ERROR
041174  000207                        RTS   PC               ;RETURN TO "COMPAR"
041176  104005                5$:     ERROR 5                ;WORD NOS 1 TO 4 ARE
                                                        ;HEADER WORDS
                                                        ;5 TO 260 ARE DATA WORDS
```

```
 6354  041200  000207                          RTS     PC              ;RETURN TO "COMPAR"
```

```
6355
6356                                    ;*****************************************************************
6357                                    ;*TEST 65       READ ECC ENABLED 3B
6358
6359                                    ;*      THIS IS AN ECC READ DATA TEST
6360                                    ;*      ERROR CORRECTION IS ENABLED
6361                                    ;*      A CORRECTABLE ERROR IS INSERTED IN BIT POSITION 4128
6362                                    ;*      THIS IS THE LAST BIT OF THE ECC
6363                                    ;*      GOOD DATA USED IS 256 WORDS OF 52525
6364                                    ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
6365                                    ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
6366
6367                                    ;*****************************************************************
6368  041202  000004                    TST65:  SCOPE
6369  041204  012706  001000                    MOV     #STACK,SP       ;RESET STACK
6370  041210  012737  000065  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
6371
6372                                            ;SETUP FOR WHAT IS TO BE READ
6373                                            ;HEADER CRC IS RESTORED FROM A SUBROUTINE
6374
6375  041216  012746  052525                    MOV     #52525, -(SP)   ;DATA TO BE READ
6376  041222  012705  000400                    MOV     #256.,R5        ;COUNTER
6377  041226  012700  053520                    MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
6378  041232  011620                    1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
6379  041234  005305                            DEC     R5              ;COUNT
6380  041236  001375                            BNE     1$              ;BRANCH IF 256 NOT COMPLETE
6381  041240  005726                            TST     (SP)+           ;UNDO -(SP)
6382  041242  022020                            CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
6383  041244  012705  000017                    MOV     #15.,   R5      ;1 DATA GAP
6384                                                                    ;14 TOLERANCE GAP
6385  041250  005020                    2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
6386  041252  005305                            DEC     R5              ;TOLERANCE GAP
6387  041254  001375                            BNE     2$              ;BRANCH IF NOT COMPLETE
6388
6389
6390  041256  004737  050442                    JSR     PC,@#FILLEC     ;INSERT ECC IN PROPER PLACE ON DISK
6391
6392
6393
6394                                            ;THESE ARE FOR ECC TEST ONLY
6395
6396  041262  012737  177777  015140            MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
6397  041270  005037  047660                    CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
6398  041274  013737  047654  047656            MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
6399  041302  013737  047662  047670            MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
6400  041310  005037  047646                    CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
6401  041314  005037  047650                    CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
6402  041320  005037  047664                    CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
6403  041324  005037  047666                    CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
6404
6405
6406                                            ;THESE ARE TO SETUP FOR DISKLESS USE ONLY
6407
6408  041330  012737  010000  051602            MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
                                                        ;CYLINDER 0, FORMAT 16 BITS
041336  112737  000000  051605      MOVB    #0,@#SECOTR+1   ;TRACK 0
041344  112737  000000  051604      MOVB    #0,@#SECOTR     ;SECTOR 0
041352  012737  000000  051606      MOV     #0,@#KEY1       ;KEY1=0
041360  012737  000000  051610      MOV     #0,@#KEY2       ;KEY2=0
041366  012737  000400  051662      MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
041374  005037  051612              CLR     @#X             ;THIS IS A READ COMMAND
041400  004537  046360              JSR     R5,@#CRC        ;GO TO CALCULATE CRC
041404  051602                      CYL
041406  053502                      WCRC


                                    ;THIS IS TO INSERT ERROR
                                    ;THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
                                    ;THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
                                    ;THIS MOVE
                                    ;THIS CHANGES THE LAST BIT OF THE ECC

041410  013746  054522              MOV     @#WECC2,-(SP)   ;GET LAST ECC
041414  005116                      COM     (SP)            ;INVERT ALL BITS OF WECC2
041416  042716  077777              BIC     #^C100000,(SP)  ;KEEP BIT 16
041422  042737  100000  054522      BIC     #100000,@#WECC2 ;CLEAR BIT 16 IN ECC
041430  052637  054522              BIS     (SP)+,@#WECC2   ;THIS WILL SET BIT 16 IF IT WAS 0
                                                            ;OR WILL SET NOTHING IF IT WAS A 1


041434  012737  010026  041610      MOV     #4118.,@#8$     ;INSERT POSITION REG.


                                    ;THESE ARE REGULAR SETUPS

041442  004737  045152              JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
041446  012777  177374  153276      MOV     #-256.-4.,@RH#WC ;256. DATA 4 HEADER WORDS
041454  012777  016256  153272      MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
041462  112746  000000              MOVB    #0,     -(SP)   ;IN LOWER BYTE GET SECTOR
041466  112766  000000  000001      MOVB    #0,     1(SP)   ;GET TRACK IN HIGHER BYTE
041474  012677  153264              MOV     (SP)+,  @RHDST  ;TRACK/SECTOR IN RHDST
041500  012777  010000  153262      MOV     #FMT22,@RHOF ;16 BITS PER WORD
                                                            ;ECC CORRECTION NOT INHIBIT
                                                            ;BECAUSE ECC IS NOT GOING
                                                            ;TO BE CHECKED
041506  005077  153260              CLR     @RHCA           ;CYLINDER 0

041512  004737  045206              JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
041516  104400  005116              TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                            ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
041522  000000                      HALT                    ;STOP THE TEST

041524  013711  015174              MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
041530  005037  015122              CLR     @#ERFLG$        ;CLEAR ERROR FLAG
041534  004737  051456              JSR     PC,@#COMHD      ;READ HEADER AND DATA
                                                            ;IF THERE ARE READ ERRORS THEN
                                                            ;ECC WILL NOT BE CHECKED
```

```
                                        ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
                                        ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
                                        ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
                                        ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
                                        ;DETECTED
                                        ;HEADER AND DATA ARE TO BE CHECKED.
                                        ;IN CHECKING READ DATA THE WRITE FROM BUFFER
                                        ;"WRFROM" IS FILLED WITH EXPECTED DATA AND
                                        ;COMPARISONS ARE MADE

041540  005737  015122          TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
041544  001074                  BNE     TST66           ;BRANCH IF YES
041546  004737  044652          JSR     PC,@#PUTREG     ;SAVE REGISTERS
041552  022737  100000  015032  CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
041560  001401                  BEQ     6$              ;BRANCH IF YES
041562  104032                  ERROR   32              ;32 BIT ECC REGISTER SHOULD BE NON
                                                        ;ZERO
                                                        ;ONLY 11 OF THE 32 BITS CAN BE SEEN
                                                        ;IN THE PATERN REGISTER
                                                        ;DCK SHOULD BE SET IN RHER1
041564  013746  047646  6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
041570  042716  174000          BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
041574  022637  015062          CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
041600  001401                  BEQ     7$              ;BRANCH IF GOOD
041602  104032                  ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT

041604  004037  050270  7$:     JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
041610  010026          8$:     4118.                   ;EXPECTED POSITION REG. WHEN CORRECTION
                                                        ;IS COMPLETE


041612  004737  045376          JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
041616  104400  005116          TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
041622  000000                  HALT                    ;STOP THE TEST AND RESTART PROGRAM
041624  012700  015212          MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
041630  012720  010000          MOV     #0!FMT22,(R0)+  ;CYLINDER 0
041634  112746  000000          MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
041640  112766  000000  000001  MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
041646  012620                  MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
041650  012720  000000          MOV     #0,(R0)+        ;KEY1 IN BUFFER
041654  012720  000000          MOV     #0,(R0)+        ;KEY2 IN BUFFER
041660  012701  000400          MOV     #256.,R1        ;DATA WORD COUNTER
041664  012702  052525          MOV     #52525,R2       ;DATA
041670  010220          3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
041672  005301                  DEC     R1              ;COUNT
041674  001375                  BNE     3$              ;BRANCH IF 256 NOT DONE

                                        ;ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
                                        ;NOW THE INSERTED ERROR WILL BE PUT IN
                                        ;BUT INSERTED ERROR IS IN ECC SO DATA IS NOT WRONG
```

```
6517  041676  004737  044652                JSR     PC,@#PUTREG     ;SAVE REGISTERS
6518  041702  005037  015122                CLR     @#ERFLG$        ;CLEAR ERROR FLAG
6519
6520
6521                                        ;NOW READ DATA BUFFER WILL BE CHECKED
6522
6523  041706  004037  046046                JSR     R0,@#COMPAR     ;CHECK
6524  041712  015212                        WRFROM                  ;GOOD BUFFER
6525  041714  016256                        REINTO                  ;TEST BUFFER
6526  041716  000404                        4+256.                  ;NUMBER OF WORDS CHECKED
6527  041720  041726                        4$                      ;RETURN POINT FOR ERROR HEADER
6528  041722  041732                        5$                      ;RETURN POINT FOR ERROR DATA
6529
6530  041724  041736                        TST66                   ;RETURN FOR GOOD COMPARISON
6531
6532  041726  104004              4$:       ERROR   4               ;READ NEXT ERROR
6533  041730  000207                        RTS     PC              ;RETURN TO "COMPAR"
6534  041732  104005              5$:       ERROR   5               ;WORD NOS 1 TO 4 ARE
6535                                                                ;HEADER WORDS
6536                                                                ;5 TO 260 ARE DATA WORDS
6537  041734  000207                        RTS     PC              ;RETURN TO "COMPAR"
6538
```

```
                                ;*****************************************************************
                                ;#TEST 66       READ ECC ENABLED 3C
                                ;
                                ;*      THIS IS AN ECC READ DATA TEST
                                ;*      ERROR CORRECTION IS ENABLED
                                ;*      A NON CORRECTABLE ERROR IS INSERTED IN BIT POSITION 296 THRU 308
                                ;*      THIS IS IN WORD NUMBER 19 AND 20
                                ;*      GOOD DATA USED IS 256 WORDS OF 52525
                                ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
                                ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
                                ;
                                ;*****************************************************************
041736  000004                TST66:  SCOPE
041740  012706  001000                MOV     #STACK,SP       ;RESET STACK
041744  012737  000066  017322        MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                ;
                                ;SETUP FOR WHAT IS TO BE READ
                                ;HEADER CRC IS RESTORED FROM A SUBROUTINE
                                ;
041752  012746  052525                MOV     #52525,-(SP)    ;DATA TO BE READ
041756  012705  000400                MOV     #256.,R5        ;COUNTER
041762  012700  053520                MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
041766  011620              1$:       MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
041770  005305                        DEC     R5              ;COUNT
041772  001375                        BNE     1$              ;BRANCH IF 256 NOT COMPLETE
041774  005726                        TST     (SP)+           ;UNDO -(SP)
041776  022020                        CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
042000  012705  000017                MOV     #15.,   R5      ;1 DATA GAP
                                                        ;14 TOLERANCE GAP
042004  005020              2$:       CLR     (R0)+           ;CLEAR DATA GAP, AND
042006  005305                        DEC     R5              ;TOLERANCE GAP
042010  001375                        BNE     2$              ;BRANCH IF NOT COMPLETE
                                ;
042012  004737  050442                JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
                                                        ;IN THE CORRECT PLACE
                                ;
                                ;THESE ARE FOR ECC TEST ONLY
                                ;
042016  012737  177777  015140        MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
042024  005037  047660                CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
042030  013737  047654  047656        MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
042036  013737  047662  047670        MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
042044  005037  047646                CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
042050  005037  047650                CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
042054  005037  047664                CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
042060  005037  047666                CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
                                ;
                                ;THESE ARE TO SETUP FOR DISKLESS USE ONLY
                                ;
042064  012737  010000  051602        MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
                                                        ;CYLINDER 0, FORMAT 16 BITS
042072  112737  000000  051605      MOVB    #0,@#SECOTR+1   ;TRACK 0
042100  112737  000000  051604      MOVB    #0,@#SECOTR     ;SECTOR 0
042106  012737  000000  051606      MOV     #0,@#KEY1       ;KEY1=0
042114  012737  000000  051610      MOV     #0,@#KEY2       ;KEY2=0
042122  012737  000400  051662      MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
042130  005037  051612              CLR     @#X             ;THIS IS A READ COMMAND
042134  004537  046360              JSR     R5,@#CRC        ;GO TO CALCULATE CRC
042140  051602                      CYL
042142  053502                      WCRC


                                    ;THIS IS TO INSERT ERROR
                                    ;THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
                                    ;THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
                                    ;THIS MOVE

042144  012737  152652  053564      MOV     #152652,@#DISK+44;INSERT ERROR IN POSITION 296 THRU 304
                                                            ;IN WORD NUMBER 19
042152  012737  052532  053566      MOV     #52532,@#DISK+46;INSERT ERROR IN POSITION 305 THRU 308
                                                            ;IN WORD NUMBER 20
042160  012737  010040  042334      MOV     #4128.,@#8$     ;INSERT POSITION REG.


                                    ;THESE ARE REGULAR SETUPS

042166  004737  045152              JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
042172  012777  177374  152552      MOV     #-256.-4.,@RH#WC;256. DATA 4 HEADER WORDS
042200  012777  016256  152546      MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
042206  112746  000000              MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
042212  112766  000000  000001      MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
042220  012677  152540              MOV     (SP)+, @RHDST   ;TRACK/SECTOR IN RHDST
042224  012777  010000  152536      MOV     #FMT22,@RHOF    ;16 BITS PER WORD
                                                            ;ECC CORRECTION NOT INHIBIT
                                                            ;BECAUSE ECC IS NOT GOING
                                                            ;TO BE CHECKED
042232  005077  152534              CLR     @RHCA           ;CYLINDER 0
042236  004737  045206              JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
042242  104400  005116              TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                            ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
042246  000000                      HALT                    ;STOP THE TEST
042250  013711  015104              MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
042254  005037  015122              CLR     @#ERFLG$        ;CLEAR ERROR FLAG
042260  004737  051456              JSR     PC,@#COMHD      ;READ HEADER AND DATA
                                                            ;IF THERE ARE READ ERRORS THEN
                                                            ;ECC WILL NOT BE CHECKED


                                    ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
                                    ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
                                    ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
                                    ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
                                    ;DETECTED
                                    ;HEADER AND DATA ARE TO BE CHECKED.
```

```
                                                ;IN CHECKING READ DATA THE WRITE FROM BUFFER
                                                ;"WRFROM" IS FILLED WITH EXPECTED DATA AND
                                                ;COMPARISONS ARE MADE

042264  005737  015122            TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
042270  001111                    BNE     TST67           ;BRANCH IF YES
042272  004737  044652            JSR     PC,@#PUTREG     ;SAVE REGISTERS
042276  022737  100000  015032    CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
042304  001401                    BEQ     6$              ;BRANCH IF YES
042306  104032                    ERROR   32              ;32 BIT ECC REGISTER SHOULD BE NON
                                                ;ZERO
                                                ;ONLY 11 OF THE 32 BITS CAN BE SEEN
                                                ;IN THE PATERN REGISTER
                                                ;DCK SHOULD BE SET IN RHER1
042310  013746  047646      6$:   MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
042314  042716  174000            BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
042320  022637  015062            CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
042324  001401                    BEQ     7$              ;BRANCH IF GOOD
042326  104032                    ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT

042330  004037  050270      7$:   JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
042334  000000      8$:   .WORD                           ;EXPECTED POSITION REG. WHEN CORRECTION
                                                ;IS COMPLETE


042336  004737  044652            JSR     PC,@#PUTREG     ;SAVE REGISTERS
042342  022737  100100  015032    CMP     #DCK!ECH,@#ER1  ;WITH ERRORS INSERTED IN BIT POSITION 21
                                                ;THRU 32 HARD ERROR BIT SHOULD SET
042350  001401                    BEQ     9$              ;BRANCH IF GOOD
042352  104036                    ERROR   36              ;WITH ERROR INSERTED IN BIT POSITION 21 THRU
                                                ;32 HCE SHOULD SET


042354              9$:
042354  004737  045376            JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
042360  104400  005116            TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
042364  000000                    HALT                    ;STOP THE TEST AND RESTART PROGRAM
042366  012700  015212            MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
042372  012720  010000            MOV     #0!FMT22,(R0)+  ;CYLINDER 0
042376  112746  000000            MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
042402  112766  000000  000001    MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
042410  012620                    MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
042412  012720  000000            MOV     #0,(R0)+        ;KEY1 IN BUFFER
042416  012720  000000            MOV     #0,(R0)+        ;KEY2 IN BUFFER
042422  012701  000400            MOV     #256.,R1        ;DATA WORD COUNTER
042426  012702  052525            MOV     #52525,R2       ;DATA
042432  010220      3$:   MOV     R2,(R0)+        ;DATA INTO BUFFER
042434  005301                    DEC     R1              ;COUNT
042436  001375                    BNE     3$              ;BRANCH IF 256 NOT DONE


                                                ;ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
                                                ;NOW THE INSERTED ERROR WILL BE PUT IN
```

```
6701
6702  042440  012737  152652  015266          MOV     #152652,@#WRFROM+54;INSERT ERROR IN POSITION 296 THRU 304
6703                                                                     ;IN WORD NUMBER 19 IN DATA
6704  042446  012737  052532  015270          MOV     #52532,@#WRFROM+56;INSERT ERROR IN POSITION 305 THRU 308
6705                                                                     ;IN WORD NUMBER 20 IN DATA
6706
6707  042454  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
6708  042460  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
6709
6710
6711                                          ;NOW READ DATA BUFFER WILL BE CHECKED
6712
6713  042464  004037  046046                  JSR     R0,@#COMPAR     ;CHECK
6714  042470  015212                          WRFROM                  ;GOOD BUFFER
6715  042472  016256                          REINTO                  ;TEST BUFFER
6716  042474  000404                          4+256.                  ;NUMBER OF WORDS CHECKED
6717  042476  042504                          4$                      ;RETURN POINT FOR ERROR HEADER
6718  042500  042510                          5$                      ;RETURN POINT FOR ERROR DATA
6719
6720  042502  042514                          TST67                   ;RETURN FOR GOOD COMPARISON
6721
6722  042504  104004                  4$:     ERROR   4               ;READ NEXT ERROR
6723  042506  000207                          RTS     PC              ;RETURN TO "COMPAR"
6724  042510  104005                  5$:     ERROR   5               ;WORD NOS 1 TO 4 ARE
6725                                                                   ;HEADER WORDS
6726                                                                   ;5 TO 260 ARE DATA WORDS
6727  042512  000207                          RTS     PC              ;RETURN TO "COMPAR"
6728
```

```
6729
6730                                    ;*****************************************************************
6731                                    ;*TEST 67       READ ECC ENABLED 3D
6732
6733                                    ;*      THIS IS AN ECC READ DATA TEST
6734                                    ;*      ERROR CORRECTION IS ENABLED
6735                                    ;*      A NON CORRECTABLE ERROR IS INSERTED IN BIT POSITION 32 AND 4096
6736                                    ;*      4096 IS THE LAST DATA BIT
6737                                    ;*      GOOD DATA USED IS 256 WORDS OF 52525
6738                                    ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
6739                                    ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
6740
6741                                    ;*****************************************************************
6742  042514  000004                    TST67:  SCOPE
6743  042516  012706  001000                    MOV     #STACK,SP       ;RESET STACK
6744
6745  042522  012737  000067  017322            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
6746
6747
6748                                            ;SETUP FOR WHAT IS TO BE READ
6749                                            ;HEADER CRC IS RESTORED FROM A SUBROUTINE
6750
6751  042530  012746  052525                    MOV     #52525,-(SP)    ;DATA TO BE READ
6752  042534  012705  000400                    MOV     #256.,R5        ;COUNTER
6753  042540  012700  053520                    MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
6754  042544  011620                    1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
6755  042546  005305                            DEC     R5              ;COUNT
6756  042550  001375                            BNE     1$              ;BRANCH IF 256 NOT COMPLETE
6757  042552  005726                            TST     (SP)+           ;UNDO -(SP)
6758  042554  022020                            CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
6759  042556  012705  000017                    MOV     #15.,R5         ;1 DATA GAP
6760                                                                    ;14 TOLERANCE GAP
6761  042562  005020                    2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
6762  042564  005305                            DEC     R5              ;TOLERANCE GAP
6763  042566  001375                            BNE     2$              ;BRANCH IF NOT COMPLETE
6764
6765
6766  042570  004737  050442                    JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
6767                                                                    ;IN THE CORRECT PLACE
6768
6769                                            ;THESE ARE FOR ECC TEST ONLY
6770
6771  042574  012737  177777  015140            MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
6772  042602  005037  047660                    CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
6773  042606  013737  047654  047656            MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
6774  042614  013737  047662  047670            MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
6775  042622  005037  047646                    CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
6776  042626  005037  047650                    CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
6777  042632  005037  047664                    CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
6778  042636  005037  047666                    CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
6779
6780
6781                                            ;THESE ARE TO SETUP FOR DISKLESS USE ONLY
6782
```

```
 6783  042642  012737  010000  051602          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
 6784                                                                  ;CYLINDER 0, FORMAT 16 BITS
 6785  042650  112737  000000  051605          MOVB    #0,@#SECOTR+1   ;TRACK 0
 6786  042656  112737  000000  051604          MOVB    #0,@#SECOTR     ;SECTOR 0
 6787  042664  012737  000000  051606          MOV     #0,@#KEY1       ;KEY1=0
 6788  042672  012737  000000  051610          MOV     #0,@#KEY2       ;KEY2=0
 6789  042700  012737  000400  051662          MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
 6790  042706  005037  051612                  CLR     @#X             ;THIS IS A READ COMMAND
 6791  042712  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
 6792  042716  051602                          CYL
 6793  042720  053502                          MCRC
 6794
 6795
 6796                                          ;THIS IS TO INSERT ERROR
 6797                                          ;THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
 6798                                          ;THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
 6799                                          ;THIS MOVE
 6800
 6801  042722  012737  152525  053522          MOV     #152525,@#DISK+2  ;FORCE ERROR ON BIT NUMBER 32
 6802  042730  012737  152525  054516          MOV     #152525,@#DISK+<255.*2>;FORCE ERROR IN BIT 4096
 6803  042736  012737  010040  043112          MOV     #4128.,@#8$     ;INSERT POSITION REG.
 6804
 6805
 6806                                          ;THESE ARE REGULAR SETUPS
 6807
 6808  042744  004737  045152                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
 6809  042750  012777  177374  151774          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
 6810  042756  012777  016256  151770          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
 6811  042764  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
 6812  042770  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
 6813  042776  012677  151762                  MOV     (SP)+, @RHDST   ;TRACK/SECTOR IN RHDST
 6814  043002  012777  010000  151760          MOV     #FMT22,@RHOF    ;16 BITS PER WORD
 6815                                                                  ;ECC CORRECTION NOT INHIBIT
 6816                                                                  ;BECAUSE ECC IS NOT GOING
 6817                                                                  ;TO BE CHECKED
 6818  043010  005077  151756                  CLR     @RHCA           ;CYLINDER 0
 6819
 6820  043014  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
 6821  043020  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
 6822                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
 6823  043024  000000                          HALT                    ;STOP THE TEST
 6824
 6825  043026  013711  015174                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
 6826  043032  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
 6827  043036  004737  051456                  JSR     PC,@#COMHD      ;READ HEADER AND DATA
 6828                                                                  ;IF THERE ARE READ ERRORS THEN
 6829                                                                  ;ECC WILL NOT BE CHECKED
 6830
 6831
 6832                                          ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
 6833                                          ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
 6834                                          ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
 6835                                          ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
 6836                                          ;DETECTED
```

```
6837                                                    ;HEADER AND DATA ARE TO BE CHECKED.
6838                                                    ;IN CHECKING READ DATA THE WRITE FROM BUFFER
6839                                                    ;"WRFROM" IS FILLED WITH EXPECTED DATA AND
6840                                                    ;COMPARISONS ARE MADE
6841
6842  043042  005737  015122            TST     @#ERFLG$      ;ANY ERRORS ALREADY THERE
6843  043046  001111                    BNE     TST7D         ;       BRANCH IF YES
6844  043050  004737  044652            JSR     PC,@#PUTREG   ;SAVE REGISTERS
6845  043054  022737  100000  015032    CMP     #DCK,@#ER1    ;ONLY DATA CHECK ERROR SHOULD BE SET
6846  043062  001401                    BEQ     6$            ;BRANCH IF YES
6847  043064  104032                    ERROR   32            ;32 BIT ECC REGISTER SHOULD BE NON
6848                                                          ;ZERO
6849                                                          ;ONLY 11 OF THE 32 BITS CAN BE SEEN
6850                                                          ;IN THE PATERN REGISTER
6851                                                          ;DCK SHOULD BE SET IN RHER1
6852  043066  013746  047646    6$:     MOV     @#GECC1,-(SP) ;GET PATTERN REGISTER
6853  043072  042716  174000            BIC     #174000,(SP)  ;KEEP ONLY 11 BITS
6854  043076  022637  015062            CMP     (SP)+,@#EC2   ;COMPARE PATTERN REGISTER
6855  043102  001401                    BEQ     7$            ;BRANCH IF GOOD
6856  043104  104032                    ERROR   32            ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT
6857
6858  043106  004037  050270    7$:     JSR     R0,@#ECORR    ;GO TO ECC CORRECTION PROCESS
6859  043112  000000    8$:     .WORD                         ;EXPECTED POSITION REG. WHEN CORRECTION
6860                                                          ;IS COMPLETE
6861
6862
6863
6864  043114  004737  044652            JSR     PC,@#PUTREG   ;SAVE REGISTERS
6865  043120  022737  100100  015032    CMP     #DCK!ECH,@#ER1 ;WITH ERRORS INSERTED IN BIT POSITION 32
6866                                                          ;AND 4096 HARD ERROR BIT SHOULD SET
6867  043126  001401                    BEQ     9$            ;BRANCH IF GOOD
6868  043130  104036                    ERROR   36            ;WITH ERROR INSERTED IN BIT POSITION 21 THRU
6869                                                          ;32 HCE SHOULD SET
6870
6871
6872
6873
6874  043132                    9$:
6875  043132  004737  045376            JSR     PC,@#CHECKE   ;CHECK THAT DVA,RDY,DPR,DRY = 1
6876  043136  104400  005116            TYPE    ,CPHALT       ;CANNOT CONTINUE IF THEY DON'T
6877  043142  000000                    HALT                  ;STOP THE TEST AND RESTART PROGRAM
6878  043144  012700  015212            MOV     #WRFROM,R0    ;GETTING READY TO FILL EXPECTED DATA
6879  043150  012720  010000            MOV     #0!FMT22,(R0)+ ;CYLINDER 0
6880  043154  112746  000000            MOVB    #0,-(SP)      ;IN LOWER BYTE GET SECTOR
6881  043160  112766  000000  000001    MOVB    #0,1(SP)      ;GET TRACK IN HIGHER BYTE
6882  043166  012620                    MOV     (SP)+,(R0)+   ;GET TRACK/SECTOR IN BUFFER
6883  043170  012720  000000            MOV     #0,(R0)+      ;KEY1 IN BUFFER
6884  043174  012720  000000            MOV     #0,(R0)+      ;KEY2 IN BUFFER
6885  043200  012701  000400            MOV     #256.,R1      ;DATA WORD COUNTER
6886  043204  012702  052525            MOV     #52525,R2     ;DATA
6887  043210  010220            3$:     MOV     R2,(R0)+      ;DATA INTO BUFFER
6888  043212  005301                    DEC     R1            ;COUNT
6889  043214  001375                    BNE     3$            ;BRANCH IF 256 NOT DONE
6890
```

```
                                        ;ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
                                        ;NOW THE INSERTED ERROR WILL BE PUT IN
                                        
043216  012737  152525  015224         MOV     #152525,@#WRFROM+(5*2)  ;INSERTED ERROR IN BIT 32
043224  012737  152525  016220         MOV     #152525,@#WRFROM+(259.*2)  ;INSERT ERROR IN BIT 4096
                                        
043232  005037  015122                 CLR     @#ERFLG$        ;CLEAR ERROR FLAG
043236  004737  044652                 JSR     PC,@#PUTREG     ;SAVE REGISTERS
                                        
                                        ;NOW READ DATA BUFFER WILL BE CHECKED
                                        
043242  004037  046046                 JSR     R0,@#COMPAR     ;CHECK
043246  015212                         WRFROM                  ;GOOD BUFFER (CHANGED)
043250  016256                         REINTO                  ;TEST BUFFER
043252  000404                         4+256.                  ;NUMBER OF WORDS CHECKED
043254  043262                         4$                      ;RETURN POINT FOR ERROR HEADER
043256  043266                         5$                      ;RETURN POINT FOR ERROR DATA
                                        
043260  043272                         TST70                   ;RETURN FOR GOOD COMPARISON
                                        
043262  104004                 4$:     ERROR   4               ;READ NEXT ERROR
043264  000207                         RTS     PC              ;RETURN TO "COMPAR"
043266  104005                 5$:     ERROR   5               ;WORD NOS 1 TO 4 ARE
                                                               ;HEADER WORDS
                                                               ;5 TO 260 ARE DATA WORDS
043270  000207                         RTS     PC              ;RETURN TO "COMPAR"
```

```
                                        .SBTTL  CURSORY INTERRUPT LOGIC TESTS


                                ;*****************************************************************
                                ;*TEST 70        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
                                ;*****************************************************************
043272  000004                  TST70:  SCOPE

043274  012737  000070  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
043302  012706  001000                  MOV     #STACK,SP       ;RESET STACK

043306  004737  045152                  JSR     PC,@#CLDISK     ;CLEAR DISK
043312  013700  014746                  MOV     @#RPVEC,R0      ;GET VECTOR ADDRESS
043316  012720  043364                  MOV     #RPTRP1,(R0)+   ;SET INTERRUPT VECTOR
043322  012710  000340                  MOV     #340,(R0)       ;SET SERVICE ROUTINE PRIORITY
043326  012767  000200  134442          MOV     #200,PS         ;SET PROCESSOR PRIORITY
043334  012711  000300                  MOV     #RDY!IE,@R1     ;RDY, IE IN RHSC1 SHOULD CAUSE INTERRUPT
043340  013737  045522  001172          MOV     @#TIMCNT,@#STMP1;COUNTER
043346  005337  001172          1$:     DEC     @#STMP1         ;WAIT FOR INTERRUPT
043352  001375                  BNE     1$                      ;BRANCH IF NOT ZERO
                                                                ;BEFORE THIS IS ZERO INTERRUPT SHOULD
                                                                ;OCCUR
043354  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
043360  104021                  ERROR   21                      ;INTERRUPT DID NOT OCCUR

043362  000410                  BR      TST71                   ;       BRANCH TO NEXT TEST

043364  022626          RPTRP1: CMP     (SP)+,(SP)+             ;RESTORE STACK
043366  004737  044652          JSR     PC,@#PUTREG             ;SAVE REGISTERS
043372  022737  004200  015030          CMP     #DVA!RDY,@#CS1  ;'IE' SHOULD BE LOW
043400  001401                  BEQ     TST71                   ;       BRANCH IF GOOD
043402  104021                  ERROR   21                      ;INTERRUPT OCCURRED BUT
                                                                ;'IE' FAILED TO RESET
```

```
                                        ;*********************************************************************
                                        ;*TEST 71        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
                                        ;*********************************************************************
043404  000004                  TST71:  SCOPE

043406  012737  000071  017322          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
043414  012706  001000                  MOV     #STACK,SP       ;RESET STACK

043420  004737  045152                  JSR     PC,@#CLDISK     ;CLEAR DISK
043424  013700  014746                  MOV     @#RPVEC,R0      ;GET VECTOR ADDRESS
043430  012720  043470                  MOV     #RPTRP2,(R0)+   ;SET INTERRUPT VECTOR
043434  012710  000340                  MOV     #340,(R0)       ;SET SERVICE ROUTINE PRIORITY
043440  012767  000240  134330          MOV     #240,PS         ;SET PROCESSOR PRIORITY
043446  012711  000300                  MOV     #RDY!IE,@R1     ;RDY, IE IN RHSC1 SHOULD CAUSE INTERRUPT
043452  013737  045522  001172          MOV     @#TIMCNT,@#STMP1;COUNTER
043460  005337  001172          1$:     DEC     @#STMP1         ;WAIT FOR INTERRUPT
043464  001375                  BNE     1$                      ;BRANCH IF NOT ZERO
                                                                ;BEFORE THIS IS ZERO INTERRUPT SHOULD
                                                                ;OCCUR
043466  000404                  BR      TST72                   ;       NO INTERRUPT SO BRANCH

043470  022626                  RPTRP2: CMP     (SP)+,(SP)+     ;RESTORE STACK
043472  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
043476  104021                          ERROR   21              ;INTERRUPT OCCURRED WITH
                                                                ;PROCESSOR STATUS SAME
                                                                ;AS DISK
```

```
                                ;*****************************************************************
                                ;*****************************************************************
                                ;*TEST 72        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 PASS IS REACHED ONLY AFTER ALL DRIVES ARE COMPLETE

                                ;*****************************************************************
043500  000004                  TST72:  SCOPE
043502  012767  000001  135474          MOV     #1,$TIMES       ;;DO 1 ITERATION
043510  004737  045152                  JSR     PC,@#CLDISK
043514  012767  000000  134254          MOV     #0,PS           ;REINSTATE PS TO 0
043522  104400  043530                  TYPE    .+4             ;;TYPE ASCIZ STRING
043526  000425                          BR      64$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/TOTAL ERRORS ON THIS PASS ON  UNIT NO. /
043602                          64$:
043602  013746  015110                  MOV     @#UNIT,-(SP)    ;GET READY TO TYPE UNIT NUMBER
043606  104410                          TYPDS
043610  104400  043616                  TYPE    .+4             ;;TYPE ASCIZ STRING
043614  000402                          BR      65$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        /= /
043622                          65$:
043622  013746  001112                  MOV     @#$ERTTL,-(SP)  ;GET READY TO TYPE NUMBER OF ERRORS
043626  104410                          TYPDS
043630  005037  001112                  CLR     @#$ERTTL        ;CLEAR TOTAL NUMBER OF ERRORS
043634  005737  015116                  TST     @#SELECT        ;STARTING FROM 200 ?
043640  001415                          BEQ     3$              ;BRANCH IF YES
043642  005067  135234                  CLR     $TSTNM          ;CLEAR TEST NUMBER
043646  005237  001100                  INC     @#$PASS         ;INCREASE PASS COUNT
043652  104400  044050                  TYPE    ,$ENDMG         ;TYPE END PASS #
043656  013746  001100                  MOV     @#$PASS,-(SP)
043662  104410                          TYPDS
043664  104400  044065                  TYPE    ,$ENULL
043670  000137  022440                  JMP     @#TST5          ;JUMP TEST 5
043674  005337  015112          3$:     DEC     @#NOUNITS       ;NO. OF UNITS PRESENT DECREMENT
043700  001413                          BEQ     $EOP            ;BRANCH IF ALL DRIVES COMPLETE
043702  013700  015110                  MOV     @#UNIT,R0       ;UNIT UNDER TEST
043706  012701  015070                  MOV     #UNITS,R1       ;TABLE
043712  022100                  1$:     CMP     (R1)+,R0        ;IS THIS UNIT JUST TESTED
043714  001401                          BEQ     2$              ;BRANCH IF YES
043716  000775                          BR      1$              ;BRANCH IF NO
043720  011137  015110          2$:     MOV     (R1),@#UNIT     ;THIS IS NEXT UNIT
043724  000137  022440                  JMP     @#TST5          ;GO FOR NEXT TESTS.
```

```
                                        .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

043730                          $EOP:
043730  000004                          SCOPE
043732  005067  135144                 CLR     $TSTNM          ;;ZERO THE TEST NUMBER
043736  005067  135242                 CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
043742  005267  135132                 INC     $PASS           ;;INCREMENT THE PASS NUMBER
043746  042767  100000  135124         BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
043754  005327                         DEC     (PC)+           ;;LOOP?
043756  000001                  $EOPCT: .WORD   1
043760  003031                         BGT     $DOAGN          ;;YES
043762  012737                         MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
043764  000001                  $ENDCT: .WORD   1
043766  043756                         $EOPCT
043770  104400  044050                 TYPE    ,$ENDMG         ;;TYPE "END PASS #"
043774  016746  135100                 MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
044000  104410                         TYPOS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
044002  104400  044065                 TYPE    ,$ENULL         ;;TYPE A NULL CHARACTER
044006  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
044012  001414                         BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
044014  022700  044034                 CMP     #$ENDAD,R0      ;;IS MONITOR ACT11?
044020  001004                         BNE     $RESET          ;;NO--BRANCH (IT'S XXDP)
044022  022760  177777  000002         CMP     #-1,2(R0)       ;;YES--IS THIS THE LAST PASS?
044030  001001                         BNE     $ENDAD          ;;NO--MAKE ANOTHER PASS
044032  000005                  $RESET: RESET                   ;;CLEAR THE WORLD
044034  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
044036  000240                         NOP                     ;;SAVE ROOM
044040  000240                         NOP                     ;;FOR
044042  000240                         NOP                     ;;ACT11
044044  000137  020744          $DOAGN: JMP     @#TST1          ;;RETURN
044050  005015  047105  020104  $ENDMG: .ASCIZ  <15><12>/END PASS #/
044056  040520  051523  021440
044064     000
044065     377     377     000  $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
```

```
                                ;*****************************************************************
                                ;*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.
                                ;*****************************************************************

044070  000000                  TESTAD: 0                       ;FIRST ADDRESS OF TEST

044072                          OPERSEL:
044072  005067  133700                  CLR     PS              ;MAKE PROCESSOR STATUS ZERO
044076  104400  044104                  TYPE    .+4             ;;TYPE ASCIZ STRING
044102  000421                          BR      64$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/THE PROGRAM WAS IN TEST NUMBER /
044146                          64$:
044146  013746  017322                  MOV     @#TSTNM,-(SP)   ;GET READY TO TYPE TEST
044152  104402                          TYPOC                   ;NUMBER
044154  104400  044162                  TYPE    .+4             ;;TYPE ASCIZ STRING
044160  000414                          BR      65$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/THE LOOP BACK PC WAS /
044212                          65$:
044212  013746  001110                  MOV     @#$LPERR,-(SP)  ;GET READY TO TYPE LOOP BACK PC
044216  104402                          TYPOC
044220  104400  001215                  TYPE    ,$CRLF
044224  104400  044232                  TYPE    .+4             ;;TYPE ASCIZ STRING
044230  000426                          BR      66$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/SET LOOP ON ERROR OR LOOP ON TEST SWITCH/
044306                          66$:
044306  104400  044314                  TYPE    .+4             ;;TYPE ASCIZ STRING
044312  000420                          BR      67$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/TYPE THE FIRST PC OF THE TEST/
044354                          67$:
044354  104400  044362                  TYPE    .+4             ;;TYPE ASCIZ STRING
044360  000423                          BR      68$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/ FOLLOWED BY A CARRIAGE RETURN  /<15><12>
044430                          68$:
044430  104416                          RDOCT
044432  062716  000002                  ADD     #2,(SP)         ;GET LPADR
044436  012637  001106                  MOV     (SP)+,@#$LPADR
```

```
7144  044442  104400  044450                TYPE    ,.+4            ;;TYPE ASCIZ STRING
7145  044446  000417                        BR      69$             ;;GET OVER THE ASCIZ
7146                                        ;;.ASCIZ    <15><12>/TYPE THE PC WHERE YOU WANT/
7147  044506                          69$:
7148  044506  104400  044514                TYPE    ,.+4            ;;TYPE ASCIZ STRING
7149  044512  000441                        BR      70$             ;;GET OVER THE ASCIZ
7150                                        ;;.ASCIZ    <15><12>/ THE PROGRAM TO LOOP BACK TO FOLLOWED BY A CARRIAGE RETUR
7151  044616                          70$:
7152  044616  104416                        RDOCT
7153  044620  012637  001110                MOV     (SP)+,@#$LPERR  ;GET LPERR
7154  044624  013746  001106                MOV     @#$LPADR,-(SP)
7155                                        ;THIS CLEARS UP GARBAGE
7156  044630  005037  051716                CLR     @#NOSYNC                ;CLEAR FLAG FOR HEADER ERROR COMMANDS
7157  044634  005037  015140                CLR     @#TSECC                 ;CLEAR FLAG FOR ECC TEST
7158                                                                        ;WHEN =177777 IT IS AN ECC TEST
7159                                                                        ;WHEN =0 IT IS NOT AN ECC TEST
7160
7161  044640  005037  047652                CLR     @#TSECCG                ;EVEN IN AN ECC TEST EVERY CLOCK
7162                                                                        ;IS NOT TO GENERATE ECC
7163                                                                        ;IF =177777 GENERATE ECC
7164                                                                        ;IF =0 DO NOT GENERATE ECC
7165  044644  005037  015142                CLR     @#TESDTE                ;DRIVE TIMING ERROR TEST
7166  044650  000002                        RTI
```

```
                                        .SBTTL  SAVE REGISTERS ROUTINE

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

044652                          PUTREG:
044652  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
044654  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
044656  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
044660  012700  014752                  MOV     #RHWC,R0        ;STARTING ADDRESS OF REG
044664  012701  015022                  MOV     #WC,R1          ;STARTING ADDRESS OF SAVE LOCATIONS
044670  012702  000023                  MOV     #RHCC-RHWC+2/2,R2 ;NUMBER OF REG. INTO R2
044674  013021                  10$:    MOV     @(R0)+,(R1)+    ;SAVE HARDWARE REG.
044676  005302                          DEC     R2
044700  001375                          BNE     10$
044702  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
044704  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
044706  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
044710  000207                          RTS     PC
```

```
                                        .SBTTL  FLOAT 1 AND 0

                                ;*****************************************************************
                                ;*FLOAT A ONE AND A ZERO THRU A DESIGNATED REGISTER
                                ;*ABSOLUTE ADDRESS OF REG. UNDER TEST IS IN R4
                                ;*****************************************************************

044712  000000                MASK:   0                       ;BITS UNDER TEST
044714  000000                LERR:   0                       ;ERROR HLT ADDRESS
044716  000000                REGADR: 0

044720  012567  177766        BITST:  MOV     (R5)+,  MASK    ;FETCH DATA MASK
044724  012504                        MOV     (R5)+,  R4      ;GET ADDRESS OF REG. UNDER TEST
044726  010467  177764                MOV     R4,     REGADR
044732  010567  177756                MOV     R5,     LERR    ;GET ERROR RETURN ADDR.
044736  062705  000004                ADD     #4,     R5      ;MODIFY RETURN ADDR. TO JUMP OVER RTS
044742  012703  000001                MOV     #1,     R3      ;INITIALIZE DATA PATTERN
044746  004767  000016        BLT1:   JSR     PC,     BLT2    ;OUTPUT FLOATING ZERO
044752  004767  000012                JSR     PC,     BLT2    ;OUTPUT FLOATING ONE
044756  000241                        CLC
044760  006103                        ROL     R3              ;SHIFT PATTERN
044762  005703                        TST     R3
044764  001370                        BNE     BLT1            ;BRANCH IF NOT COMPLETE
044766  000205                        RTS     R5              ;RETURN TO TEST
044770  005103                BLT2:   COM     R3              ;COMPLEMENT PATTERN
044772  012737  045000  045132        MOV     #BLT3,  @#LAD   ;SET SCOPE LOOP
045000  010337  001124        BLT3:   MOV     R3,@#$GDDAT     ;STORE GOOD DATA
045004  005137  044712                COM     @#MASK          ;AND MASK WITH PATTERN
045010  043737  044712  001124        BIC     @#MASK, @#$GDDAT;CLEAR THE REST
045016  005137  044712                COM     @#MASK          ;RESTORE MASK
045022  013714  001124                MOV     @#$GDDAT,(R4)   ;OUTPUT TO REGISTER
045026  011437  001126                MOV     (R4),@#$BDDAT   ;INPUT FROM REGISTER
045032  005137  044712                COM     @#MASK
045036  043737  044712  001126        BIC     @#MASK,@#$BDDAT ;AND MASK OUT RECE_VED DATA
045044  005137  044712                COM     @#MASK          ;RESTORE MASK
045050  023737  001124  001126        CMP     @#$GDDAT,@#$BDDAT;IS DATA CORRECT
045056  001403                        BEQ     1$              ;BRANCH IF GOOD
045060  004777  177630                JSR     PC,     @LERR   ;GO TO REPORT ERROR
045064  104420                        SCOP1                   ;LOCAL SCOPE LOOP
045066  000207                1$:     RTS     PC
```

```
                                .SBTTL  CLEAR MEMORY ROUTINE


                        ;*****************************************************************
                        ;*      THIS CLEARS ANY BLOCK OF MEMORY
                        ;*      FILLING IT WITH ANY DATA
                        ;*
                        ;*      CALL
                        ;*      JSR     R0,CLAREA
                        ;*      X                       ;STARTING ADDRESS OF BLOCK
                        ;*      Y
                        ;*      Z                       ;DATA TO BE FILLED
                        ;*R1 WILL HAVE STARTING ADDRESS OF BLOCK TO BE FILLED
                        ;*R2 AFTER SUBTRACTION WILL HAVE TWICE NUMBER OF LOCATIONS
                        ;*R3 WILL HAVE DATA TO BE FILLED
                        ;*TO AVOID DIVIDE ROUTINE TWO DECREMENT R2 WILL BE USED
                        ;*****************************************************************

045070                  CLAREA:
045070  010146          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
045072  010246          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
045074  010346          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
045076  012001          MOV     (R0)+,R1        ;FROM
045100  012002          MOV     (R0)+,R2        ;TO
045102  012003          MOV     (R0)+,R3        ;DATA
045104  160102          SUB     R1,R2           ;NO. OF LOCATIONS MINUS TWO
045106  062702  000002  ADD     #2,R2           ;GET TWICE NO OF LOCATIONS
045112  010321          1$:     MOV     R3,(R1)+        ;MOVE IN DATA
045114  005302          DEC     R2
045116  005302          DEC     R2
045120  001374          BNE     1$              ;BRANCH IF NOT COMPLETE
045122  012603          MOV     (SP)+,R3        ;;POP STACK INTO R3
045124  012602          MOV     (SP)+,R2        ;;POP STACK INTO R2
045126  012601          MOV     (SP)+,R1        ;;POP STACK INTO R1
045130  000200          RTS     R0              ;RETURN
```

```
                                        .SBTTL  LOCAL TRAPS
045132  000000                  LAD:    0

045134  032737  001000  177570  T.SCOP: BIT     #SW09,  @#SWR
045142  001402                          BEQ     1$
045144  013716  045132                  MOV     @#LAD,  (SP)
045150  000002                  1$:     RTI

                                ;*EXAMPLE OF THE USE OF THE ABOVE
                                ;*THIS WILL LOOP BETWEEN X: AND SCOP1 PROVIDED THERE IS NO "NEWTST"
                                ;*MOV   #X,     @#LAD
                                ;*X:    ---     ---
                                ;*      ---     ---
                                ;*      ---     ---
                                ;*      SCOP1

                                        .SBTTL  CLEAR DISK ROUTINE

045152  013701  014760          CLDISK: MOV     @#RHCS1,R1      ;R1 WILL BE CONTROL AND STATUS1
045156  013702  014756                  MOV     @#RHCS2,R2      ;R2 WILL BE CONTROL AND STATUS2
045162  013703  015002                  MOV     @#RHDS1,R3      ;R3 WILL BE DISK STATUS REGISTER1
045166  013704  014762                  MOV     @#RHER1,R4      ;R4 WILL BE ERROR REGISTER #1

045172  012712  000040                  MOV     #CLR,@R2        ;CLEAR ALL REG.
045176  013712  015110                  MOV     @#UNIT,@R2      ;REINSTATE UNIT NO.
045202  005011                          CLR     @R1             ;CLEAR FUNCTION BITS
045204  000207                          RTS     PC
```

```
7300
7301                                        .SBTTL  CHECK DISK STATUS ROUTINES
7302
7303                                ;*****************************************************************
7304                                ;*THIS CHECKS THAT DEVICE AVAILABLE (DVA) AND READY (RDY) IN RHCS1 = 1
7305                                ;*AND CHECKS THAT DEVICE PRESENT (DPR), DEVICE READY (DRY) IN RHDS1 = 1
7306                                ;*IT ALSO CHECKS THAT ALL OTHER BITS IN THESE REGISTERS = 0
7307                                ;*****************************************************************
7308
7309
7310  045206  011637  015130        CHECKT: MOV     (SP),@#PCJSR    ;SAVE PC OF JSR+4
7311  045212  162737  000004  015130        SUB     #4,@#PCJSR      ;GET PC OF JSR
7312  045220  004737  044652                JSR     PC,@#PUTREG     ;SAVE REGISTERS
7313  045224  022737  004200  015030        CMP     #DVA!RDY,@#CS1  ;RHCS1 SHOULD HAVE DEVICE AVAILABLE
7314                                                                ;AND BE READY
7315  045232  001423                        BEQ     3$              ;BRANCH IF GOOD TO RHDS1 CHECK
7316
7317  045234  032737  004000  015030        BIT     #DVA,@#CS1      ;BAD SO TEST DEVICE AVAILABLE
7318  045242  001004                        BNE     1$              ;TEST READY IF DVA THERE
7319  045244  010137  001122                MOV     R1,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHCS1)
7320  045250  104026                        ERROR   26              ;RHCS1 DID NOT HAVE DEVICE
7321                                                                ;AVAILABLE AT START OF TEST
7322  045252  000413                        BR      3$              ;BRANCH TO RHDS1 CHECK
7323
7324  045254  032737  000200  015030  1$:   BIT     #RDY,@#CS1      ;TEST READY
7325  045262  001003                        BNE     2$              ;IF RDY THERE BRANCH
7326  045264  010137  001122                MOV     R1,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHCS1)
7327  045270  104026                        ERROR   26              ;RHCS1 DID NOT HAVE READY
7328                                                                ;AT THE START OF TEST
7329  045272  000403                2$:     BR      3$              ;BRANCH TO NEXT COMPARE
7330  045274  010137  001122                MOV     R1,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHCS1)
7331  045300  104026                        ERROR   26              ;RHCS1 HAD SOME BITS OTHER
7332                                                                ;THAN DVA AND RDY SET
7333                                                                ;ALL OTHER BITS SHOULD BE 0
7334                                                                ;AT START OF TEST
7335
7336  045302  013746  015052        3$:     MOV     @#DS1,-(SP)     ;GET RHDS1
7337  045306  042716  001100                BIC     #VV!PROG,(SP)   ;CLEAR VV AND PROGRAMABLE BIT
7338  045312  022726  000600                CMP     #DPR!DRY,(SP)+  ;RHDS1 SHOULD HAVE THESE SET
7339  045316  001424                        BEQ     8$              ;RETURN TO TEST IF GOOD
7340
7341  045320  032737  000400  015052  4$:   BIT     #DPR,@#DS1      ;BAD SO TEST DRIVE PRESENT
7342  045326  001004                        BNE     5$              ;CHECK DRY IF GOOD
7343  045330  010337  001122                MOV     R3,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHDS1)
7344  045334  104026                        ERROR   26              ;RHDS1 DOES NOT HAVE DPR
7345  045336  000413                        BR      7$              ;BRANCH OUT
7346  045340  032737  000200  015052  5$:   BIT     #DRY,@#DS1      ;TEST DRIVE READY
7347  045346  001004                        BNE     6$              ;IF DPR WAS THERE SO BRANCH
7348  045350  010337  001122                MOV     R3,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHDS1)
7349  045354  104026                        ERROR   26              ;RHDS1 DOES NOT HAVE DRY
7350  045356  000403                        BR      7$              ;BRANCH OUT
7351  045360  010337  001122        6$:     MOV     R3,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHDS1)
7352  045364  104026                        ERROR   26              ;RHDS1 HAS SOME BITS OTHER
7353                                                                ;THAN MCL, DRY, DPR, SET
```

```
7354
7355  045366  000207                    7$:     RTS     PC              ;ALL OTHER BITS SHOULD BE 0
                                                                        ;RETURN TO TEST AND HALT - FATAL ERROR
7356
7357  045370  062716  000006            8$:     ADD     #6,(SP)         ;ADJUST STACK PTR TO GET OVER HALT IN TEST
7358  045374  000207                            RTS     PC              ;RETURN TO TEST AND CONTINUE TESTING
7359
7360
7361                                    ;*****************************************************************
7362                                    ;*THIS CHECKS THAT DEVICE AVAILABLE (DVA) AND READY (RDY) IN RHCS1 = 1
7363                                    ;*AND CHECKS THAT DEVICE PRESENT (DPR), DEVICE READY (DRY) IN RHDS1 = 1
7364                                    ;*IT DOES NOT CHECK THAT OTHER BITS IN THESE REGISTERS = 0
7365                                    ;*****************************************************************
7366
7367  045376  011637  015130            CHECKE: MOV     (SP),@#PCJSR    ;SAVE PC OF JSR+4
7368  045402  162737  000004  015130            SUB     #4,@#PCJSR      ;GET PC OF JSR
7369  045410  004737  044652                    JSR     PC,@#PUTREG     ;SAVE REGISTERS
7370  045414  032737  000200  015030            BIT     #RDY,@#CS1      ;RHCS1 SHOULD HAVE DEVICE AVAILABLE
7371                                                                    ;AND BE READY
7372  045422  001004                            BNE     1$              ;BRANCH IF GOOD
7373  045424  010137  001122                    MOV     R1,@#$BDADR     ;FAILING REGISTER
7374  045430  104026                            ERROR   26              ;RHCS1 IS IN ERROR
7375                                                                    ;DOES NOT HAVE DVA, RDY
7376  045432  000427                            BR      4$              ;BRANCH
7377
7378  045434  032737  004000  015030  1$:     BIT     #DVA,@#CS1      ;RHCS1 SHOULD HAVE DEVICE AVAILABLE
7379                                                                    ;AND BE READY
7380  045442  001004                            BNE     2$              ;BRANCH IF GOOD
7381  045444  010137  001122                    MOV     R1,@#$BDADR     ;FAILING REGISTER
7382  045450  104026                            ERROR   26              ;RHCS1 IS IN ERROR
7383                                                                    ;DOES NOT HAVE DVA, RDY
7384  045452  000417                            BR      4$              ;BRANCH OUT
7385  045454  032737  000200  015052  2$:     BIT     #DRY,@#DS1      ;RHDS1 SHOULD HAVE DPR,DRY
7386  045462  001004                            BNE     3$              ;BRANCH IF THERE
7387  045464  010337  001122                    MOV     R3,@#$BDADR     ;FAILING REGISTER RHDS1
7388  045470  104026                            ERROR   26              ;RHDS1 DOES NOT HAVE DPR,DRY
7389  045472  000407                            BR      4$              ;BRANCH OUT
7390  045474  032737  000400  015052  3$:     BIT     #DPR,@#DS1      ;RHDS1 SHOULD HAVE DPR,DRY
7391  045502  001004                            BNE     5$              ;BRANCH IF THERE
7392  045504  010337  001122                    MOV     R3,@#$BDADR     ;FAILING REGISTER RHDS1
7393  045510  104026                            ERROR   26              ;RHDS1 DOES NOT HAVE DPR,DRY
7394  045512  000207                    4$:     RTS     PC              ;RETURN TO TEST AND HALT - FATAL ERROR
7395
7396  045514  062716  000006            5$:     ADD     #6,(SP)         ;ADJUST STACK TO GET OVER HALT IN TEST
7397  045520  000207                            RTS     PC              ;RETURN TO TEST AND CONTINUE TESTING
```

```
7398
7399                                    .SBTTL  WAIT LOOP
7400                                ;*********************************************************************
7401                                ;*      WAIT LOOP
7402                                ;*      ONE  LOOP OR ONE COUNT = 5.15 MICROSEC WITH BIPOLAR MEMORY (MIN)
7403                                ;*      ONE LOOP OR ONE COUNT = 11.86 MICROSEC WITH CORE (MIN)
7404                                ;*      WITH CORE ERROR IS INDICATED AFTER ABOUT 650 MILLISEC (MIN)
7405                                ;*********************************************************************
7406
7407  045522  177777                TIMCNT: 177777                  ;WAITING COUNT
7408
7409  045524  010046                WAIT.T: MOV     R0,-(SP)        ;SAVE R0
7410  045526  016600  000002                MOV     2(SP),R0        ;GET ADRESS OF REG. ADDRESS
7411  045532  010037  001176                MOV     R0,@#$TMP3      ;WAT PC+2 IN $TMP3
7412  045536  162737  000002  001176        SUB     #2,@#$TMP3      ;WAT PC FOR TYPEOUT
7413  045544  012037  001170                MOV     (R0)+,@#$TMP0   ;WAIT REGISTER ADDRESS
7414  045550  012037  001172                MOV     (R0)+,@#$TMP1   ;WAIT ON BIT
7415  045554  010066  000002                MOV     R0,2(SP)        ;RESTORE RETURN ON STACK
7416  045560  012600                        MOV     (SP)+,R0        ;RESTORE R0
7417  045562  013737  045522  001174        MOV     @#TIMCNT,@#$TMP2;TEMPORARY COUNT
7418
7419  045570  033777  001172  133372  1$:   BIT     @#$TMP1,@$TMP0  ;IS REQUIRED BIT THERE?
7420  045576  001021                        BNE     2$              ;BRANCH IF YES
7421  045600  005337  001174                DEC     @#$TMP2         ;COUNT
7422  045604  001371                        BNE     1$              ;BRANCH IF NOT TIME UP
7423  045606  013737  045522  001174        MOV     @#TIMCNT,@#$TMP2;TEMPORARY COUNT
7424  045614  033777  001172  133346  3$:   BIT     @#$TMP1,@$TMP0  ;IS REQUIRED BIT THERE?
7425  045622  001007                        BNE     2$              ;BRANCH IF YES
7426  045624  005337  001174                DEC     @#$TMP2         ;COUNT
7427  045630  001371                        BNE     3$              ;BRANCH IF NOT TIME UP
7428  045632  017737  133332  001126        MOV     @$TMP0,@#$BDDAT ;REGISTER CONTENTS
7429  045640  104016                        ERROR   16              ;WAITED ON BIT FAILED TO SET
7430  045642  000002                2$:     RTI
7431
7432
7433                                ;*      CALL FOR THE ABOVE WAITLOOP IS
7434                                ;*
7435                                ;*      MOV     @A,@#X$         ;A CONTAINS REGISTER ADDRESS
7436                                ;*      -       -       -       ;HENCE X$ WILL HAVE ABSOLUTE REG. ADR.
7437                                ;*      -       -       -
7438                                ;*      -       -       -
7439                                ;*      WAT
7440                                ;*X$:   0                       ;ABSOLUTE REG. ADDRESS UNDER WAIT
7441                                ;*      .WORD   0               ;BIT WAITED FOR
7442                                ;*                              ;CONTINUE
```

```
                                        .SBTTL  SAVE ROUTINE

                                ;*****************************************************************
                                        ;THIS IS A SUBROUTINE TO READ & SAVE REGISTERS
                                        ;IN THE REGISTER TABLE TO ANY LOCATION
                                        ;THE CALL IS
                                        ;JSR     R0,@#SAVER
                                        ;FROM
                                        ;TO
                                        ;NUMBER OF WORDS SAVED
                                ;*****************************************************************

045644                          SAVER:
045644  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
045646  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
045650  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
045652  012001                          MOV     (R0)+,R1        ;FROM
045654  012002                          MOV     (R0)+,R2        ;TO
045656  012003                          MOV     (R0)+,R3        ;NUMBER
045660  013122                  1$:     MOV     @(R1)+,(R2)+    ;SAVE REGISTER CONTENTS
045662  005303                          DEC     R3              ;COUNT
045664  001375                          BNE     1$              ;BRANCH IF NOT DONE
045666  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
045670  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
045672  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
045674  000200                          RTS     R0


                                        .SBTTL  WRITE CHECK ROUTINE

                                ;*****************************************************************
                                        ;THIS IS A SUBROUTINE TO DO WRITE CHECK HEADER AND DATA
                                        ;CYLINDER 0, TRACK 1, SECTOR 1, KEYS 0
                                ;*****************************************************************

                                        ;THESE ARE TO SET UP FOR DISKLESS USE ONLY

045676  012737  010000  051602  WRCHHD: MOV     #FMT22,@#CYL    ;CYLINDER 0 FORMAT 16 BIT WORDS
045704  112737  000001  051605          MOVB    #1,@#SECOTR+1   ;TRACK=1
045712  112737  000001  051604          MOVB    #1,@#SECOTR     ;SECTOR=1
045720  005037  051606                  CLR     @#KEY1          ;KEY1=0
045724  005037  051610                  CLR     @#KEY2          ;KEY2=0
045730  012767  000044  003724          MOV     #36.,DAWORD     ;NO OF DATA WORDS
045736  005037  051612                  CLR     @#X             ;THIS IS A READ OPERATION
045742  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
045746  051602                          CYL
045750  053502                          WCRC

                                        ;THESE ARE REGULAR SETUPS

045752  004737  045152                  JSR     PC,@#CLDISK     ;SET UP GENERAL REGISTERS
```

```
 7497
 7498  045756  012777  177730  146766          MOV     #-40.,@RHWC     ;AND CLEAR DISK REGISTERS
 7499  045764  012777  016256  146762          MOV     #REINTO,@RHBA   ;36 DATA WORDS 4 HEADER WORDS
 7500  045772  112746  000001                  MOVB    #1,-(SP)        ;STARTING ADDRESS OF READ BUFFER
 7501  045776  112766  000001  000001          MOVB    #1,1(SP)        ;SECTOR=1
 7502  046004  012677  146754                  MOV     (SP)+,@RHDST    ;TRACK=1 IN UPPER BYTE
 7503  046010  012777  014000  146752          MOV     #FMT22!ECI,@RHOF ;TRACK=1, SECTOR=1 IN RHDST
 7504                                                                  ;16 BIT WORDS
 7505                                                                  ;ECC CORRECTION INHIBIT BECAUSE
                                                                      ;ECC LOGIC IS NOT CHECKED YET
 7506  046016  005077  146750                  CLR     @RHCA           ;CYLINDER=0
 7507  046022  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
 7508  046026  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
 7509                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
 7510  046032  000000                          HALT                    ;STOP THE TEST
 7511  046034  013711  015164                  MOV     @#WRCHDT,@R1    ;WRITE CHECK HEADER AND DATA=52
 7512                                                                  ;INTO RHCS1
 7513  046040  004737  051456                  JSR     PC,@#COMHD      ;WRITE CHECK HEADER AND DATA
 7514                                                                  ;SAME AS READ HEADER AND DATA
 7515
 7516  046044  000207                          RTS     PC              ;RETURN TO WRITE CHECK TEST
```

```
                                .SBTTL  COMPARE ROUTINE

                        ;*****************************************************
                        ;*THIS IS A SUBROUTINE TO COMPARE TWO BLOCKS IN MEMORY
                        ;*R1 HAS GOOD DATA BUFFER ADDRESS
                        ;*R2 HAS TEST DATA BUFFER ADDRESS
                        ;*$TMP0 HAS ADDRESS OF RETURN ON ERROR TO PRINT HEADER
                        ;*$TMP1 HAS ADDRESS OF RETURN ON ERROR TO PRINT DATA
                        ;*R3 HAS NUMBER OF WORDS TO BE COMPARED
                        ;*R4 HAS ONE MORE THAN NUMBER OF WORDS TO BE COMPARED
                        ;*****************************************************

046046                  COMPAR:
046046  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
046050  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
046052  010346                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
046054  010446                  MOV     R4,-(SP)        ;;PUSH R4 ON STACK
046056  010546                  MOV     R5,-(SP)        ;;PUSH R5 ON STACK
046060  012001                  MOV     (R0)+,R1        ;ADDRESS OF GOOD DATA BUFFER
046062  012002                  MOV     (R0)+,R2        ;ADDRESS OF TEST DATA BUFFER
046064  012003                  MOV     (R0)+,R3        ;NO OF WORDS TO BE COMPARED
046066  012067  133076          MOV     (R0)+,$TMP0     ;RETURN ON ERROR TO PRINT HEADER
046072  012067  133074          MOV     (R0)+,$TMP1     ;RETURN ON ERROR TO PRINT DATA
046076  011000                  MOV     (R0),R0         ;RETURN ON NO ERROR
046100  010304                  MOV     R3,R4           ;NO OF WORDS TO BE COMPARED
046102  005204                  INC     R4
046104  010437  051722  1$:     MOV     R4,@#ERWORD     ;FOR ERROR WORD NO
046110  022122                  CMP     (R1)+,(R2)+     ;COMPARE GOOD WITH TEST DATA
046112  001426                  BEQ     3$              ;BRANCH IF GOOD

046114  014137  001124          MOV     -(R1),@#$GDDAT  ;GOOD DATA
046120  014237  001126          MOV     -(R2),@#$BDDAT  ;BAD DATA
046124  160337  051722          SUB     R3,@#ERWORD     ;ERROR WORD NO.
046130  005737  015122          TST     @#ERFLG$        ;ANY ERRORS ALREAY THERE
046134  001003                  BNE     2$              ;BRANCH IF YES
046136  004777  133026          JSR     PC,@$TMP0       ;RETURN TO PRINT HEADER
046142  000402                  BR      5$              ;BRANCH TO AVOID PRINTING NEXT ERROR
046144  004777  133022  2$:     JSR     PC,@$TMP1       ;RETURN TO PRINT DATA
046150  022122  5$:     CMP     (R1)+,(R2)+     ;UNDO -(R1) AND -(R2) FOR ERRORS
046152  013746  177570          MOV     @#SWR,-(SP)     ;GET SWITCH SETTING
046156  042716  177177          BIC     #^C600,(SP)     ;KEEP ONLY SWITCH 7 AND 8
046162  022726  000200          CMP     #SW07,(SP)+     ;IS 7 SET AND 8 RESET
046166  001402                  BEQ     4$              ;BRANCH OUT IF YES
046170  005303  3$:     DEC     R3              ;COUNT
046172  001344                  BNE     1$              ;BRANCH IF ALL NOT DEVICE
046174                  4$:
046174  012605                  MOV     (SP)+,R5        ;;POP STACK INTO R5
046176  012604                  MOV     (SP)+,R4        ;;POP STACK INTO R4
046200  012603                  MOV     (SP)+,R3        ;;POP STACK INTO R3
046202  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
046204  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
046206  000200                  RTS     R0              ;RETURN TO MAIN PROGRAM
```

```
                                        .SBTTL  WRITE CHECK DATA
                                ;*****************************************************************
                                        ;THIS IS A SUBROUTINE TO DO WRITE CHECK DATA
                                        ;CYLINDER 0, TRACK 1, SECTOR 1, KEYS 0
                                ;*****************************************************************


                                        ;THESE ARE TO SET UP FOR DISKLESS USE ONLY

046210  012737  010000  051602  WRCHDA: MOV     #FMT22,@#CYL    ;CYLINDER 0 FORMAT 16 BIT WORDS
046216  112737  000001  051605          MOVB    #1,@#SECOTR+1   ;TRACK=1
046224  112737  000001  051604          MOVB    #1,@#SECOTR     ;SECTOR=1
046232  005037  051606                  CLR     @#KEY1          ;KEY1=0
046236  005037  051610                  CLR     @#KEY2          ;KEY2=0
046242  012737  000040  051662          MOV     #32.,@#DAWORD   ;NO OF DATA WORDS
046250  005037  051612                  CLR     @#X             ;THIS IS A READ OPERATION

046254  004537  046360                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
046260  051602                          CYL
046262  053502                          WCRC

                                        ;THESE ARE REGULAR SETUPS

046264  004737  045152                  JSR     PC,@#CLDISK     ;SET UP GENERAL REGISTERS
                                                                ;AND CLEAR DISK REGISTERS

046270  012777  177740  146454          MOV     #-32.,@RHWC     ;36 DATA WORDS 4 HEADER WORDS
046276  012777  016256  146450          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
046304  112746  000001                  MOVB    #1,-(SP)        ;SECTOR=1
046310  112766  000001  000001          MOVB    #1,1(SP)        ;TRACK=1 IN UPPER BYTE
046316  012677  146442                  MOV     (SP)+,@RHDST    ;TRACK=1, SECTOR=1 IN RHDST
046322  012777  014000  146440          MOV     #FMT22!ECI,@RHOF
                                                        ;16 BIT WORDS
                                                        ;ECC CORRECTION INHIBIT BECAUSE
                                                        ;ECC LOGIC IS NOT CHECKED YET
046330  005077  146436                  CLR     @RHCA           ;CYLINDER=0
046334  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
046340  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
046344  000000                          HALT                    ;STOP THE TEST
046346  013711  015162                  MOV     @#WRCHEK,@R1    ;WRITE CHECK DATA=50 INTO RHCS1
046352  004737  051456                  JSR     PC,@#COMHD      ;WRITE CHECK HEADER AND DATA
                                                                ;SAME AS READ HEADER AND DATA

046356  000207                          RTS     PC              ;RETURN TO WRITE CHECK TEST
```

```
                                .SBTTL  CRC GENERATION ROUTINE

                        ;*****************************************************************
                                ;THIS IS A SUBROUTINE TO CALCULATE CRC FOR THE FOUR
                                ;HEADER WORDS AND STORE THEM IN "WCRC" AND "GCRC"
                                ;R1 - REGISTER FOR CRC, INCREMENTED CRC VALUE IS HERE
                                ;R2 - THIS HAS BIT POSITION 2 VALUE C
                                ;R3 - THIS HAS BIT POSITION 16 I.E. OUTPUT BIT VALUE B
                                ;R4 - THIS HAS BIT POSITION 15 VALUE E
                                ;$TMP0 - NUMBER OF WORDS
                                ;$TMP2 - NUMBER OF BITS PER WORD = 16
                                ;$TMP3 - TEMPORARY REG.
                                ;$TMP4 - TEMPORARY REG TO TRANSFER CARRY
                                ;$TMP5 - THIS HAS DATA BIT VALUE D

                                ;FETCH DATA BIT D
                                ;B = D XOR 16
                                ;C = B XOR 2
                                ;E = B XOR 15
                                ;ROTATE RIGHT ONE POSITION
                                ;B GOES TO POSITION 1
                                ;C GOES TO POSITION 3
                                ;E GOES TO POSITION 16
                                ;REPEAT 64 TIMES

                                ;CALL   JSR     R5,@#CRC
                                ;X      ;FIRST LOCATION AT
                                ;Y      ;PUT CRC IN WCRC FOR READ GCRC FOR WRITE
                        ;*****************************************************************

 046360                         CRC:
 046360 010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 046362 012500                          MOV     (R5)+,R0        ;GET POINTER TO CYL NO.
 046364 010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 046366 010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 046370 010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 046372 010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
 046374 005001                          CLR     R1              ;CLEAR WORKING LOCATION
 046376 005037 001202                   CLR     @#$TMP5
 046402 012737 000004 001170            MOV     #4,@#$TMP0      ;WORD COUNT
 046410 012037 001176           16$:    MOV     (R0)+,@#$TMP3   ;TEMPORARY WORD STORAGE
 046414 012767 000020 132552            MOV     #16.,$TMP2      ;BIT COUNT
 046422 013737 001176 001200            MOV     @#$TMP3,@#$TMP4 ;TEMPORARY WORD STORAGE
 046430 006037 001176           15$:    ROR     @#$TMP3         ;GET LSB INTO "C"
 046434 006037 001202                   ROR     @#$TMP5         ;GET ABOVE "C" INTO $TMP5
 046440 032701 000001                   BIT     #BIT0,R1        ;IS POSITION 15 HIGH
 046444 001403                          BEQ     1$              ;BRANCH IF POSITION 16 LOW
 046446 012703 100000                   MOV     #BIT15,R3       ;GET POSITION 16
 046452 000401                          BR      2$
 046454 005003                  1$:     CLR     R3              ;GET POSITION 16
 046456 063703 001202           2$:     ADD     @#$TMP5,R3      ;XOR POSITION 16 WITH D
                                                                ;TO GIVE B
 046462 032701 040000                   BIT     #BIT14,R1       ;IS POSITION 2 HIGH
 046466 001403                          BEQ     3$              ;BRANCH IF POSITION 2 LOW
```

```
7670  046470  012702  100000            MOV   #BIT15,R2       ;GET POSITION 2
7671  046474  000401                    BR    4$
7672  046476  005002              3$:   CLR   R2              ;GET POSITION 2
7673  046500  060302              4$:   ADD   R3,R2           ;XOR B WITH POSITION 2
7674                                                          ;TO GIVE C
7675  046502  032701  000002            BIT   #BIT1,R1        ;IS POSITION 15 HIGH
7676  046506  001403                    BEQ   5$              ;BRANCH IF POSITION 15 LOW
7677  046510  012704  100000            MOV   #BIT15,R4       ;GET POSITION 15
7678  046514  000401                    BR    6$
7679  046516  005004              5$:   CLR   R4              ;GET POSITION 15
7680  046520  060304              6$:   ADD   R3,R4           ;XOR POSITION 15 WITH B
7681                                                          ;TO GIVE E
7682  046522  006037  001200            ROR   @#$TMP4         ;GET LSB INTO "C"
7683  046526  006001                    ROR   R1              ;GET ABOVE C INTO R1
7684  046530  005703                    TST   R3              ;TEST B
7685  046532  100403                    BMI   7$              ;BRANCH IF B=1
7686  046534  042701  100000            BIC   #BIT15,R1       ;SET B IN POSITION 1
7687  046540  000402                    BR    10$
7688  046542  052701  100000      7$:   BIS   #BIT15,R1       ;SET B IN POSITION 1
7689  046546  005702              10$:  TST   R2              ;TEST C
7690  046550  100403                    BMI   11$             ;BRANCH IF C=1
7691  046552  042701  020000            BIC   #BIT13,R1       ;GET C IN POSITION 3
7692  046556  000402                    BR    12$
7693  046560  052701  020000      11$:  BIS   #BIT13,R1       ;GET C IN POSITION 3
7694  046564  005704              12$:  TST   R4              ;TEST E
7695  046566  100403                    BMI   13$             ;BRANCH IF E=1
7696  046570  042701  000001            BIC   #BIT0,R1        ;GET E IN POSITION 16
7697  046574  000402                    BR    14$
7698  046576  052701  000001      13$:  BIS   #BIT0,R1        ;GET E IN POSITION 16
7699  046602  005337  001174      14$:  DEC   @#$TMP2         ;BIT COUNTER
7700  046606  001310                    BNE   15$             ;BRANCH IF 16 NOT DONE
7701  046610  005337  001170            DEC   @#$TMP0         ;WORD COUNTER
7702  046614  001275                    BNE   16$             ;BRANCH IF 4 NOT DONE
7703  046616  010135                    MOV   R1,@(R5)+       ;PUT CRC WHERE DESIRED
7704  046620  012604                    MOV   (SP)+,R4        ;;POP STACK INTO R4
7705  046622  012603                    MOV   (SP)+,R3        ;;POP STACK INTO R3
7706  046624  012602                    MOV   (SP)+,R2        ;;POP STACK INTO R2
7707  046626  012601                    MOV   (SP)+,R1        ;;POP STACK INTO R1
7708  046630  012600                    MOV   (SP)+,R0        ;;POP STACK INTO R0
7709  046632  000205                    RTS   R5
```

```
                                .SBTTL  SIMULATED DISK SETUP

                        ;*****************************************************************
                        ;THIS IS A SUBROUTINE TO SET UP THE SIMULATOR DISK FOR
                        ;CYLINDER 0 (16 BITS PER WORD)
                        ;TRACK 1, SECTOR 1
                        ;KEY1 1
                        ;KEY2 1
                        ;CRC THROUGH THE JSR R5,@#CRC
                        ;256 WORDS OF 177400

                        ;CALL   JSR     PC,@#SETDSK
                        ;*****************************************************************

046634                  SETDSK:
046634  010046                MOV     R0,-(SP)        ;;PUSH R0 ON STACK
046636  010146                MOV     R1,-(SP)        ;;PUSH R1 ON STACK
046640  010246                MOV     R2,-(SP)        ;;PUSH R2 ON STACK
046642  012700  177400        MOV     #177400,R0      ;DATA IN THE DISK
046646  012701  000400        MOV     #256.,R1        ;COUNTER
046652  012702  053520        MOV     #DISK,R2        ;START OF SIMULATOR DISK
046656  010022          1$:   MOV     R0,(R2)+        ;MOVE IN DATA
046660  005301                DEC     R1              ;COUNT FOR 256
046662  001375                BNE     1$              ;BRANCH IF 256 NOT COMPLETE
046664  012701  000021        MOV     #17.,R1         ;2 ECC WORDS, 1 DATA GAP
                                                      ;14 TOLERANCE GAP
046670  005022          2$:   CLR     (R2)+           ;CLEAR ECC,DATA GAP AND
                                                      ;TOLERANCE GAP
046672  005301                DEC     R1              ;COUNT
046674  001375                BNE     2$              ;BRANCH IF NOT COMPLETE

                        ;NOW SET UP FOR DISKLESS USE

;046676  012737  010000  051602        MOV     #FMT22,@#CYL    ;CYLINDER 0 (16 BIT WORDS)
046704  112737  000001  051605        MOVB    #1,@#SECOTR+1   ;TRACK=1
046712  112737  000001  051604        MOVB    #1,@#SECOTR     ;SECTOR=1
046720  012737  000001  051606        MOV     #1,@#KEY1       ;KEY1=1
046726  012737  000001  051610        MOV     #1,@#KEY2       ;KEY2=1
046734  016737  131440  051662        MOV     256.,@#DAWORD   ;NO. OF DATA WORDS
046742  004537  046360                JSR     R5,@#CRC        ;GO TO CALCULATE CRC
046746  051602                        CYL                     ;FIRST CRC WORD
046750  053502                        WCRC                    ;PUT CALCULATED CRC
046752  012602                MOV     (SP)+,R2        ;;POP STACK INTO R2
046754  012601                MOV     (SP)+,R1        ;;POP STACK INTO R1
046756  012600                MOV     (SP)+,R0        ;;POP STACK INTO R0
046760  000207                RTS     PC
```

```
                                        .SBTTL  CHECK HCE ROUTINE

                                ;*****************************************************************
                                        ;THIS IS A SUBROUTINE TO CHECK HEADER COMPARE ERROR
                                        ;(BIT #7) AND CRC ERROR (BIT #8)

                                        ;CALL JSR R0,@#HCCRCE

                                        ;       COM             ;COMMAND-READ HEADER AND DATA
                                        ;                       ;  -WRITE DATA
                                        ;       C               ;CYLINDER
                                        ;       S               ;SECTOR
                                        ;       T               ;TRACK
                                        ;       -N.             ;WORD COUNT
                                        ;       B               ;RHBA BUFFER START
                                        ;       X               ;1=WRITE DATA 0=READ
                                        ;       H               ;H=1 HEADER CHECK, H=0 CRC CHECK
                                ;*****************************************************************

046762  010037  015130          HCCRCE: MOV     R0,@#PCJSR      ;SAVE PC OF JSR+4
046766  162737  000004  015130          SUB     #4,@#PCJSR      ;GET PC OF JSR
046774  004737  045152                  JSR     PC,@#CLDISK     ;INIT AND SETUP GENERAL REG.
047000  004737  045206                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
047004  104400  005116                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
047010  000000                          HALT                    ;STOP THE TEST
047012  011037  001202                  MOV     (R0),@#STMP5    ;SAVE COMMAND
047016  012011                          MOV     (R0)+,@R1       ;COMMAND
047020  012077  145746                  MOV     (R0)+,@RHCA     ;CYLINDER
047024  112046                          MOVB    (R0)+,-(SP)     ;SECTOR
047026  105720                          TSTB    (R0)+           ;UP DATE R0
047030  112066  000001                  MOVB    (R0)+,1(SP)     ;TRACK
047034  105720                          TSTB    (R0)+           ;UPDATE R0
047036  012677  145722                  MOV     (SP)+,@RHDST    ;TRACK SECTOR
047042  012077  145704                  MOV     (R0)+,@RHWC     ;NO. OF DATA WORDS +4 HEADER
                                                                ;IF A READ HEADER AND DATA
047046  012077  145702                  MOV     (R0)+,@RHBA     ;STARTING ADDRESS OF BUFFER
047052  012037  051612                  MOV     (R0)+,@#X       ;X=0 READ HEADER AND DATA
                                                                ;X=1 WRITE DATA
047056  012777  014000  145704          MOV     #FMT22!ECI,@RHOF ;16 BITS PER WORD
                                                                ;ECC CORRECTION INHIBIT
047064  005037  015122                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
047070  004737  051456                  JSR     PC,@#COMHD      ;COMMAND

                                ;IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
                                ;FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
                                ;FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
                                ;SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
                                ;DETECTED
                                ;HEADER AND DATA ARE TO BE CHECKED.

047074  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
047100  005737  015122                  TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
047104  001034                          BNE     10$             ;BRANCH IF YES
```

```
7811  047106  005737  051612              TST     @#X             ;IS THIS A READ
7812  047112  001015                      BNE     3$              ;IF A WRITE DATA BRANCH
7813
7814                                      ;NOW THE READ BUFFER WILL BE CHECKED
7815                                      ;HEADER SHOULD BE COMPLETELY READ AS WRITTEN
7816                                      ;NO DATA WORDS SHOULD BE READ
7817                                      ;REINTO BUFFER HAS BEEN FILLED WITH 0
7818                                      ;WRFROM BUFFER HAS BEEN FILLED WITH EXPECTED DATA
7819
7820  047114  004037  046046              JSR     R0,@#COMPAR     ;CHECK
7821  047120  015212                      WRFROM                  ;GOOD DATA
7822  047122  016256                      REINTO                  ;TEST BUFFER
7823  047124  000400                      256.                    ;4 HEADER 252 DATA
7824  047126  047134                      1$                      ;RETURN POINT FOR ERROR HEADER
7825  047130  047140                      2$                      ;RETURN POINT FOR ERROR DATA
7826  047132  047176                      10$                     ;RETURN FOR GOOD COMPARISON
7827  047134  104004              1$:     ERROR   4               ;READ NEXT ERROR 5
7828  047136  000207                      RTS     PC              ;RETURN TO COMPARISON SUBROUTINE
7829  047140  104005              2$:     ERROR   5               ;WORD NO 1 THRU 4 ARE
7830                                                              ;HEADER WORDS AND HENCE
7831                                                              ;SHOULD BE READ AS WRITTEN ON
7832                                                              ;DISK, WORD NOS. 5 ONWARDS
7833                                                              ;SHOULD NOT BE READ AND HENCE
7834                                                              ;READ INTO BUFFER
7835                                                              ;SHOULD BE UNCHANGED
7836  047142  000207                      RTS     PC              ;RETURN TO COMPARISON
7837
7838  047144  000414                      BR      10$             ;JUMP OUT
7839
7840                                      ;NOW THE DISK WILL BE CHECKED
7841                                      ;NO DATA SHOULD BE WRITTEN
7842                                      ;REINTO BUFFER HAS BEEN FILLED WITH EXPECTED DATA
7843                                      ;DISK HAS BEEN FILLED WITH 177400
7844                                      ;WRFROM HAS BEEN FILLED WITH 125252
7845
7846  047146  004037  046046      3$:     JSR     R0,@#COMPAR     ;CHECK
7847  047152  016256                      REINTO                  ;GOOD DATA BUFFER
7848  047154  053520                      DISK                    ;TEST BUFFER
7849  047156  000400                      256.
7850  047160  047166                      4$                      ;RETURN POINT FOR ERROR HEADER
7851  047162  047172                      5$                      ;RETURN POINT FOR ERROR DATA
7852  047164  047176                      10$                     ;RETURN POINT FOR GOOD COMPARISON
7853  047166  104004              4$:     ERROR   4               ;READ NEXT ERROR 5
7854  047170  000207                      RTS     PC              ;RETURN TO COMPARISON SUBROUTINE
7855  047172  104005              5$:     ERROR   5               ;WORD NO ARE ALL DATA
7856                                                              ;WORDS THE SHOULD NOT
7857                                                              ;HAVE BEEN CHANGED BY THE
7858                                                              ;WRITE COMMAND
7859  047174  000207                      RTS     PC              ;RETURN TO COMPARISON SUBROUTINE
7860  047176  005720              10$:    TST     (R0)+           ;IS THIS A HCRC ON HCE CHECK?
7861  047200  001442                      BEQ     6$              ;BRANCH IF HCRC
7862  047202  022737  000072  001202      CMP     #72,@#STMPS     ;IS THIS A READ COMMAND
7863  047210  001417                      BEQ     11$             ;BRANCH IF YES
7864  047212  017737  145544  001126      MOV     @RHER1,@#SBCDAT ;TEST DATA
```

```
7865  047220  022737  000200  001126          CMP     #HCE,@#$BDDAT   ;ONLY HEADER COMPARE BIT?
7866                                                                  ;SHOULD BE SET
7867  047226  001470                          BEQ     7$              ;BRANCH IF GOOD
7868  047230  013737  014762  044716          MOV     @#RHER1,@#REGADR ;REGISTER ADDRESS RHER1
7869  047236  012737  000200  001124          MOV     #HCE,@#$GDDAT   ;GOOD DATA
7870  047244  104027                          ERROR   27              ;AFTER AN ERROR ON THE
7871                                                                  ;HEADER ONLY HCE SHOULD
7872  047246  000460                          BR      7$              ;BE SET
7873  047250                          11$:
7874  047250  017737  145506  001126          MOV     @RHER1,@#$BDDAT ;TEST DATA
7875  047256  022737  100200  001126          CMP     #DCK!HCE,@#$BDDAT       ;ONLY HEADER COMPARE BIT?
7876                                                                  ;SHOULD BE SET
7877                                                                  ;DCK IS SET BECAUSE ECC IS NOT READ
7878  047264  001451                          BEQ     7$              ;BRANCH IF GOOD
7879  047266  013737  014762  044716          MOV     @#RHER1,@#REGADR ;REGISTER ADDRESS RHER1
7880  047274  012737  100200  001124          MOV     #DCK!HCE,@#$GDDAT       ;GOOD DATA
7881  047302  104027                          ERROR   27              ;AFTER AN ERROR ON THE
7882                                                                  ;HEADER ONLY HCE SHOULD
7883  047304  000441                          BR      7$              ;BE SET
7884  047306  022737  000072  001202  6$:     CMP     #72,@#$TMP5     ;IS THIS A READ COMMAND?
7885  047314  001417                          BEQ     12$             ;BRANCH IF A READ
7886  047316  017737  145440  001126          MOV     @RHER1,@#$BDDAT ;TEST DATA
7887  047324  022737  000400  001126          CMP     #HCRC,@#$BDDAT  ;ONLY CRC ERROR SHOULD BE THERE
7888  047332  001426                          BEQ     7$
7889  047334  013737  014762  044716          MOV     @#RHER1,@#REGADR ;REG. ADDR = RHER1
7890  047342  012737  000400  001124          MOV     #HCRC,@#$GDDAT  ;GOOD DATA
7891  047350  104027                          ERROR   27              ;AFTER A CRC ERROR ONLY CRC
7892                                                                  ;SHOULD BE SET
7893  047352  000416                          BR      7$              ;BRANCH OUT
7894  047354  017737  145402  001126  12$:     MOV     @RHER1,@#$BDDAT ;TEST DATA
7895
7896  047362  022737  100400  001126          CMP     #DCK!HCRC,@#$BDDAT;HCRC AND DCK SHOULD BE SET
7897                                                                  ;DCK IS SET BECAUSE ECC IS NOT READ
7898  047370  001407                          BEQ     7$              ;BRANCH IF GOOD
7899  047372  012737  100400  001124          MOV     #DCK!HCRC,@#$GDDAT;GOOD DATA
7900  047400  013737  014762  044716          MOV     @#RHER1,@#REGADR;FAILING REGISTER RHER1
7901  047406  104027                          ERROR   27              ;AFTER A CRC ERROR ON A READ
7902                                                                  ;DCK AND HCRC SHOULD BE SET
7903                                                                  ;DCK IS SET BECAUSE ECC IS NOT READ
7904  047410  000200                  7$:     RTS     R0              ;RETURN TO MAIN TEST
```

```
                                        .SBTTL  EXIT WRT HEADER & DATA ROUTINE

                                ;*****************************************************************
                                        ;THIS IS A SUBROUTINE TO LEAVE AT THE MIDDLE OF
                                        ;A WRITE HEADER AND DATA COMMAND
                                        ;IT TRYS TO GET SECTOR 10, TRACK 0, CYLINDER 0
                                        ;BUT COMES OUT AFTER ONE SECTOR
                                        ;THE COMMAND OS JSR PC,@#MIDDLE
                                        ;BAI IS SET
                                ;*****************************************************************

047412                          MIDDLE:
047412  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
047414  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
047416  013777  015170  145334          MOV     @#WRIFOR,@RHCS1 ;WRITE HEADER AND DATA=62
                                                                ;IN RHCS1
047424  012777  177766  145320          MOV     #-10.,@RHWC     ;10 WORDS
047432  012777  015212  145314          MOV     #WRFROM,@RHBA   ;BUS ADDRESS=WRFROM
047440  012777  000010  145316          MOV     #10,@RHDST      ;DESIRED TRACK=0 SECTOR=10
047446  052777  000010  145302          BIS     #BAI,@RHCS2     ;BUS ADDRESS INCREMENT INHIBIT
047454  012777  010000  145306          MOV     #FMT22,@RHOF    ;FORMAT 16 BIT WORDS
047462  005077  145304                  CLR     @RHCA           ;CYLINDER=0
047466  012737  000001  047514          MOV     #1,@#MID        ;SECTOR IS SET TO 1 SO THAT
                                                                ;WE CAN GET OUT AT THE
                                                                ;MIDDLE OF AN OPERATION
                                                                ;LOOKING FOR SECTOR 10
047474  012777  000001  145276          MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE
047502  052777  000001  145250          BIS     #GO,@RHCS1              ;GO TO RHCS1 WITH 62
047510  004137  055634                  JSR     R1,@#SEARCH
047514  000000                  MID:    .WORD   0               ;SECTOR
047516  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
047520  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
047522  000207                          RTS     PC
```

```
                                .SBTTL  JAM CURRENT CYLINDER ROUTINE

                        ;*********************************************************************
                        ;*THIS SUBROUTINE WILL CHANGE THE CURRENT CYLINDER REGISTER
                        ;*THIS IS DONE BY GIVING A SEEK COMMAND THEN AN INIT
                        ;*WHICH WILL LOAD THE CURRENT CYLINDER WITH THE DESIRED CYLINDER VALUE
                        ;*
                        ;*CALL IS:
                        ;*      JSR     R0,@#MAKECYL
                        ;*      XC                              ;DESIRED VALUE OF CURRENT CYLINDER
                        ;*********************************************************************

047524                  MAKECYL:
047524  010546                  MOV     R5,-(SP)        ;;PUSH R5 ON STACK
047526  010037  015130          MOV     R0,@#PCJSR      ;PC OF JSR+4
047532  162737  000004  015130  SUB     #4,@#PCJSR      ;SAVE PC OF JSR
047540  012005                  MOV     (R0)+,R5        ;GETTING READY TO FILL DESIRED CYLINDER
047542  010577  145224          MOV     R5,@RHCA        ;FILL DESIRED CYLINDER REGISTER
047546  005077  145212          CLR     @RHDST          ;MAKE SURE DESIRED SECTOR TRACK IS NOT ILLEGAL
047552  013777  015176  145200  MOV     @#SEECOM,@RHCS1 ;FILL SEEK COMMAND
047560  012777  000001  145212  MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE
047566  052777  000001  145164  BIS     #GO,@RHCS1      ;GO TO SEEK
047574  000240                  NOP                     ;ALLOW TIME FOR SEEK TO HANG UP
047576  000240                  NOP                     ;ALLOW TIME FOR SEEK TO HANG UP
047600  000240                  NOP                     ;ALLOW TIME FOR SEEK TO HANG UP
047602  000240                  NOP                     ;ALLOW TIME FOR SEEK TO HANG UP
047604  004737  045152          JSR     PC,@#CLDISK     ;GIVE INIT
047610  017737  145202  001126  MOV     @RHCC,@#$BDDAT  ;TEST DATA
047616  020537  001126          CMP     R5,@#$BDDAT     ;COMPARE CURRENT CYLINDER
047622  001406                  BEQ     1$              ;BRANCH IF GOOD
047624  010537  001124          MOV     R5,@#$GDDAT     ;GOOD VALUE OF RHCC
047630  013737  015016  044716  MOV     @#RHCC,@#REGADR ;FAILING REGISTER ADDRESS
047636  104030                  ERROR   30              ;CURRENT CYLINDER DOES NOT MATCH DESIRED CYLINDER
                                                        ;REGISTER AFTER A SEEK AND AN INIT
047640                  1$:
047640  012605                  MOV     (SP)+,R5        ;;POP STACK INTO R5
047642  000200                  RTS     R0
```

```
7977
7978                                    .SBTTL  ECC GENERATION AND COMPARISON ROUTINE
7979
7980                                ;*****************************************************************
7981                                ;*THIS SUBROUTINE GENERATES AND TESTS ECC
7982                                ;*CALL    JSR PC,ECTEST
7983                                ;*****************************************************************
7984
7985
7986
7987
7988    100000                      PIE1    =100000
7989    040000                      PIE2    =40000
7990    020000                      PIE3    =20000
7991    010000                      PIE4    =10000
7992    004000                      PIE5    =4000
7993    002000                      PIE6    =2000
7994    001000                      PIE7    =1000
7995    000400                      PIE8    =400
7996    000200                      PIE9    =200
7997    000100                      PIE10   =100
7998    000040                      PIE11   =40
7999    000020                      PIE12   =20
8000    000010                      PIE13   =10
8001    000004                      PIE14   =4
8002    000002                      PIE15   =2
8003    000001                      PIE16   =1
8004    100000                      PIE17   =100000
8005    040000                      PIE18   =40000
8006    020000                      PIE19   =20000
8007    010000                      PIE20   =10000
8008    004000                      PIE21   =4000
8009    002000                      PIE22   =2000
8010    001000                      PIE23   =1000
8011    000400                      PIE24   =400
8012    000200                      PIE25   =200
8013    000100                      PIE26   =100
8014    000040                      PIE27   =40
8015    000020                      PIE28   =20
8016    000010                      PIE29   =10
8017    000004                      PIE30   =4
8018    000002                      PIE31   =2
8019    000001                      PIE32   =1
8020
8021  047644  000000                ECDATA: 0               ;DATA BIT FOR ECC
8022                                                        ;IF ALL ONES THEN CURRENT BIT IS A ONE
8023                                                        ;IF ZERO THEN CURRENT BIT IS A ZERO
8024
8025  047646  000000                GECC1:  0               ;LOW ORDER ECC WORD TO BE GENERATED HERE
8026                                                        ;=R1
8027
8028  047650  000000                GECC2:  0               ;HIGH ORDER ECC WORD TO BE GENERATED HERE
8029                                                        ;=R2
8030
```

```
8031  047652  000000                    TSECCG: 0               ;IF =177777 GENERATE AND TEST ECC FOR THIS BIT
8032                                                            ;IF =0 DO NOT GENERATE AND TEST ECC FOR THIS BIT
8033
8034  047654  113713                    NCODE:  38859.          ;N-CODE WORD
8035  047656  000000                    NCOUNT: 0               ;TEMPORARY N CODE
8036  047660  000000                    POSITI: 0               ;POSITION REGISTER
8037  047662  010041                    HARDER: 4129.           ;HARD ERROR COUNT
8038                                                            ;TRUE COUNT IS 4128 BUT AS COMPARES ARE
8039                                                            ;DONE ONE STAGE LATER SO 4129
8040  047664  000000                    DATENV: 0               ;DATA ENVELOPE FOR TYPE OUT
8041                                                            ;MAX FOR WRITE IS 4096
8042                                                            ;MAX FOR READ IS 4128
8043  047666  000000                    ZCODE:  0               ;LEADING ZEROS ENVELOPE FOR TYPE OUT
8044                                                            ;THIS IS SHUT OFF WHEN POSITION COUNTER
8045                                                            ;IN ENABLED
8046                                                            ;MAX COUNT IS 38859
8047
8048
8049
8050  047670  000000                    HADTMP: 0               ;TEMPORARY HARD ERROR COUNT
8051  047672  000000                    P3:     0
8052  047674  000000                    P12:    0
8053  047676  000000                    P22:    0
8054  047700  000000                    P24:    0
8055
8056
8057
8058
8059
8060  047702                            ECTEST:
8061  047702  010046                            MOV     R0,-(SP)        ;;PUSH R0 ON STACK
8062  047704  010146                            MOV     R1,-(SP)        ;;PUSH R1 ON STACK
8063  047706  010246                            MOV     R2,-(SP)        ;;PUSH R2 ON STACK
8064  047710  010346                            MOV     R3,-(SP)        ;;PUSH R3 ON STACK
8065  047712  010446                            MOV     R4,-(SP)        ;;PUSH R4 ON STACK
8066  047714  010546                            MOV     R5,-(SP)        ;;PUSH R5 ON STACK
8067  047716  013701  047646                    MOV     @#GECC1,R1              ;ECC1 WORD
8068  047722  013702  047650                    MOV     @#GECC2,R2              ;ECC2 WORD
8069  047726  005737  047644                    TST     @#ECDATA                ;IS CURRENT BIT A ONE
8070  047732  001406                            BEQ     2$                      ;BRANCH IF CURRENT DATA D=0
8071
8072                                            ;IF CARRY IS NOT ZERO THEN D=1
8073                                            ;INVERT X32 TO GIVE R0
8074
8075  047734  010103                    1$:     MOV     R1,R3
8076  047736  052703  177776                    BIS     #^CPIE32,R3
8077  047742  005103                            COM     R3
8078  047744  010300                            MOV     R3,R0
8079  047746  000404                            BR      3$
8080
8081                                            ;IF CARRY IS ZERO THEN D=0
8082                                            ;X32 BECOMES R0
8083  047750  010103                    2$:     MOV     R1,R3
8084  047752  042703  177776                    BIC     #^CPIE32,R3
```

```
8085  047756  010300                        MOV     R3,R0
8086
8087  047760  000241              3$:       CLC
8088  047762  006000                        ROR     R0
8089  047764  006000                        ROR     R0
8090  047766  005700                        TST     R0
8091  047770  001462                        BEQ     10$             ;BRANCH IF R0=0
8092                                        ;INVERT X2
8093
8094  047772  010203                        MOV     R2,R3
8095  047774  052703  137777              BIS     #^CPIE2,R3
8096  050000  005103                        COM     R3
8097  050002  010337  047672              MOV     R3,@#P3
8098  050006  006237  047672              ASR     @#P3
8099
8100                                        ;INVERT X11
8101
8102
8103  050012  010203                        MOV     R2,R3
8104  050014  052703  177737              BIS     #^CPIE11,R3
8105  050020  005103                        COM     R3
8106  050022  010337  047674              MOV     R3,@#P12
8107  050026  006237  047674              ASR     @#P12
8108
8109                                        ;INVERT X21
8110
8111  050032  010103                        MOV     R1,R3
8112  050034  052703  173777              BIS     #^CPIE21,R3
8113  050040  005103                        COM     R3
8114  050042  010337  047676              MOV     R3,@#P22
8115  050046  006237  047676              ASR     @#P22
8116
8117                                        ;INVERT X23
8118
8119  050052  010103                        MOV     R1,R3
8120  050054  052703  176777              BIS     #^CPIE23,R3
8121  050060  005103                        COM     R3
8122  050062  010337  047700              MOV     R3,@#P24
8123  050066  006237  047700              ASR     @#P24
8124
8125                                        ;NOW THAT R0 FOR POSITION 1
8126                                        ;         P3 FOR POSITION 3
8127                                        ;        P12 FOR POSITION 12
8128                                        ;        P22 FOR POSITION 22
8129                                        ;        P24 FOR POSITION 24
8130                                        ;ARE KNOWN THE ROTATE WILL BE DONE AND
8131                                        ;THESE BITS JAMED IN
8132
8133  050072  006002                        ROR     R2
8134  050074  006001                        ROR     R1
8135  050076  053700  047672              BIS     @#P3,R0
8136  050102  053700  047674              BIS     @#P12,R0
8137  050106  042702  120020              BIC     #PIE1!PIE3!PIE12,R2
8138  050112  050002                        BIS     R0,R2
```

```
8139
8140  050114  005000                        CLR     R0
8141  050116  053700  047676                BIS     @#P22,R0
8142  050122  053700  047700                BIS     @#P24,R0
8143  050126  042701  002400                BIC     #PIE22!PIE24,R1
8144  050132  050001                        BIS     R0,R1
8145  050134  000404                        BR      12$
8146
8147                                        ;THE PROGRAM COMES HERE IF R0=0
8148                                        ;SO AFTER ROTATE R0 GETS PUT INTO POSITION 1
8149
8150  050136  006002              10$:      ROR     R2
8151  050140  006001                        ROR     R1
8152  050142  042702  100000                BIC     #PIE1,R2
8153  050146  010137  047646        12$:    MOV     R1,@#GECC1      ;SAVE ECC1
8154  050152  010237  047650                MOV     R2,@#GECC2      ;SAVE ECC2
8155  050156  005737  047652                TST     @#TSECCG        ;IS HARDWARE TO BE CHECKED
8156                                                                ;IF =1777777 TEST HARDWARE
8157                                                                ;IF = 0 DO NOT TEST HARDWARE
8158  050162  001432                        BEQ     14$             ;BRANCH IF HARDWARE NOT TO BE CHECKED
8159
8160
8161                              ;#CHECK HARDWARE
8162  050164  032737  000400  177570        BIT     #SW8,@#SWR      ;IS SWITCH 8 SET
8163  050172  001005                        BNE     15$             ;BRANCH IF SW8 IS SET
8164  050174  032737  000100  177570        BIT     #SW6,@#SWR      ;IS SWITCH 6 SET
8165  050202  001401                        BEQ     15$             ;BRANCH IF SW6 IS NOT SET
8166  050204  000421                        BR      14$             ;IF SWITCH 8 IS NOT SET AND
8167                                                                ;SWITCH 6 IS SET THEN
8168                                                                ;DO NOT DO COMPARES
8169  050206  010146              15$:      MOV     R1,-(SP)        ;GOOD PATTERN REGISTER
8170  050210  042716  174000                BIC     #174000,(SP)    ;GET ONLY PATTERN BITS
8171  050214  022677  144572                CMP     (SP)+,@RHEC2    ;COMPARE PATTERN REGISTER
8172  050220  001404                        BEQ     13$             ;BRANCH IF GOOD
8173                                        ;TO SAVE TIME
8174  050222  004737  044652                JSR     PC,@#PUTREG     ;SAVE REGISTERS
8175  050226  104035                        ERROR   35              ;PATTERN REGISTER IN 11 BITS IN ERROR
8176  050230  000407                        BR      14$             ;BRANCH OUT
8177  050232  023777  047660  144550  13$:  CMP     @#POSITI,@RHEC1 ;COMPARE POISTION REGISTER
8178  050240  001403                        BEQ     14$             ;BRANCH IF GOOD
8179                                        ;TO SAVE TIME
8180  050242  004737  044652                JSR     PC,@#PUTREG     ;SAVE REGISTERS
8181  050246  104035                        ERROR   35              ;POSITION REGISTER IN ERROR
8182                                                                ;"DATA ENVLOP" GIVES NUMBER OF CLOCK
8183                                                                ;PULSES FROM BEGINING OF COMMAND
8184                                                                ;THAT IS THE CLOCKS IN THE R/W DATA FIELD ENVELOPE
8185                                                                ;
8186                                                                ;IN A WRITE THERE ARE 10000 OCTAL CLOCKS
8187                                                                ;IN A READ THERE ARE 10040 OCTAL CLOCKS
8188                                                                ;
8189                                                                ;
8190                                                                ;"N-CODE ZEROS" GIVE THE NUMBER OF CLOCKS
8191                                                                ; GIVEN FOR THE LEADING ZEROS FIELD
8192                                                                ;MAX COUNT IS 113713 OCTAL
```

```
 8193                                                          ;
 8194                                                          ;"GOOD POSITION" GIVES NUMBER OF CLOCKS
 8195                                                          ;GIVEN AFTER LEADING ZEROS WHICH IS FOR THE DATA
 8196                                                          ;FIELD
 8197                                                          ;MAX COUNT IS 10040 OR 10041 OCTAL
 8198
 8199
 8200  050250                                  14$:
 8201  050250  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
 8202  050252  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
 8203  050254  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
 8204  050256  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
 8205  050260  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 8206  050262  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
 8207  050264  000207                          RTS     PC
```

```
                                        .SBTTL  ECC GENERATION CONTROL ROUTINE

                                ;*****************************************************************
                                ;*THIS SUBROUTINE WILL CONTROL THE ECC GENERATION ROUTINE
                                ;*FOR ERROR CORRECTION PROCESS
                                ;*CALL  JSR,    PC,@#ECORR
                                ;*      XP      ;EXPECTED POSITION REGISTER WHEN CORRECTION IS COMPLETE
                                ;*****************************************************************

050266  000000                  ERPOS:  0                       ;POSITION REG. WHEN CORRECTION IS COMPLETE

050270  010037  015130          ECORR:  MOV     R0,@#PCJSR      ;SAVE PC OF JSR + 4
050274  162737  000004  015130          SUB     #4,@#PCJSR      ;SAVE PC OF JSR
050302  012037  050266                  MOV     (R0)+,@#ERPOS   ;GET POSITION REG. WHEN CORRECTION IS COMPLETE
050306  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
050310  013701  015000                  MOV     @#RHMR,R1       ;MAINTENANCE REGISTER
050314  012711  000001                  MOV     #DMD,@R1        ;SET DIAGNOSTIC MODE BIT
050320  005037  047644                  CLR     @#ECDATA        ;ECC DATA IS ZERO

050324  005737  047660          1$:     TST     @#POSITI        ;IS  SOFTWARE POSITION NON ZERO
050330  001007                          BNE     2$              ;BRANCH IF N-CODE S COMPLETE
050332  005337  047656                  DEC     @#NCOUNT        ;DECREMENT N-CODE
050336  001001                          BNE     6$              ;BRANCH IF N-CODE IS NOT COMPLETE
050340  000403                          BR      2$              ;BRANCH  AS N-CODE IS COMPLETE
050342  005237  047666          6$:     INC     @#ZCODE         ;INCREMENT CLOCKS GIVEN FOR LEADING ZEROS
050346  000420                          BR      3$              ;BRANCH AS N-CODE IS NOT COMPLETE
                                                                ;GO TO GIVE CLOCK AND TEST ECC
050350  005237  047660          2$:     INC     @#POSITI        ;INCREMENT SOFTWARE POSITION
050354  023737  050266  047660          CMP     @#ERPOS,@#POSITI;HAVE ENOUGH CLOCKS BEEN GIVEN TO DETECT ERROR
050362  103012                          BHIS    3$              ;BRANCH IF MORE CLOCKS TO BE GIVEN
050364  023737  047670  047660          CMP     @#HADTMP,@#POSITI;HAVE ENOUGH CLOCKS BEEN GIVEN FOR HARD ERROR
                                                                ;THAT IS HAVE 4128 MORE CLOCKS BEEN GIVEN
050372  001415                          BEQ     5$              ;BRANCH IF YES
050374  032711  000400                  BIT     #ZER,@R1        ;CHECK ZERO DETECT BIT IN RHMR
050400  001016                          BNE     4$              ;BRANCH IS ZER SET
                                        ;TO SAVE TIME
050402  004737  044652                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
050406  104034                          ERROR   34              ;ZERO DETECT BIT NOT HIGH
                                                                ;WHEN 21 BITS IN ECC 32 BIT REGISTER IS  0

050410  052711  000002          3$:     BIS     #MCLK,@R1       ;SET CLOCK
050414  042711  000002                  BIC     #MCLK,@R1       ;CLEAR CLOCK
050420  004737  047702                  JSR     PC,@#ECTEST     ;GO TO GENERATE AND TEST ECC
050424  000737                          BR      1$              ;CONTINUE

                                ;THIS EXTRA CLOCK IS TO BRING ECH HIGH
                                ;AFTER THIS CLOCK POSITION REGISTER MAY BE 10040 OR 10041 OCTAL
```

```
 8262  050426  052711  000002          5$:     BIS     #MCLK,@R1       ;SET CLOCK
 8263  050432  042711  000002                  BIC     #MCLK,@R1       ;CLEAR CLOCK
 8264
 8265  050436                          4$:
 8266  050436  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 8267  050440  000200                          RTS     R0
```

```
                                        .SBTTL  SOFTWARE DISK DATA ECC GEN. ROUTINE

                                ;**********************************************************************
                                ;*THIS SUBROUTINE GENERATES THE ECC FOR WHAT IS ON DISK AND INSERTS THEM
                                ;*ON LOCATIONS "DISK+1000" AND "DISK+1002"
                                ;**********************************************************************

050442                          FILLEC:
050442  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
050444  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
050446  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
050450  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
050452  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
050454  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
050456  005037  047660                  CLR     @#POSITI        ;CLEAR POSITION
050462  005037  047646                  CLR     @#GECC1         ;CLEAR GECC1
050466  005037  047650                  CLR     @#GECC2         ;CLEAR
050472  012701  053520                  MOV     #DISK,R1        ;POINTER TO DATA FOR ECC GENERATION
050476  012702  000400                  MOV     #256.,R2        ;COUNTER FOR NUMBER OF DATA WORDS
050502  012703  000020          9$:     MOV     #16.,R3         ;COUNTER FOR NUMBER OF BITS PER WORD
050506  012104                  10$:    MOV     (R1)+,R4        ;DATA IN R4
050510  006004                          ROR     R4              ;GET ONE DATA BIT IN CARRY
050512  103004                          BCC     11$             ;BRANCH IF DATA BIT IS ZERO
050514  012737  177777  047644          MOV     #-1,@#ECDATA    ;ECC DATA BIT IS A ONE
050522  000402                          BR      12$             ;BRANCH TO GENERATE ECC
050524  005037  047644          11$:    CLR     @#ECDATA        ;ECC DATA BIT IS A ZERO
050530  004737  047702          12$:    JSR     PC,@#ECTEST     ;GO TO GENERATE ECC
050534  005303                          DEC     R3              ;DECREMENT BIT COUNT
050536  001364                          BNE     10$             ;BRANCH IF 16 BITS NOT DONE
050540  005302                          DEC     R2              ;DECREMENT WORD COUNT
050542  001357                          BNE     9$              ;BRANCH IF 256 WORDS NOT DONE
050544  013737  047646  054520          MOV     @#GECC1,@#DISK+<256.*2>;INSERT ECC1 ON DISK
050552  013737  047650  054522          MOV     @#GECC2,@#DISK+<257.*2>;INSERT ECC2 ON DISK
050560  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
050562  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
050564  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
050566  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
050570  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
050572  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
050574  000207                          RTS     PC
```

```
8309
8310                                    .SBTTL  RH BASE ADDRESS CHANGE ROUTINE
8311
8312                                ;*********************************************************************
8313                                ;*      THIS ROUTINE WILL ALLOW THE CHANGE OF THE BASE
8314                                ;*      ADDRESS FROM 176700 TO ANY TYPED VALUE
8315                                ;*********************************************************************
8316
8317  050576                        BASECH:
8318  050576  104400  050604                TYPE    .+4             ;;TYPE ASCIZ STRING
8319  050602  000425                BR      64$             ;;GET OVER THE ASCIZ
8320                                ;;.ASCIZ      <15><12>/PRESENT BASE ADDRESS OF REGISTERS IS   /
8321  050656                        64$:
8322  050656  013746  014760               MOV     @#RHCS1,-(SP)   ;GET READY TO TYPE OLD BASE
8323  050662  104402                TYPOC
8324  050664  104400  050672               TYPE    .+4             ;;TYPE ASCIZ STRING
8325  050670  000425                BR      65$             ;;GET OVER THE ASCIZ
8326                                ;;.ASCIZ      <15><12>/TYPE NEW BASE ADDRESS FOLLOWED BY 'CR' /
8327  050744                        65$:
8328  050744  004737  057146               JSR     PC,@#$TKINT     ;INITIALIZE THE TTY KEYBOARD
8329  050750  104416                RDOCT
8330  050752  012700  014750               MOV     #RHDB,R0        ;GET STARTING ADDRESS OF REGISTERS
8331  050756  012701  000024               MOV     #20.,R1         ;NUMBER OF REGISTERS
8332  050762  042710  177700        1$:    BIC     #^C77,(R0)      ;CLEAR OLD BASE ADDRESS
8333  050766  051620                BIS     (SP),(R0)+      ;SET NEW BASE
8334  050770  005301                DEC     R1              ;COUNT
8335  050772  001373                BNE     1$              ;BRANCH IF 20 NOT DONE
8336  050774  104400  051002               TYPE    .+4             ;;TYPE ASCIZ STRING
8337  051000  000417                BR      66$             ;;GET OVER THE ASCIZ
8338                                ;;.ASCIZ      <15><12>/PRESENT VECTOR ADDRESS IS /
8339  051040                        66$:
8340  051040  013746  014746               MOV     @#RPVEC,-(SP)   ;GET READY TO TYPE OLD VECTOR ADDRESS
8341  051044  104402                TYPOC
8342  051046  104400  051054               TYPE    .+4             ;;TYPE ASCIZ STRING
8343  051052  000437                BR      67$             ;;GET OVER THE ASCIZ
8344                                ;;.ASCIZ      <15><12>/TYPE NEW VECTOR ADDRESS OR RETYPE OLD ONE FOLLOWED BY "CR
8345  051152                        67$:
8346  051152  104416                RDOCT
8347  051154  012637  014746               MOV     (SP)+,@#RPVEC   ;SETUP VECTOR ADDRESS
8348  051160  104400  051166               TYPE    .+4             ;;TYPE ASCIZ STRING
8349  051164  000421                BR      68$             ;;GET OVER THE ASCIZ
8350                                ;;.ASCIZ      <15><12>/RESTART PROGRAM FROM 200 OR 210/
8351  051230                        68$:
8352  051230  104400  051236               TYPE    .+4             ;;TYPE ASCIZ STRING
8353  051234  000416                BR      69$             ;;GET OVER THE ASCIZ
8354                                ;;.ASCIZ      <15><12>/NEW BASE WILL REMAIN   - /
8355  051272                        69$:
8356  051272  013746  014760               MOV     @#RHCS1,-(SP)
8357  051276  104402                TYPOC
8358  051300  104400  051306               TYPE    .+4             ;;TYPE ASCIZ STRING
8359  051304  000416                BR      70$             ;;GET OVER THE ASCIZ
8360                                ;;.ASCIZ      <15><12>/NEW VECTOR WILL REMAIN - /
8361  051342                        70$:
8362  051342  013746  014746               MOV     @#RPVEC,-(SP)
```

```
8363  051346  104402                        TYPOC
8364  051350  104400  051356                TYPE    ,.+4            ;;TYPE ASCIZ STRING
8365  051354  000402                        BR      71$             ;;GET OVER THE ASCIZ
8366                                        ;;.ASCIZ    <15><12>/ /
8367  051362                          71$:
8368  051362  104400  051370                TYPE    ,.+4            ;;TYPE ASCIZ STRING
8369  051366  000416                        BR      72$             ;;GET OVER THE ASCIZ
8370                                        ;;.ASCIZ    <15><12>/UNTIL PROGRAM IS RELOADED/
8371  051424                          72$:
8372  051424  000000                        HALT
8373
8374
8375
8376
8377
8378                                    ;*THIS IS A LITTLE ROUTINE THAT TESTS NED BIT 11 IN RHCS2
8379                                    ;*THIS LOOPS HERE FOR EVER
8380                                    ;*TO BE USED ONLY IF DRIVES PRESENT LOOKING AT NED DOES NOT AGREE
8381                                    ;*WITH WHAT IS REALY THERE
8382  051426  000000                ERUNIT: 0                       ;UNIT UNDER MANUAL TEST
8383  051430  004737  045152        ERSTART:JSR     PC,@#CLDISK     ;SET GENERAL REG.
8384  051434  013712  051426                MOV     @#ERUNIT,@R2    ;SELECT UNIT
8385  051440  005714                1$:     TST     @R4             ;TEST RHER1
8386  051442  032712  010000                BIT     #NED,@R2        ;TEST NED
8387  051446  001401                        BEQ     2$              ;BRANCH IF GOOD
8388  051450  000773                        BR      1$              ;NED NOT SET
8389  051452  000772                2$:     BR      1$              ;NED SET
```

```
                        .SBTTL  DISK SIMULATION
                ;*********************************************************************
                ;*********************************************************************
                ;*IN A WRITE HEADER AND DATA COMMAND FILL THE FOLLOWING
                ;*WCLY=WITH CYLINDER TO BE ON DISK
                ;*WSECTR=WITH SECTOR AND TRACK TO BE ON DISK
                ;*WKEY1= WITH KEY1 TO BE ON DISK
                ;*WKEY2= WITH KEY2 TO BE ON DISK
                ;*FNWORD= NO OF DATA WORDS TO BE WRITTEN ON DISK
                ;*THE COMMAND THEN IS   JSR PC,COMWHD
                ;*
                ;*
                ;*
                ;*
                ;*IN A WRITE DATA COMMAND FILL THE FOLLOWING
                ;*CYL=WITH CYLINDER TO BE FOUND ON DISK
                ;*SECOTR= WITH SECTOR AND TRACK TO BE FOUND ON DISK
                ;*KEY1= WITH KEY1 TO BE FOUND ON DISK
                ;*KEY2= WITH KEY2 TO BE FOUND ON DISK
                ;*X= 1  MUST BE ONE
                ;*NOWORD= WITH NUMBER OF DATA WORDS TO BE WRITTEN
                ;*THE COMMAND THEN IS JSR PC,COMHD
                ;*
                ;*
                ;*
                ;*
                ;*
                ;*IN A READ HEADER AND DATA COMMAND FILL THE FOLLOWING
                ;*CYL= WITH CYLINDER TO BE FOUND ON DISK
                ;*SECOTR= WITH SECTOR AND TRACK TO BE FOUND ON DISK
                ;*KEY1= WITH KEY1 TO BE FOUND ON DISK
                ;*KEY2=WITH KEY2 TO BE FOUND ON DISK
                ;*DAWORD= WITH NUMBER OF WORDS TO BE FOUND ON DISK
                ;*;X=0 MUST BE ZERO
                ;*THE COMMAND THEN IS JSR PC,COMHD
                ;*
                ;*
                ;*
                ;*
                ;*
                ;*
                ;*
                ;*
                ;*IN A READ DATA COMMAND FILL THE FOLLOWING
                ;*CYL= WITH CYLINDER TO BE FOUND ON DISK
                ;*SECOTR= WITH SECTOR AND TRACK TO BE FOUND ON DISK
                ;*KEY1= WITH KEY1 TO BE FOUND ON DISK
                ;*KEY2=WITH KEY2 TO BE FOUND ON DISK
                ;*DAWORD= WITH NUMBER OF WORDS TO BE FOUND ON DISK
                ;*;X=0 MUST BE ZERO
                ;*THE COMMAND THEN IS JSR PC,COMHD
```

```
 8444                                   ;*
```

```
8445
8446
8447
8448
8449
8450
8451                                    ;*****************************************************************
8452                                    ;*WRITE DATA COMMAND
8453                                    ;*OR READ COMMAND, I.E DATA ONLY, OR HEADER AND DATA
8454                                    ;*****************************************************************
8455
8456  051454  000000                   RUNCTR: .WORD   0
8457  051456  011637  015130           COMHD:  MOV     (SP),@#PCJSR    ;SAVE PC OF JSR + 4
8458  051462  162737  000004  015130           SUB     #4,@#PCJSR      ;SAVE PC OF JSR
8459  051470  010046                           MOV     R0,-(SP)        ;;PUSH R0 ON STACK
8460  051472  010146                           MOV     R1,-(SP)        ;;PUSH R1 ON STACK
8461  051474  010246                           MOV     R2,-(SP)        ;;PUSH R2 ON STACK
8462  051476  010346                           MOV     R3,-(SP)        ;;PUSH R3 ON STACK
8463  051500  010446                           MOV     R4,-(SP)        ;;PUSH R4 ON STACK
8464  051502  010546                           MOV     R5,-(SP)        ;;PUSH R5 ON STACK
8465  051504  012777  000001  143266           MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE
8466  051512  052777  000001  143240           BIS     #GO,@RHCS1      ;ISSUE 'GO' BIT & STALL 'TILL 'RUN'
8467                                                                   ;FUNCTION CODE IS ISSUED BY THE TEST
8468  051520  012737  000113  051454  RUNWAT: MOV     #75.,@#RUNCTR   ;LOAD STALL COUNT = APPROX. 450US FOR 11/50 CPU
8469  051526  005337  051454          1$:     DEC     @#RUNCTR        ;COUNT DOWN ONE
8470  051532  001375                           BNE     1$              ;CONTINUE UNTIL = 0
8471
8472  051534  016746  000044                   MOV     SECOTR, -(SP)   ;GET DESIRED SECTOR/TRACK
8473  051540  042716  177740                   BIC     #177740,(SP)    ;MAKE ONLY SECTOR
8474  051544  012637  051554                   MOV     (SP)+, @#TRK    ;SAVE SECTOR
8475  051550  004137  055634                   JSR     R1,@#SEARCH     ;DO SEARCH SECTOR & ISSUE SECTOR CLOCKS
8476
8477  051554  000000                   TRK:    .WORD   0
8478  051556  012701  000240                   MOV     #+NOP,R1        ;GOING TO MOVE NOPS
8479  051562  010137  051614                   MOV     R1,@#SSYN       ;NOP INTO SSYN
8480  051566  010137  051616                   MOV     R1,@#HEDGAP     ;NOP INTO HEDGAP
8481  051572  010137  051620                   MOV     R1,@#HEDSYN     ;NOP INTO HEDSYN
8482  051576  004137  051724                   JSR     R1,@#RDHEAD     ;READ THE HEADER
8483
8484  051602  000000                   CYL:    .WORD   0               ;CYLINDER ADDRESS
8485  051604  000000                   SECOTR: .WORD   0               ;SECTOR/TRACK ADDRESS
8486  051606  000000                   KEY1:   .WORD   0               ;KEY1 WORD
8487  051610  000000                   KEY2:   .WORD   0               ;KEY2 WORD
8488  051612  000000                   X:      .WORD   0               ;X=1 WRITE COMMAND
8489                                                                   ;X=0 READ COMMAND
8490
8491  051614  000240                   SSYN:   NOP                     ;IF "ERROR 2" INSERTED BY RDHEAD
8492                                                                   ;SUBROUTINE, THEN THE FIRST SYNC
8493                                                                   ;IS NOT DETECTED.  NO BAD DATA
8494                                                                   ;IS GIVEN BECAUSE SYNC=144000
8495                                                                   ;CANNOT BE READ.  WORD NUMBER
8496                                                                   ;IS "1" BECAUSE THIS IS THE FIRST
8497                                                                   ;WORD TESTED.
8498
```

```
 8499  051616  000240                    HEDGAP: NOP                          ;IF "ERROR 3" INSERTED BY
 8500                                                                         ;RDHEAD SUBROUTINE, THEN THE
 8501                                                                         ;HEADER GAP 0'S WERE NOT
 8502                                                                         ;WRITTEN RIGHT.
 8503
 8504                                                                         ;IF "WORD NO" CONTAINS, SAY
 8505                                                                         ;3(8), THEN IT IS THE THIRD
 8506                                                                         ;WORD OF A 5 WORD HEADER
 8507                                                                         ;GAP THAT IS WRONG.
 8508
 8509                                                                         ;"BAD DATA" CONTAINS WHAT IS
 8510                                                                         ;GOING ON THE DISK.
 8511
 8512  051620  000240                    HEDSYN: NOP
 8513                                                                         ;IF "ERROR 3" INSERTED BY RDHEAD
 8514                                                                         ;SUBROUTINE, THEN THE HEADER SYNC
 8515                                                                         ;GENERATED BY DCL IS WRONG,
 8516                                                                         ;OR THE LAST BYTE
 8517                                                                         ;OF THE HEADER GAP 0'S IS WRONG.
 8518
 8519                                                                         ;IN EITHER CASE WORD NO=6,
 8520                                                                         ;RIGHT BYTE IS HEADER 0,
 8521                                                                         ;LEFT BYTE IS SYNC.
 8522
 8523                                                                         ;"BAD DATA" HAS WHAT IS GOING
 8524                                                                         ;ON DISK.
 8525
 8526  051622  005737  015122                    TST     @#ERFLG$           ;ARE ANY ERRORS DETECTED ?
 8527  051626  001017                            BNE     OUT                ;IF YES BRANCH
 8528  051630  005737  051612                    TST     @#X
 8529  051634  001410                            BEQ     DAREAD
 8530  051636  005737  051716                    TST     @#NOSYNC           ;IS THIS FORCED HEADER ERROR COMMAND ?
 8531                                                                         ;IF YES  NOSYNC=-1 THEN WRITE OR READ
 8532                                                                         ;IS SHUT OFF, SO BRANCH OUT
 8533                                                                         ;IF  NOSYNC=0 THEN CONTINUE
 8534  051642  001011                            BNE     OUT                ;BRANCH IF SET
 8535  051644  004137  053170                    JSR     R1,@#WRDATA        ;WRITE DATA
 8536
 8537  051650  000000                NOWORD: .WORD   0                      ;NO OF WORDS TO BE WRITTEN
 8538  051652  000000                Y:      .WORD   0                      ;
 8539  051654  000404                        BR      OUT                    ;
 8540  051656  004137  056110        DAREAD: JSR     R1,@#REDATA            ;READ DATA
 8541  051662  000000                DAWORD: .WORD   0                      ;NO OF WORDS TO BE READ
 8542  051664  000000                        .WORD   0
 8543
 8544  051666                        OUT:
 8545  051666  012605                        MOV     (SP)+,R5               ;;POP STACK INTO R5
 8546  051670  012604                        MOV     (SP)+,R4               ;;POP STACK INTO R4
 8547  051672  012603                        MOV     (SP)+,R3               ;;POP STACK INTO R3
 8548  051674  012602                        MOV     (SP)+,R2               ;;POP STACK INTO R2
 8549  051676  012601                        MOV     (SP)+,R1               ;;POP STACK INTO R1
 8550  051700  012600                        MOV     (SP)+,R0               ;;POP STACK INTO R0
 8551  051702  000207                        RTS     PC                     ;EXIT
 8552
```

```
8553
8554                                    ;*****************************************************************
8555
8556                                    ;*THE DISK SECTOR IS DEVIDED AS FOLLOWS
8557
8558                                    ;*19 WORDS OF 0, ONE WORD 144000
8559                                    ;*THESE MAKE 39 BYTES FOR SECTOR GAP AND ONE SYNC. BYTE
8560
8561
8562  051704  014400                    RSYNC:  14400
8563  051706  000000                    RCYL:   0
8564  051710  000000                    RSETR:  0
8565  051712  000000                    RKEY1:  0
8566  051714  000000                    RKEY2:  0
8567
8568
8569                                    ;*5 WORDS OF 0 ONE WORD 144000
8570                                    ;*THESE MAKE 11 BYTES FOR HEADER GAP AND ONE SYNC. BYTE
8571                                    ;*THESE ARE DCL GENERATED
8572
8573
8574
8575                                    ;*THERE ARE 256 WORDS OF DATA
8576                                    ;*THERE ARE 2 WORDS FOR ECC GENERATED BY DCL
8577                                    ;*15 WORDS OF 0 FOR DATA GAP AND TOLERANCE GAP
8578                                    ;*****************************************************************
8579
8580
8581
8582
8583
8584
```

```
                                ;*****************************************************************
                                ;*READ DISK HEADER
                                ;*****************************************************************



051716  000000          NOSYNC: 0                       ;FORCED HEADER ERROR = -1
                                                        ;NORMAL = 0
051720  000000          TY:     0                       ;ERROR TYPE NO.
051722  000000          ERWORD: 0                       ;ERROR WORD NO.



051724  012137  051706  RDHEAD: MOV     (R1)+,  @#RCYL  ;STORE CYLINDER ADDRESS
051730  012137  051710          MOV     (R1)+,  @#RSETR ;STORE SECTOR AND TRACK ADDRESS
051734  012137  051712          MOV     (R1)+,  @#RKEY1 ;STORE KEY1
051740  012137  051714          MOV     (R1)+,  @#RKEY2 ;STORE KEY2
051744  012137  052514          MOV     (R1)+,  @#COMPA ;STORE COMPARE OR NOT
051750  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
051752  013700  015000          MOV     @#RHMR, R0      ;R0 CONTAINS MAINTANENCE REG.
051756  012705  000002          MOV     #2,     R5      ;R5 IS A COUNTER FOR WORDS
051762  012710  000001          MOV     #DMD,   @R0     ;DIAG. MODE
051766  052710  000010          BIS     #MSTCK,@R0      ;SET SECTOR FOR FIRST WORD
051772  052710  000002          BIS     #MCLK,@R0       ;SET CLOCK FOR FIRST WORD
051776  042710  000012          BIC     #MSTCK!MCLK,@R0 ;RESET SECTOR AND CLOCK
052002  000404                  BR      2$              ;BRANCH OVER GIVING SECTOR FOR FIRST TIME
052004  012710  000013  1$:     MOV     #MSTCK!MCLK!DMD,@R0;SET SECTOR, CLOCK, DIAG. MODE, RESET INDEX
052010  042710  000012          BIC     #MSTCK!MCLK,@R0 ;RESET SECTOR, CLOCK
052014  012702  000007  2$:     MOV     #7,     R2      ;R2 IS A COUNTER FOR BYTES
052020  052710  000002  3$:     BIS     #MCLK,  @R0     ;SET CLOCK
052024  042710  000002          BIC     #MCLK,  @R0     ;RESET CLOCK
052030  005302                  DEC     R2              ;BYTE COUNTER
052032  001372                  BNE     3$              ;BRANCH IF BYTE NOT COMPLETE
052034  005305                  DEC     R5              ;WORD COUNTER
052036  001362                  BNE     1$              ;BRANCH IF WORD NOT COMPLETE
052040  012702  000022          MOV     #18.,   R2      ;NO OF WORDS OF ZEROS
052044  005037  052512  4$:     CLR     @#WORD          ;READ 0
052050  004737  052516          JSR     PC,     @#READ  ;GO TO READ
052054  005302                  DEC     R2              ;COUNT
052056  001372                  BNE     4$
052060  013737  051704  052512  MOV     @#RSYNC,@#WORD  ;SYNC. WORD
052066  004737  052516          JSR     PC,     @#READ
052072  032710  001000          BIT     #DTSY,  @R0     ;SYNC. BYTE DETECTED?
052076  001012                  BNE     5$              ;BRANCH IF SYNC DETECTED
052100  012737  000001  051722  MOV     #1,     @#ERWORD        ;ERROR WORD NO
052106  013737  051704  001124  MOV     @#RSYNC,@#$GDDAT        ;SYNC WORD
052114  012737  104002  051614  MOV     #104002,@#SSYN  ;INSERT "ERROR 2" IN SSYN
052122  000571                  BR      13$             ;BRANCH OUT
052124  013737  051706  052512  5$:     MOV     @#RCYL, @#WORD  ;SETUP CYLINDER
052132  004737  052516          JSR     PC,     @#READ  ;READ
052136  013737  051710  052512          MOV     @#RSETR,@#WORD  ;SETUP SECTOR/TRACK
```

```
8639  052144  004737  052516                      JSR     PC,@#READ       ;READ
8640  052150  013737  051712  052512              MOV     @#RKEY1,@#WORD  ;SETUP KEY1
8641  052156  004737  052516                      JSR     PC,@#READ       ;READ
8642  052162  013737  051714  052512              MOV     @#RKEY2,@#WORD  ;SETUP KEY2
8643  052170  004737  052516                      JSR     PC,@#READ       ;READ
8644  052174  013737  053502  052512              MOV     @#WCRC,@#WORD   ;SETUP CRC
8645  052202  004737  052516                      JSR     PC,@#READ       ;READ
8646  052206  005737  015142                      TST     @#TESDTE        ;IS THIS A DRIVE TIMING ERROR
8647  052212  001135                              BNE     13$             ;BRANCH OUT IF YES
8648  052214  005737  052514                      TST     @#COMPA         ;IS THIS A READ OR WRITE COMMAND
8649  052220  001472                              BEQ     11$
8650  052222  012705  053504                      MOV     #HEGAP, R5      ;POINTER FOR HEADER GAP
8651  052226  012702  000005                      MOV     #5,     R2      ;NO OF WORDS OF ZEROS
8652  052232  012737  000006  051722  6$:         MOV     #6,@#ERWORD     ;ERROR WORD NO SET
8653  052240  004737  052750                      JSR     PC,@#WRITE      ;FOR HEADER GAP
8654  052244  005737  052746                      TST     @#WWORD         ;TEST WRITTEN WORD
8655  052250  001413                              BEQ     7$              ;BRANCH IF GOOD THAT IS 0
8656  052252  160237  051722                      SUB     R2,@#ERWORD     ;WORD NO IN ERROR
8657  052256  005037  001124                      CLR     @#$GDDAT                ;GOOD WORD SHOULD BE 0
8658  052262  013767  052746  126636              MOV     @#WWORD,        $BDDAT  ;BAD DATA
8659  052270  012737  104003  051616              MOV     #104003,@#HEDGAP        ;"ERROR 2" GOES IN HEDGAP
8660  052276  000503                              BR      13$             ;BRANCH OUT
8661  052300  013725  052746          7$:         MOV     @#WWORD,(R5)+   ;SAVE HEADER GAP
8662  052304  005302                              DEC     R2
8663  052306  001351                              BNE     6$
8664  052310  004737  052750                      JSR     PC,     @#WRITE ;WRITE HEADER (DATA) GAP SYNC
8665  052314  023737  051704  052746              CMP     @#RSYNC,@#WWORD
8666  052322  001426                              BEQ     10$
8667  052324  005737  051716                      TST     @#NOSYNC        ;IS THIS FORCED HEADER ERROR COMMAND
8668                                                                      ;IF YES  NOSYNC=-1 THEN WRITE OR READ
8669                                                                      ;IS SHUT OFF SO BRANCH OUT
8670                                                                      ;IF NO NOSYNC=0 THEN CONTINUE
8671  052330  001406                              BEQ     14$             ;BRANCH IF TRUE ERROR
8672  052332  005737  052746                      TST     @#WWORD         ;
8673  052336  001420                              BEQ     10$             ;BRANCH IF GOOD
8674  052340  005037  001124                      CLR     @#$GDDAT        ;IT SHOULD BE ZERO
8675  052344  000403                              BR      15$             ;BRANCH TO TYPE ERROR
8676  052346  013737  051704  001124  14$:         MOV     @#RSYNC,@#$GDDAT        ;GOOD DATA
8677  052354  013737  052746  001126  15$:         MOV     @#WWORD,@#$BDDAT        ;BAD DATA
8678  052362  012737  000006  051722              MOV     #6,     @#ERWORD
8679  052370  012737  104003  051620              MOV     #104003,@#HEDSYN
8680  052376  000443                              BR      13$             ;BRANCH OUT
8681  052400  013725  052746          10$:        MOV     @#WWORD,(R5)+   ;SAVE DATA SYNC.
8682  052404  000440                              BR      13$
8683                                  ;*READ COMMAND START FROM HERE
8684  052406  012702  000005          11$:        MOV     #5,     R2
8685  052412  005067  000074          12$:        CLR     WORD
8686  052416  004767  000074                      JSR     PC,     READ    ;READ HEADER GAP
8687  052422  005302                              DEC     R2              ;IS 5 HEADER GAP ZEROS COMPLETE
8688  052424  001372                              BNE     12$             ;IF NOT BRANCH
8689  052426  013737  051704  052512              MOV     @#RSYNC,@#WORD  ;SYNC WORD
8690  052434  004767  000056                      JSR     PC,     READ    ;READ HEADER (DATA) SYNC)
8691  052440  005737  051716                      TST     @#NOSYNC
8692  052444  001404                              BEQ     16$             ;IF NOT ERROR COMMAND BRANCH
```

```
8693  052446  032710  001000              BIT     #DTSY,@R0       ;SYNC. DETECTED
8694  052452  001415                      BEQ     13$             ;IF ZERO BRANCH OUT
8695  052454  000403                      BR      17$             ;IF NOT ZERO BRANCH TO ERROR
8696  052456  032710  001000      16$:    BIT     #DTSY,  @R0     ;SYNC. DETECTED?
8697  052462  001011                      BNE     13$             ;BRANCH IF YES
8698  052464  012737  000006  051722  17$:    MOV     #6,@#ERWORD     ;ERROR WORD NO.
8699  052472  013737  051704  001124          MOV     @#RSYNC,@#$GDDAT;SYNC WORD
8700  052500  012737  104002  051620          MOV     #104002,@#HEDSYN
8701  052506                          13$:
8702  052506  012601                      MOV     (SP)+,R1        ;;POP STACK INTO R1
8703  052510  000201                      RTS     R1
8704
8705
8706
8707
8708
8709
8710
8711
```

```
                                ;*****************************************************************
                                ;*READ ONE WORD IN "WORD"
                                ;*****************************************************************



052512  000000                  WORD:   0
052514  000000                  COMPA:  0


052516                          READ:
052516  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
052520  012705  000002                   MOV     #2,     R5      ;WORD COUNTER
052524  012710  000001                   MOV     #DMD,   @R0     ;SET DIAG. MODE
052530  006037  052512                   ROR     @#WORD          ;CHECKING IF THERE IS A ONE
052534  103002                          BCC     1$              ;IF NO ONE BRANCH
052536  052710  000020                   BIS     #MRD,   @R0     ;SET BIT 4 IF DATA HAS ONE
052542  012702  000007           1$:     MOV     #7,     R2      ;BYTE COUNTER
052546  052710  000012                   BIS     #MSTCK!MCLK,    @R0     ;SET CLOCK,DATA IF ANY, SECTOR
052552  005737  047652                   TST     @#TSECCG        ;IS THIS BIT TO GENERATE AND TEST ECC
052556  001411                          BEQ     6$              ;BRANCH IF NO
052560  032710  000020                   BIT     #MRD,@R0        ;IS DATA BIT A ONE
052564  001404                          BEQ     5$              ;BRANCH IF DATA BIT IS 0
052566  012737  177777  047644           MOV     #-1,@#ECDATA    ;ECC DATA BIT IS A ONE
052574  000402                          BR      6$              ;BRANCH
052576  005037  047644           5$:     CLR     @#ECDATA        ;ECC DATA BIT IS A 0
052602  012746  000001           6$:     MOV     #DMD,   -(SP)   ;KEEP ONLY DIAG. MODE
052606  006037  052512                   ROR     @#WORD          ;CHECKING IF THERE IS A ONE
052612  103002                          BCC     2$              ;IF NO ONE BRANCH
052614  012716  000021                   MOV     #MRD!DMD,       (SP)    ;KEEP DATA AND DIAG. MODE
052620  012610                  2$:     MOV     (SP)+,  @R0     ;PUT IN DATA,RESET CLOCK, SECTOR
052622  005737  047652                   TST     @#TSECCG        ;IS ECC TO BE GENERATED FOR THIS BIT
052626  001404                          BEQ     3$              ;BRANCH IF NO
052630  005237  047664                   INC     @#DATENV        ;NUMBER OF CLOCKS GIVEN FOR DATA ENVELOPE
052634  004737  047702                   JSR     PC,@#ECTEST     ;GO TO GENERATE AND TEST ECC
052640  052710  000002           3$:     BIS     #MCLK,  @R0     ;SET CLOCK
052644  005737  047652                   TST     @#TSECCG        ;IS THIS BIT TO GENERATE ECC
052650  001411                          BEQ     8$              ;BRANCH IF NO
052652  032710  000020                   BIT     #MRD,@R0        ;IS DATA BIT A ONE
052656  001404                          BEQ     7$              ;BRANCH IF DATA BIT IS = 0
052660  012737  177777  047644           MOV     #-1,@#ECDATA    ;ECC DATA BIT IS A ONE
052666  000402                          BR      8$              ;BRANCH
052670  005037  047644           7$:     CLR     @#ECDATA        ;ECC DATA BIT IS = 0
052674  012746  000001           8$:     MOV     #DMD,   -(SP)   ;KEEP DIAG. MODE
052700  006037  052512                   ROR     @#WORD          ;CHECKING IF THERE IS A ONE
052704  103002                          BCC     4$              ;BRANCH IF NO ONE
052706  012716  000021                   MOV     #MRD!DMD,(SP)   ;KEEP DIAG. MODE AND DATA
052712  012610                  4$:     MOV     (SP)+,  @R0     ;SET DATA, DIAG. MODE, CLEAR CLOCK
052714  005737  047652                   TST     @#TSECCG        ;IS THIS BIT TO GENERATE ECC
052720  001404                          BEQ     9$              ;BRANCH IF NO
052722  005237  047664                   INC     @#DATENV        ;NUMBER OF CLOCKS GIVEN FOR DATA ENVELOPE
```

```
 8766  052726  004737  047702              JSR     PC,@#ECTEST     ;GO TO GENERATE AND TEST ECC
 8767  052732  005302                  9$: DEC     R2              ;BYTE COUNTER
 8768  052734  001341                      BNE     3$              ;BRANCH IF ONE BYTE NOT COMPLETE
 8769  052736  005305                      DEC     R5              ;WORD COUNTER
 8770  052740  001300                      BNE     1$              ;BRANCH IF ONE WORD NOT COMPLETE
 8771  052742  012602                      MOV     (SP)+,R2        ;;POP STACK INTO R2
 8772  052744  000207                      RTS     PC
 8773
 8774
 8775
 8776
 8777
 8778
```

```
8779                                    ;*****************************************************************
8780                                    ;*WRITE ONE WORD WHICH COMES BACK IN "WWORD"
8791                                    ;*****************************************************************
8782
8783
8784
8785
8786
8787
8788  052746  000000                    WWORD:  0
8789
8790
8791
8792
8793  052750                            WRITE:
8794  052750  010046                            MOV     R0,-(SP)        ;;PUSH R0 ON STACK
8795  052752  010246                            MOV     R2,-(SP)        ;;PUSH R2 ON STACK
8796  052754  010346                            MOV     R3,-(SP)        ;;PUSH R3 ON STACK
8797  052756  010546                            MOV     R5,-(SP)        ;;PUSH R5 ON STACK
8798  052760  012705  000002                    MOV     #2,     R5      ;WORD COUNTER
8799  052764  012710  000001                    MOV     #1,     @R0     ;SET DIAG. MODE
8800  052770  012702  000007            1$:     MOV     #7,     R2      ;BYTE COUNTER
8801  052774  012710  000013                    MOV     #MSTCK!MCLK!DMD,@R0;SET SECTOR AND CLOCK
8802  053000  032710  000040                    BIT     #MWR,   @R0     ;CHECK WRITEBIT IN MAINT. REG.
8803  053004  001406                            BEQ     2$              ;BRANCH IF ZERO
8804  053006  012737  177777  047644            MOV     #-1,@#ECDATA    ;ECC DATA BIT IS A ONE
8805  053014  000261                            SEC                     ;SET CARRY
8806  053016  006003                            ROR     R3              ;MOVE 1 FORWARD
8807  053020  000404                            BR      3$
8808  053022  005037  047644            2$:     CLR     @#ECDATA        ;ECC DATA BIT IS = 0
8809  053026  000241                            CLC                     ;CLEAR CARRY
8810  053030  006003                            ROR     R3              ;MOVE 0 FOR WWORD
8811  053032  012710  000001            3$:     MOV     #DMD,   @R0     ;CLEAR SECTOR AND CLOCK
8812  053036  005737  047652                    TST     @#TSECCG        ;IS THIS BIT TO GENERATE ECC
8813  053042  001404                            BEQ     4$              ;BRANCH IF NO
8814  053044  005237  047664                    INC     @#DATENV        ;NUMBER OF CLOCKS GIVEN FOR DATA ENVELOPE
8815  053050  004737  047702                    JSR     PC,@#ECTEST     ;GO TO GENERATE AND TEST ECC
8816  053054  052710  000002            4$:     BIS     #MCLK,  @R0     ;SET CLOCK
8817  053060  032710  000040                    BIT     #MWR,   @R0     ;CHECK WRITE BIT IN MAINT. REG.
8818  053064  001406                            BEQ     5$              ;BRANCH IF ZERO
8819  053066  012737  177777  047644            MOV     #-1,@#ECDATA    ;ECC DATA BIT IS A ONE
8820  053074  000261                            SEC                     ;SET CARRY
8821  053076  006003                            ROR     R3              ;MOVE 1 FOR WWORD
8822  053100  000404                            BR      6$
8823  053102  005037  047644            5$:     CLR     @#ECDATA        ;ECC DATA BIT IS ZERO
8824  053106  000241                            CLC                     ;CLEAR CARRY
8825  053110  006003                            ROR     R3              ;MOVE 0 FOR WWORD
8826  053112  012710  000001            6$:     MOV     #DMD,   @R0     ;CLEAR CLOCK
8827  053116  005737  047652                    TST     @#TSECCG        ;IS THIS BIT TO GENERATE ECC
8828  053122  001404                            BEQ     7$              ;BRANCH IF NO
8829  053124  005237  047664                    INC     @#DATENV        ;NUMBER OF CLOCKS GIVEN FOR DATA ENVELOPE
8830  053130  004737  047702                    JSR     PC,@#ECTEST     ;GO TO GENERATE AND TEST ECC
8831  053134  005302            7$:     DEC     R2              ;COUNT FOR BYTE END
8832  053136  001346                            BNE     4$              ;IF NOT BYTE END BRANCH
```

```
 8833  053140  005305                    DEC     R5              ;COUNT FOR WORD END
 8834  053142  001312                    BNE     1$              ;IF NOT WORD END BRANCH
 8835  053144  010337  052746            MOV     R3,     @#WWORD ;STORE WORD
 8836  053150  012605                    MOV     (SP)+,R5        ;;POP STACK INTO R5
 8837  053152  012603                    MOV     (SP)+,R3        ;;POP STACK INTO R3
 8838  053154  012602                    MOV     (SP)+,R2        ;;POP STACK INTO R2
 8839  053156  012600                    MOV     (SP)+,R0        ;;POP STACK INTO R0
 8840  053160  000207                    RTS     PC
 8841
 8842
 8843
 8844
 8845
 8846
```

```
 8847                                ;*****************************************************************
 8848                                ;*WRITE DATA
 8849                                ;*****************************************************************
 8850
 8851
 8852
 8853
 8854
 8855
 8856
 8857  053162  000000                COUNTD: 0
 8858  053164  000400                FORMAT: 256.
 8859  053166  000000                ZWORDS: 0
 8860  053170                        WRDATA:
 8861  053170  011137  053162               MOV     (R1),   @#COUNTD        ;STORE NO. OF WORDS TO BE WRITTEN
 8862  053174  012102                       MOV     (R1)+,  R2      ;SAME IN R2
 8863  053176  012137  052514               MOV     (R1)+,  @#COMPA ;COMPARE OR NOT
 8864  053202  010046                       MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 8865  053204  010146                       MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 8866  053206  010246                       MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 8867  053210  010346                       MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 8868  053212  010446                       MOV     R4,-(SP)        ;;PUSH R4 ON STACK
 8869  053214  012701  000016               MOV     #14.,   R1      ;NO. OF TOLERANCE GAP WORDS
 8870  053220  012703  054526               MOV     #TOLGAP,R3      ;START OF TOLERANCE GAP TABLE
 8871  053224  012723  177777       1$:     MOV     #-1,    (R3)+   ;MAKE IT 177777
 8872  053230  005301                       DEC     R1              ;IS 14 COMPLETED
 8873  053232  001374                       BNE     1$              ;IF NO BRANCH
 8874  053234  013700  015000               MOV     @#RHMR, R0      ;R0 CONTAINS MAINTANENCE REG.
 8875  053240  013746  053164               MOV     @#FORMAT,       -(SP)
 8876  053244  163716  053162               SUB     @#COUNTD,       (SP)
 8877  053250  011637  053166               MOV     (SP),@#ZWORDS   ;NO. OF ZERO WORDS TO BE WRITTEN
 8878  053254  012604                       MOV     (SP)+,  R4
 8879  053256  005737  015140               TST     @#TSECC         ;IS THIS AN ECC TEST
 8880  053262  001403                       BEQ     7$              ;BRANCH IF NO
 8881  053264  012737  177777  047652       MOV     #-1,@#TSECCG    ;THESE BITS ARE TO GENERATE ECC
 8882  053272  012703  053520       7$:     MOV     #DISK,  R3      ;SIMULATED DISK AREA
 8883  053276  004737  052750       2$:     JSR     PC,     @#WRITE ;WRITE ON SIMULATED DISK
 8884  053302  013723  052746               MOV     @#WWORD,(R3)+   ;STORE ON SIMULATED DISK
 8885  053306  005302                       DEC     R2
 8886  053310  001372                       BNE     2$
 8887  053312  005704                       TST     R4      ;ANY ZEROS TO BE WRITTEN
 8888  053314  001406                       BEQ     4$      ;BRANCH IF NONE TO BE WRITTEN
 8889  053316  004737  052750       3$:     JSR     PC,     @#WRITE ;WRITE ZEROS ON SIMULATED DISK
 8890  053322  013723  052746               MOV     @#WWORD,        (R3)+   ;STORE
 8891  053326  005304                       DEC     R4
 8892  053330  001372                       BNE     3$
 8893  053332  005037  047652       4$:     CLR     @#TSECCG        ;NO MORE ECC TO BE GENERATED
 8894  053336  012701  000002               MOV     #2,     R1
 8895  053342  004767  177402       5$:     JSR     PC,     WRITE   ;WRITE ECC1 AND ECC2 ON SIMULATED DISK
 8896  053346  013723  052746               MOV     @#WWORD,(R3)+   ;STORE ON WEEC1 AND WEEC2
 8897  053352  005301                       DEC     R1
 8898  053354  001372                       BNE     5$
 8899  053356  004767  177366               JSR     PC,     WRITE   ;WRITE DATA GAP
 8900  053362  013723  052746               MOV     @#WWORD,(R3)+   ;STORE
```

```
8901  053366  012701  000016          MOV     #14.,   R1
8902  053372  004737  052750  6$:     JSR     PC,     @#WRITE ;WRITE TOLERANCE GAP ZEROS
8903  053376  013723  052746          MOV     @#$$WORD,(R3)+  ;STORE
8904  053402  005301                  DEC     R1
8905  053404  001372                  BNE     6$
8906  053406  012604                  MOV     (SP)+,R4        ;;POP STACK INTO R4
8907  053410  012603                  MOV     (SP)+,R3        ;;POP STACK INTO R3
8908  053412  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
8909  053414  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
8910  053416  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
8911  053420  000201                  RTS     R1
8912
8913
8914
8915
8916
8917
8918
8919
```

```
8920                            ;*****************************************************************
8921                            ;*WRITE HEADER AND DATA
8922                            ;*
8923                            ;*
8924                            ;*THIS IS THE SIMULATED DISK
8925                            ;*ONLY ONE SECTOR OF SPACE IS ALLOWED
8926                            ;*****************************************************************
8927                            ;*****************************************************************
8928
8929
8930
8931
8932
8933
8934
8935   053422  000023   SECGAP: .BLKW   19.              ;SECTOR GAP 38 BYTES OF 0
8936   053470  000001   WSSYNC: .BLKW   1               ;SECTOR GAP 1 BYTE OF 0 ONE SYNC BYTE
8937   053472  000004   HEADER: .BLKW   4               ;HEADER = CYL, SECTOR/TRACK, KEY1, KEY2
8938   053502  000001   WCRC:   .BLKW   1               ;CRC
8939   053504  000005   HEGAP:  .BLKW   5               ;HEADER GAP 10 BYTES OF 0
8940   053516  000001   HDWSYN: .BLKW   1               ;HEADER GAP 1 BYTE OF 0 ONE SYNC. BYTE
8941   053520           SILOTB:                 ;(USED IN SILO TEST AS SILO TABLE)
8942   053520  000400   DISK:   .BLKW   256.            ;DATA SPACE
8943   054520  000001   WECC1:  .BLKW   1               ;ECC1
8944   054522  000001   WECC2:  .BLKW   1               ;ECC2
8945   054524  000001   DTAGAP: .BLKW   1               ;DATA GAP 2 BYTES OF 0
8946   054526  000016   TOLGAP: .BLKW   14.             ;TOLERANCE GAP 28 BYTES OF 0
8947
8948
8949
8950
8951
8952
```

```
                                        ;*****************************************************************
                                        ;*WRITE HEADER AND DATA
                                        ;*****************************************************************


054562  000000          RNCTR1: .WORD   0               ;'RUN' LINE STALL COUNTER
054564  011637  015130  COMWHD: MOV     (SP),@#PCJSR    ;SAVE PC OF JSR + 4
054570  162737  000004  015130  SUB     #4,@#PCJSR      ;SAVE PC OF JSR
054576  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
054600  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
054602  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
054604  010346                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
054606  010446                  MOV     R4,-(SP)        ;;PUSH R4 ON STACK
054610  010546                  MOV     R5,-(SP)        ;;PUSH R5 ON STACK
054612  012777  000001  140160  MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE BIT
054620  052777  000001  140132  BIS     #GO,@RHCS1      ;SET 'GO' BIT & STALL 'TILL 'RUN'
                                                        ;FUNCTION CODE IS SET UP BY THE TEST
054626  012737  000113  054562  RNWAT1: MOV     #75.,@#RNCTR1   ;LOAD STALL COUNTER = APPROX 450US FOR 11/50 CPU
054634  005337  054562  1$:     DEC     @#RNCTR1        ;COUNT DOWN 1 TIME
054640  001375                  BNE     1$              ;CONTINUE UNTIL = 0

054642  013746  054726          MOV     @#WSECTR,-(SP)  ;GET DESIRED SECTOR/TRACK
054646  042716  177740          BIC     #177740,(SP)    ;MAKE ONLY SECTOR
054652  012637  054662          MOV     (SP)+, @#WTRK   ;SAVE SECTOR
054656  004137  055634          JSR     R1,@#SEARCH     ;SEARCH SECTOR & ISSUE SECTOR CLOCKS

054662  000000          WTRK:   .WORD   0               ;SECTOR NO.
054664  012701  000240          MOV     #+NOP,R1        ;GOING TO MOVE NOPS
054670  010137  054736          MOV     R1,@#SEGPER     ;NOP INTO SEGAP
054674  010137  054740          MOV     R1,@#FSYNER     ;NOP INTP FSYNER
054700  010137  054742          MOV     R1,@#ERHEAD     ;NOP INTO ERHEAD
054704  010137  054744          MOV     R1,@#ERCRC      ;NOPINTO ERCRC
054710  010137  054746          MOV     R1,@#ERHDGP     ;NOP INTO ERHDGAP
054714  010137  054750          MOV     R1,@#HDESYN     ;NOP INTO HDESYN
054720  004137  055020          JSR     R1,@#WRHEAD     ;WRITE THE HEADER

054724  000000          WCYL:   0                       ;CYLINDER
054726  000000          WSECTR: 0                       ;SECTOR AND TRACK
054730  000000          WKEY1:  0                       ;KEY1
054732  000000          WKEY2:  0                       ;KEY2
054734  000000          GCRC:   0                       ;GOOD CRC

054736  000240          SEGPER: NOP                     ;IF "ERROR 6" INSERTED BY
                                                        ;WRHEAD SUBROUTINE, THEN
                                                        ;SECTOR GAP GOING ON DISK
                                                        ;IS NOT RIGHT.

                                                        ;WORD NO. CONTAINS WHICH
                                                        ;WORD IS WRONG, THAT IS
                                                        ;FIRST OF TENTH, OR WHAT EVER.

                                                        ;BAD WORD IS WHAT IS GOING ON DISK
```

```
 9007  054740  000240                FSYNER: NOP                    ;IF "ERROR 6" INSERTED BY
 9008                                                               ;WRHEAD SUBROUTINE, THEN
 9009                                                               ;THE LAST 0 BYTE OF SECTOR
 9010                                                               ;GAP OF FIRST SYNC. BYTE
 9011                                                               ;AFTER SECTOR GAP IS IN
 9012                                                               ;ERROR.
 9013
 9014                                                               ;WORD NO. CONTAINS 20
 9015                                                               ;RIGHT BYTE IS SECTOR GAP
 9016                                                               ;LEFT BYTE IS SYNC. BYTE.
 9017
 9018                                                               ;BAD WORD IS WHAT IS GOING ON
 9019                                                               ;DISK
 9020
 9021  054742  000240                ERHEAD: NOP
 9022                                                               ;IF "ERROR 6" INSERTED BY
 9023                                                               ;WRHEAD SUBROUTINE, THEN
 9024                                                               ;HEADER GOING ON DISK
 9025                                                               ;IS WRONG.
 9026
 9027                                                               ;WORD NO 1 = CYLINDER NO
 9028                                                               ;WORD NO 2 = SECTOR/TRACK
 9029                                                               ;WORD NO 3 = KEY1
 9030                                                               ;WORD NO 4 = KEY2
 9031
 9032                                                               ;BAD WORD IS WHAT IS GOING ON
 9033                                                               ;DISK
 9034
 9035  054744  000240                ERCRC:  NOP
 9036                                                               ;IF "ERROR 6" INSERTED BY
 9037                                                               ;WRHEAD SUBROUTINE, THEN CRC WRITTEN
 9038                                                               ;ON DISK IS IN ERROR.
 9039
 9040                                                               ;GOOD DATA IS WHAT SHOULD BE ON DISK
 9041                                                               ;BAD DATA IS WHAT IS GOING ON DISK.
 9042
 9043                                                               ;WORD NO IS 5
 9044
 9045  054746  000240                ERHDGP: NOP
 9046                                                               ;IF "ERROR 6" INSERTED BY
 9047                                                               ;WRHEAD SUBROUTINE, THEN HEADER
 9048                                                               ;GAP GOING ON DISK IS WRONG.
 9049
 9050                                                               ;WORD NO GIVES WHICH OF
 9051                                                               ;THE HEADER GAP WORDS
 9052                                                               ;ARE WRONG. FOR EXAMPLE:
 9053
 9054                                                               ;WORD NO 1 = FIRST HEADER
 9055                                                               ;            GAP WORD
 9056                                                               ;BAD WORD IS WHAT IS GOING ON DISK
 9057
 9058  054750  000240                HDESYN: NOP
 9059                                                               ;IF "ERROR 6" INSERTED BY
 9060                                                               ;WRHEAD SUBROUTINE, THEN LAST
```

```
                                                                ;HEADER GAP BYTE OR HEADER
                                                                ;SYNC BYTE GOING ON DISK IS WRONG.
                                                                ;WORD NO = 5
                                                                ;BAD DATA IS WHAT IS GOING
                                                                ;ON DISK, RIGHT BYTE IS HEADER
                                                                ;GAP 0'S BYTE, LEFT BYTE IS HEADER
                                                                ;GAP SYNC.
054752  005737  015122                TST     @#ERFLGS        ;ARE ANY ERRORS DETECTED ?
054756  001004                        BNE     FOUT            ;IF YES BRANCH
054760  004137  053170                JSR     R1,@#WRDATA     ;WRITE THE DATA
054764  000000              FNWORD:   .WORD   0               ;FORMAT COMMAND NO. OF DATA
054766  000000                        .WORD   0
054770                      FOUT:
054770  012605                        MOV     (SP)+,R5        ;;POP STACK INTO R5
054772  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
054774  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
054776  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
055000  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
055002  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
055004  000207                        RTS     PC              ;EXIT
```

```
 9087
 9088                                   ;*********************************************************************
 9089                                   ;*WRITE HEADER
 9090                                   ;*********************************************************************
 9091
 9092
 9093
 9094
 9095
 9096                                   ;*R0 = MAINT.REG.
 9097                                   ;*R1 = SIMULATED DISK
 9098                                   ;*R2 = BYTE COUNT
 9099                                   ;*R3 = WRITE WORD
 9100                                   ;*R5 = WORD COUNT
 9101
 9102
 9103
 9104
 9105  055006  000000                  SCYL:   0                       ;
 9106  055010  000000                  SSECTR: 0                       ;
 9107  055012  000000                  SKEY1:  0                       ;
 9108  055014  000000                  SKEY2:  0                       ;
 9109  055016  000000                  SCRC:   0                       ;
 9110
 9111
 9112  055020  012137  055006          WRHEAD: MOV     (R1)+,  @#SCYL
 9113  055024  012137  055010                  MOV     (R1)+,  @#SSECTR
 9114  055030  012137  055012                  MOV     (R1)+,  @#SKEY1
 9115  055034  012137  055014                  MOV     (R1)+,  @#SKEY2
 9116  055040  012137  055016                  MOV     (R1)+,  @#SCRC
 9117  055044  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 9118  055046  012701  053422                  MOV     #SECGAP,R1      ;SIMULATED DISK INDICATOR
 9119  055052  013700  015000                  MOV     @#RHMR, R0      ;R0 NOW HAS MAINT. REG. ADDR.
 9120  055056  012710  000001                  MOV     #DMD,   @R0     ;SET DIAG. MODE
 9121  055062  012705  000002                  MOV     #2,     R5      ;WORD COUNTER
 9122  055066  052710  000010                  BIS     #MSTCK,@R0      ;SET SECTOR FOR FIRST BYTE
 9123  055072  012710  000013          1$:     MOV     #MSTCK!MCLK!DMD,@R0;SET SECTOR, CLOCK, DIAG. MODE, RESET INDEX
 9124  055076  032710  000040                  BIT     #MWR,   @R0     ;CHECK WRITE BIT IN MAINT. REG.
 9125  055102  001403                          BEQ     2$
 9126  055104  000261                          SEC                     ;SET CARRY
 9127  055106  006003                          ROR     R3              ;MOVE ONE FORWARD
 9128  055110  000402                          BR      3$              ;
 9129  055112  000241                  2$:     CLC                     ;CLEAR CARRY
 9130  055114  006003                          ROR     R3              ;MOVE ZERO FORWARD
 9131  055116  012710  000001          3$:     MOV     #DMD,   @R0     ;CLEAR CLOCK, SECTOR
 9132  055122  012702  000007                  MOV     #7,     R2      ;BYTE COUNTER
 9133  055126  052710  000002          4$:     BIS     #MCLK,  @R0     ;SET CLOCK
 9134  055132  032710  000040                  BIT     #MWR,   @R0     ;CHECK WRITE BIT IN MAINT.REG.
 9135  055136  001403                          BEQ     5$              ;BRANCH IF ZERO
 9136  055140  000261                          SEC                     ;SET CARRY
 9137  055142  006003                          ROR     R3              ;MOVE ONE FORWARD
 9138  055144  000402                          BR      6$
 9139  055146  000241                  5$:     CLC
 9140  055150  006003                          ROR     R3
```

```
 9141  055152  012710  000001          6$:     MOV     #DMD,   @R0
 9142  055156  005302                          DEC     R2
 9143  055160  001362                          BNE     4$
 9144  055162  005305                          DEC     R5
 9145  055164  001342                          BNE     1$
 9146  055166  010321                          MOV     R3,     (R1)+
 9147  055170  005703                          TST     R3
 9148  055172  001414                          BEQ     7$
 9149  055174  012737  000001  051722          MOV     #1,@#ERWORD
 9150  055202  005037  001124                  CLR     @#$GDDAT
 9151  055206  010337  001126                  MOV     R3,     @#$BDDAT
 9152  055212  012737  104006  054736          MOV     #104006,@#SEGPER
 9153  055220  000137  055626                  JMP     @#17$           ;BRANCH OUT
 9154  055224  012702  000022          7$:     MOV     #18.,   R2      ;COUNT NO. OF SECTOR GAP
 9155  055230  012737  000024  051722  10$:     MOV     #20.,@#ERWORD   ;COUNT TO GIVE ERROR WORD
 9156  055236  004737  052750                  JSR     PC,     @#WRITE ;WRITE SECTOR GAP
 9157  055242  013721  052746                  MOV     @#WWORD,(R1)+   ;STORE SECTOR GAP WORD
 9158  055246  001413                          BEQ     11$
 9159  055250  160237  051722                  SUB     R2,@#ERWORD     ;IF NOT GET ERROR WORD NO.
 9160  055254  005037  001124                  CLR     @#$GDDAT                ;GOOD WORD
 9161  055260  013737  052746  001126          MOV     @#WWORD,@#$BDDAT        ;BAD WORD
 9162  055266  012737  104006  054736          MOV     #104006,@#SEGPER        ;STORE "ERROR 6" IN SEGPER
 9163  055274  000554                          BR      17$             ;BRANCH OUT
 9164  055276  005302                  11$:     DEC     R2              ;HAVE 18 WORDS OF ZEROS BEEN WRITTEN
 9165  055300  001353                          BNE     10$             ;IF NOT BRANCH
 9166                                          ;AT THIS POINT THE SECTOR FOUND FLOP SHOULD
 9167                                          ;BE HIGH.   SO THAT THE HEADER SYNC BYTE CAN BE GIVEN
 9168                                          ;HOWEVER IN THE DRIVE TIMING ERROR TEST THE REST OF THE ROUTINE
 9169                                          ;IS ABORTED
 9170  055302  005737  015142                  TST     @#TESDTE        ;IS THIS A DRIVE TIMING ERROR
 9171  055306  001147                          BNE     17$             ;BRANCH OUT IF YES
 9172  055310  004737  052750                  JSR     PC,     @#WRITE ;WRITE ONE SECTOR GAP 0 BYTE
 9173                                                                  ;AND ONE SYNC. BYTE = 230
 9174  055314  013711  052746                  MOV     @#WWORD,(R1)    ;SAVE 0 BYTE AND SYNC BYTE
 9175  055320  023721  051704                  CMP     @#RSYNC,(R1)+   ;IF SYNC. BYTE RIGHT
 9176  055324  001414                          BEQ     12$             ;IF YES BRANCH
 9177  055326  012737  000024  051722          MOV     #20.,@#ERWORD   ;IF NOT GET READY FOR ERROR
 9178  055334  013737  051704  001124          MOV     @#RSYNC,@#$GDDAT        ;GOOD WORD
 9179  055342  014137  001126                  MOV     -(R1),@#$BDDAT  ;BAD WORD
 9180  055346  012737  104006  054740          MOV     #104006,@#FSYNER        ;INSERT "ERROR 6" IN FSYNER
 9181  055354  000524                          BR      17$             ;BRANCH OUT
 9182  055356  012702  000004          12$:     MOV     #4,     R2      ;FOUR HEADER WORDS
 9183  055362  012703  055006                  MOV     #SCYL,  R3      ;POINTER FOR HEADER TABLE
 9184  055366  012737  000005  051722  13$:     MOV     #5,@#ERWORD     ;ERROR WORD NO SET
 9185  055374  004737  052750                  JSR     PC,     @#WRITE ;WRITE 4 HEADER WORDS
 9186  055400  013711  052746                  MOV     @#WWORD,(R1)    ;STORE WRITTEN WORD
 9187  055404  022321                          CMP     (R3)+,  (R1)+   ;IS IT RIGHT?
 9188  055406  001412                          BEQ     14$             ;IF GOOD BRANCH
 9189                                                                  ;IF NOT GET READY FOR PRINT
 9190  055410  160237  051722                  SUB     R2,@#ERWORD     ;WORD NO
 9191  055414  014337  001124                  MOV     -(R3),@#$GDDAT  ;GOOD DATA
 9192  055420  014137  001126                  MOV     -(R1),@#$BDDAT  ;BAD DATA
 9193  055424  012737  104006  054742          MOV     #104006,@#ERHEAD        ;INSERT "ERROR 6"
 9194  055432  000475                          BR      17$             ;BRANCH OUT
```

```
 9195  055434  005302                    14$:    DEC     R2              ;ARE 4 HEADER WORDS DONE?
 9196  055436  001353                            BNE     13$             ;IF NOT BRANCH
 9197  055440  004737  052750                    JSR     PC,     @#WRITE ;WRITE CRC
 9198  055444  013711  052746                    MOV     @#WWORD,(R1)    ;STORE CRC
 9199  055450  022137  054734                    CMP     (R1)+,@#GCRC    ;COMPARE GOOD CRC
 9200  055454  001414                            BEQ     20$             ;BRANCH IF GOOD
 9201  055456  014137  001126                    MOV     -(R1),@#$BDDATA ;BAD CRC WRITTEN
 9202  055462  013737  054734  001124            MOV     @#GCRC,@#$GDDAT ;GOOD CRC
 9203  055470  012737  000005  051722            MOV     #5,@#ERWORD     ;ERROR WORD NO
 9204  055476  012737  104006  054744            MOV     #104006,@#ERCRC ;INSERT ERROR 6
 9205  055504  000450                            BR      17$
 9206  055506  012702  000005            20$:    MOV     #5,     R2      ;NO OF HEADER GAP
 9207  055512  012737  000006  051722    15$:    MOV     #6,@#ERWORD     ;ERROR WORD NO SET
 9208  055520  004737  052750                    JSR     PC,@#WRITE      ;WRITE HEADER GAP
 9209  055524  013721  052746                    MOV     @#WWORD,(R1)+   ;STORE
 9210  055530  001412                            BEQ     16$             ;IF GOOD BRANCH
 9211  055532  160237  051722                    SUB     R2,@#ERWORD     ;ERROR WORD NO
 9212  055536  005037  001124                    CLR     @#$GDDAT                ;GOOD DATA
 9213  055542  014137  001126                    MOV     -(R1),@#$BDDAT  ;BAD DATA
 9214  055546  012737  104006  054746            MOV     #104006,@#ERHDGP                ;STORE "ERROR 6"
 9215  055554  000424                            BR      17$             ;BRANCH OUT
 9216  055556  005302            16$:    DEC     R2                      ;ARE 5 HEADER GAP ZEROS  DONE
 9217  055560  001354                            BNE     15$             ;IF NOT BRANCH
 9218  055562  004737  052750                    JSR     PC,@#WRITE
 9219  055566  013711  052746                    MOV     @#WWORD,(R1)
 9220  055572  023721  051704                    CMP     @#RSYNC,(R1)+
 9221  055576  001413                            BEQ     17$
 9222  055600  012737  000005  051722            MOV     #5,@#ERWORD
 9223  055606  014137  001126                    MOV     -(R1),  @#$BDDAT
 9224  055612  013737  051704  001124            MOV     @#RSYNC,        @#$GDDAT
 9225  055620  012737  104006  054750            MOV     #104006,@#HDESYN
 9226  055626                            17$:
 9227  055626  012601                            MOV     (SP)+,R1        ;;POP STACK INTO R1
 9228  055630  000201                            RTS     R1
 9229
 9230
 9231
 9232
 9233
 9234
 9235
 9236
```

```
                        ;*****************************************************************
                        ;*SEARCH SECTOR
                        ;*****************************************************************
                        ;
                        ;
                        ;
                        ;
                        ;
                        ;*      R0=RHMR ADDRESS
                        ;*      R1=PASSED ARGUMENT (SECTOR SEARCHED FOR)
                        ;*      R2=CLOCK COUNT (PER BYTE)
                        ;*      R3=SECTOR COUNTER FROM R1
                        ;*      R5=BYTES PER WORD COUNT
                        ;*BEBORE INDEX IS GIVEN TWO SECTOR CLOCKS ARE GIVEN TO RESET
                        ;*SECTOR PULSE IN CASE IT IS SET
                        ;*AT BEGINNING OF EACH SECTOR ONE SECTOR CLOCK HAS TO RISE
                        ;*BEFORE CLOCK THEN EVERY EIGHT CLOCKS ONE SECTOR CLOCK IS
                        ;*IDENTICAL WITH CLOCK
                        ;*NUMBERING THE SECTOR CLOCKS AS FOLLOWS
                        ;*THE SECTOR CLOCK UNDER INDEX - 0
                        ;*THE NEXT - 1
                        ;*THE NEXT  - 2
                        ;*ETC.
                        ;*THEN THE LAST SECTOR CLOCK IN ONE SECTOR HAS NUMBER - 608
                        ;*THE NEXT SECTOR THEN HAS 608 SECTOR CLOCKS
                        ;*THE NEXT SECTOR THEN HAS ANOTHER 608 SECTOR CLOCKS
                        ;*AND SO ON
                        ;
                        ;
                        ;
055632  000000          SECTR:  0                       ;SECTOR SEARCHED FOR
                        ;
055634  012137  055632  SEARCH: MOV     (R1)+, @#SECTR  ;SAVE SECTOR SEARCHED FOR
055640  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
055642  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
055644  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
055646  010346                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
055650  010446                  MOV     R4,-(SP)        ;;PUSH R4 ON STACK
055652  010546                  MOV     R5,-(SP)        ;;PUSH R5 ON STACK
055654  013700  015000          MOV     @#RHMR, R0      ;NOW R0 HAS MAINTENANCE REG. ADR.
055660  013703  055632          MOV     @#SECTR,R3      ;SECTOR COUNTER
055664  012710  000001          MOV     #DMD,   @R0     ;SET DIAGNOSTIC MODE
055670  052710  000010          BIS     #MSTCK, @R0     ;SET SECTOR CLOCK
055674  042710  000010          BIC     #MSTCK, @R0     ;CLEAR SECTOR CLOCK
055700  052710  000010          BIS     #MSTCK, @R0     ;SET SECTOR CLOCK
055704  042710  000010          BIC     #MSTCK, @R0     ;CLEAR SECTOR CLOCK
                                                        ;THE ABOVE TWO SECTOR CLOCKS ARE GIVEN FOR
                                                        ;RESETING SECTOR PULSE
                                                        ;IN CASE IT STARTS SET
055710  052710  000014          BIS     #MINX!MSTCK,@R0 ;SET INDEX AND SECTOR CLOCK
055714  012710  000001          MOV     #DMD,   @R0     ;RESET INDEX AND SECTOR CLOCK
055720  005703                  TST     R3              ;IF SECTOR REQUIRED JUMP OUT
055722  001461                  BEQ     7$              ;BRANCH OF SECTOR ZERO REQUIRED
```

```
                                        ;NOW THE 304 WORDS WILL START


                                ;*FOR FIRST BYTE SECTOR CLOCK WILL GO HIGH THEN CLOCK WILL GO HIGH
                                ;*BOTH WILL COME DOWN TOGETHER THEN SEVEN CLOCKS WILL BE GIVEN
                                ;*;FOR SECOND BYTE AND ALL OTHER BYTES TILL NEXT SECTOR SECTOR CLOCK
                                ;*WILL BE IDENTICAL WITH ONE CLOCK


                                        ;ONE WORD ONLY

9303  055724  012702  000010    1$:     MOV     #8.,    R2      ;BYTE COUNTER
9304  055730  012705  000002            MOV     #2,     R5      ;BYTES PER WORD
9305  055734  052710  000010            BIS     #MSTCK,@R0      ;SET SECTOR CLOCK
9306  055740  052710  000002            BIS     #MCLK,@R0       ;SET CLOCK
9307  055744  000402                    BR      3$              ;BRANCH TO CLEAR SECTOR AND CLOCK
9308  055746  052710  000012    2$:     BIS     #MSTCK!MCLK,@R0 ;SET SECTOR AND CLOCK
9309  055752  042710  000012    3$:     BIC     #MSTCK!MCLK,@R0 ;CLEAR SECTOR AND CLOCK
9310  055756  052710  000002    8$:     BIS     #MCLK,  @R0     ;SET CLOCK
9311  055762  042710  000002            BIC     #MCLK,  @R0     ;CLEAR CLOCK
9312  055766  005302                    DEC     R2              ;BYTE COUNTER
9313  055770  001372                    BNE     8$              ;BRANCH IF BYTE NOT COMPLETE
9314  055772  012702  000007            MOV     #7,     R2      ;SETUP FOR SECOND BYTE
9315  055776  005305                    DEC     R5              ;IS WORD COMPLETE?
9316  056000  001362                    BNE     2$              ;BRANCH IF NOT COMPLETE
9317                                                            ;TO GIVE SECTOR CLOCK AND CLOCK
9318
9319
9320                                    ;NOW 303 WORDS ARE LEFT AND ALL ARE IDENTICAL
9321
9322  056002  012701  000457            MOV     #303.,  R1      ;WORDS PER SECTOR COUNTER
9323  056006  012705  000002    4$:     MOV     #2,     R5      ;BYTES PER WORD COUNTER
9324  056012  012702  000007    5$:     MOV     #7,     R2      ;BYTE COUNTER (CLOCK COUNTER)
9325  056016  052710  000012            BIS     #MSTCK!MCLK,@R0 ;SET SECTOR CLOCK AND CLOCK
9326  056022  042710  000012            BIC     #MSTCK!MCLK,@R0 ;CLEAR SECTOR CLOCK AND CLOCK
9327  056026  052710  000002    6$:     BIS     #MCLK,  @R0     ;SET CLOCK
9328  056032  042710  000002            BIC     #MCLK,  @R0     ;RESET CLOCK
9329  056036  005302                    DEC     R2              ;IS BYTE COMPLETE?
9330  056040  001372                    BNE     6$              ;BRANCH IF NOT COMPLETE
9331  056042  005305                    DEC     R5              ;IS WORD COMPLETE?
9332  056044  001362                    BNE     5$              ;BRANCH IF NOT
9333  056046  005301                    DEC     R1              ;IS SECTOR COMPLETE
9334  056050  001356                    BNE     4$              ;BRANCH IF NOT
9335  056052  052710  000010            BIS     #MSTCK,@R0      ;SET SECTOR
9336  056056  042710  000010            BIC     #MSTCK,@R0      ;CLEAR SECTOR
9337  056062  005303                    DEC     R3              ;IS REQUIRED NO OF SECTORS COMPLETE
9338  056064  001317                    BNE     1$              ;BRANCH IF NOT
9339
9340  056066                    7$:
9341  056066  012605                    MOV     (SP)+,R5        ;;POP STACK INTO R5
9342  056070  012604                    MOV     (SP)+,R4        ;;POP STACK INTO R4
9343  056072  012603                    MOV     (SP)+,R3        ;;POP STACK INTO R3
9344  056074  012602                    MOV     (SP)+,R2        ;;POP STACK INTO R2
```

```
 9345  056076  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
 9346  056100  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
 9347  056102  000201                        RTS     R1
 9348
 9349
 9350                                ;*****************************************************************
 9351                                ;*READ ONE SECTOR OF DATA
 9352                                ;*****************************************************************
 9353
 9354  056104  000000                RNO:    0                       ;NO. OF WORDS READ
 9355  056106  000000                RCOM:   0                       ;EXTRA STORAGE
 9356
 9357
 9358
 9359  056110  012137  056104        REDATA: MOV     (R1)+,@#RNO     ;SAVE NO. OF WORDS ONLY FOR INFORMATION
 9360  056114  012137  056106                MOV     (R1)+,@#RCOM    ;EXTRA WORD ONLY FOR INFORMATION
 9361  056120  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 9362  056122  005737  015140                TST     @#TSECC         ;IS THIS AN ECC TEST
 9363  056126  001403                        BEQ     1$              ;BRANCH IF NO
 9364  056130  012737  177777  047652        MOV     #-1,@#TSECCG    ;THESE BITS ARE TO GENERATE ECC
 9365  056136  012702  000402        1$:     MOV     #258.,R2        ;256 WORDS PER SECTOR
 9366                                                                ;PLUS 2 ECC WORDS
 9367  056142  012703  053520                MOV     #DISK,R3        ;POINTE TO DISK SIMULATION
 9368  056146  012337  052512        2$:     MOV     (R3)+,@#WORD    ;READY TO READ CONTENTS
 9369  056152  004737  052516                JSR     PC,@#READ               ;READ
 9370  056156  005302                        DEC     R2              ;IS 256 WORDS DONE?
 9371  056160  001372                        BNE     2$              ;IF NOT BRANCH
 9372  056162  005737  015140                TST     @#TSECC         ;IS THIS AN ECC TEST
 9373  056166  001012                        BNE     4$              ;BRANCH OUT IF YES
 9374  056170  005037  047652                CLR     @#TSECCG        ;NO MORE ECC BITS ARE TO BE GENERATED
 9375  056174  012702  000017                MOV     #15.,R2         ;ONE DATA GAP, 14 TOLERANCE GAP
 9376  056200  012337  052512        3$:     MOV     (R3)+,@#WORD    ;READY TO READ CONTENTS OF WORD
 9377  056204  004737  052516                JSR     PC,@#READ       ;READ
 9378  056210  005302                        DEC     R2              ;COUNT
 9379  056212  001372                        BNE     3$              ;BRANCH IF 14 NOT DONE
 9380  056214                        4$:
 9381  056214  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
 9382  056216  000201                        RTS     R1              ;RETURN
```

```
                                ;*****************************************************************
056220                          RPVECT:
056220  104400  056226                  TYPE    ,.+4                    ;;TYPE ASCIZ STRING
056224  000423                          BR      64$                     ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ      /UNEXPECTED RP04 INTERRUPT FROM PC = /
056274                          64$:
056274  104402                          TYPOC                           ;TYPE FROM PC
056276  012777  056220  136442          MOV     #RPVECT,@RPVEC          ;RESTORE TRAP RP04 VECTOR
056304  000000                          HALT                            ;CHANGE TO CONTINUE
                                ;*****************************************************************
```

```
                                        .SBTTL
                                        .SBTTL  ***SYSMAC LIBRARY ROUTINES***
                                        .SBTTL



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

                                .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

056306                          $SCOPE:
056306  005037  051716                  CLR     @#NOSYNC        ;CLEAR FLAG FOR HEADER ERROR COMMANDS
056312  005037  015140                  CLR     @#TSECC         ;CLEAR FLAG FOR ECC TEST
                                                                ;WHEN =177777 IT IS AN ECC TEST
                                                                ;WHEN =0 IT IS NOT AN ECC TEST

056316  005037  047652                  CLR     @#TSECCG        ;EVEN IN AN ECC TEST EVERY CLOCK
                                                                ;IS NOT TO GENERATE ECC
                                                                ;IF =177777 GENERATE ECC
                                                                ;IF =0 DO NOT GENERATE ECC
056322  005037  015142                  CLR     @#TESDTE        ;DRIVE TIMING ERROR TEST
056326                          1$:
056326  006137  177570                  ROL     @#SWR           ;;LOOP ON PRESENT TEST?
056332  100511                          BMI     $OVER           ;;YES IF SW14=1
                                ;#####START OF CODE FOR THE XOR TESTER#####
056334  000416                  $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                                ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
056336  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
056342  012737  056362  000004          MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
056350  005737  177060                  TST     @#177060        ;;TIME OUT ON XOR?
056354  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
056360  000463                          BR      $SVLAD          ;;GO TO THE NEXT TEST
056362  022626                  5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
056364  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
056370  000423                          BR      7$              ;;LOOP ON THE PRESENT TEST
056372                          6$:;#####END OF CODE FOR THE XOR TESTER#####
056372  032737  000400  177570          BIT     #BIT08,@#SWR    ;;LOOP ON SPEC. TEST?
056400  001404                          BEQ     2$              ;;BR IF NO
056402  123767  177570  122472          CMPB    @#SWR,$TSTNM    ;;ON THE RIGHT TEST?    SWR<7:0>
056410  001462                          BEQ     $OVER           ;;BR IF YES
056412  105767  122465          2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
056416  001421                          BEQ     3$              ;;BR IF NO
056420  126767  122471  122455          CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
```

```
 9448  056426  101015                        BHI     3$              ;;BR IF NO
 9449  056430  032737  001000  177570        BIT     #BIT09,@#SWR    ;;LOOP ON ERROR?
 9450  056436  001404                        BEQ     4$              ;;BR IF NO
 9451  056440  016767  122444  122440  7$:   MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
 9452  056446  000443                        BR      $OVER
 9453  056450  105067  122427          4$:   CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
 9454  056454  005067  122524                CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
 9455  056460  000415                        BR      1$              ;;ESCAPE TO THE NEXT TEST
 9456  056462  032737  004000  177570  3$:   BIT     #BIT11,@#SWR    ;;INHIBIT ITERATIONS?
 9457  056470  001011                        BNE     1$              ;;BR IF YES
 9458  056472  005767  122402                TST     $PASS           ;;IF FIRST PASS OF PROGRAM
 9459  056476  001406                        BEQ     1$              ;;      INHIBIT ITERATIONS
 9460  056500  005267  122400                INC     $ICNT           ;;INCREMENT ITERATION COUNT
 9461  056504  026767  122474  122372        CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
 9462  056512  002021                        BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
 9463  056514  012767  000001  122362  1$:   MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
 9464  056522  016767  000044  122454        MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
 9465  056530  105267  122346          $SVLAD: INCB  $TSTNM          ;;COUNT TEST NUMBERS
 9466  056534  011667  122346                MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
 9467  056540  011667  122344                MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
 9468  056544  005067  122436                CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
 9469  056550  112767  000001  122337        MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
 9470  056556  016737  122320  177570  $OVER:  MOV     $TSTNM,@#DISPLAY ;;DISPLAY TEST NUMBER
 9471  056564  016716  122316                MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
 9472  056570  000002                        RTI                     ;;FIXES PS
 9473  056572  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

056574                          $TYPDS:
056574  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
056576  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
056600  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
056602  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
056604  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
056606  012746  020200                 MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
056612  016605  000020                 MOV     20(SP),R5       ;;GET THE INPUT NUMBER
056616  100004                         BPL     1$              ;;BR IF INPUT IS POS.
056620  005405                         NEG     R5              ;;MAKE THE BINARY NUMBER POS.
056622  112766  000055  000001         MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
056630  005000                 1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
056632  012703  057010                 MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
056636  112723  000040                 MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
056642  005002                 2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
056644  016001  057000                 MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
056650  160105                 3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
056652  002402                         BLT     4$              ;;BR IF DONE
056654  005202                         INC     R2              ;;INCREASE THE BCD DIGIT BY 1
056656  000774                         BR      3$
056660  060105                 4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
056662  005702                         TST     R2              ;;CHECK IF BCD DIGIT=0
056664  001002                         BNE     5$              ;;FALL THROUGH IF 0
056666  105716                         TSTB    (SP)            ;;STILL DOING LEADING 0'S?
056670  100407                         BMI     7$              ;;BR IF YES
056672  106316                 5$:     ASLB    (SP)            ;;MSD?
056674  103003                         BCC     6$              ;;BR IF NO
056676  116663  000001  177777         MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
056704  052702  000060         6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
056710  052702  000040         7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
056714  110223                         MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
056716  005720                         TST     (R0)+           ;;JUST INCREMENTING
056720  020027  000010                 CMP     R0,#10          ;;CHECK THE TABLE INDEX
056724  002746                         BLT     2$              ;;GO DO THE NEXT DIGIT
056726  003002                         BGT     8$              ;;GO TO EXIT
056730  010502                         MOV     R5,R2           ;;GET THE LSD
056732  000764                         BR      6$              ;;GO CHANGE TO ASCII
056734  105726                 8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
056736  100003                         BPL     9$              ;;BR IF NO
056740  116663  177777  177776         MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
056746  105013                 9$:     CLRB    (R3)            ;;SET THE TERMINATOR
```

```
 9528  056750  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
 9529  056752  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
 9530  056754  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
 9531  056756  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 9532  056760  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
 9533  056762  104400  057010                  TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
 9534  056766  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
 9535  056774  012616                          MOV     (SP)+,(SP)
 9536  056776  000002                          RTI                     ;;RETURN TO USER
 9537  057000  023420                  $DTBL:  10000.
 9538  057002  001750                          1000.
 9539  057004  000144                          100.
 9540  057006  000012                          10.
 9541  057010  000004                  $DBLK:  .BLKW   4
```

```
 9542                                   ;*****************************************************************
 9543
 9544                                   .SBTTL  TYPE ROUTINE
 9545
 9546                                   ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
 9547                                   ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
 9548                                   ;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
 9549                                   ;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
 9550                                   ;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
 9551                                   ;*
 9552                                   ;*CALL:
 9553                                   ;*1) USING A TRAP INSTRUCTION
 9554                                   ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
 9555                                   ;*OR
 9556                                   ;*      TYPE
 9557                                   ;*      MESADR
 9558                                   ;*
 9559                                   ;*2) USING A JSR INSTRUCTION
 9560                                   ;*      MOV     PS,-(SP)        ;;PUSH PROCESSOR STATUS WORD ON THE STACK
 9561                                   ;*      JSR     PC,$TYPE        ;;CALL TYPE ROUTINE
 9562                                   ;*      MESADDR                 ;;FIRST ADRESS OF MESSAGE
 9563
 9564  057020  105767  122125          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
 9565  057024  100002                          BPL     1$              ;;BR IF YES
 9566  057026  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
 9567  057030  000407                          BR      3$              ;;LEAVE
 9568  057032  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
 9569  057034  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
 9570  057040  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
 9571  057042  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
 9572  057044  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
 9573  057046  012600                          MOV     (SP)+,R0        ;;RESTORE R0
 9574  057050  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
 9575  057054  000002                          RTI                     ;;RETURN
 9576  057056  004767  000026          4$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
 9577  057062  126726  122062          5$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
 9578  057066  001364                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
 9579  057070  016746  122052                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
 9580                                                                  ;;AND THE NULL CHAR.
 9581  057074  105366  000001          6$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
 9582  057100  002770                          BLT     5$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
 9583  057102  004767  000002                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
 9584  057106  000772                          BR      6$              ;;LOOP
 9585  057110  105777  122026          $TYPEC: TSTB    @$TPC           ;;WAIT UNTIL PRINTER IS READY
 9586  057114  100375                          BPL     $TYPEC
 9587  057116  116677  000002  122020        MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
 9588  057124  000207                          RTS     PC
```

```
 9589                                   ;*****************************************************************
 9590
 9591                                   .SBTTL  TTY INPUT ROUTINE
 9592
 9593  057126  000000                   $TKCNT: .WORD   0               ;;NUMBER OF ITEMS IN QUEUE
 9594  057130  000000                   $TKQIN: .WORD   0               ;;INPUT POINTER
 9595  057132  000000                   $TKQOUT: .WORD  0               ;;OUTPUT POINTER
 9596  057134  000011                   $TKQSRT: .BLKB  9.              ;;TTY KEYBOARD QUEUE
 9597          057145                   $TKQEND=.
 9598          057146                   .EVEN
 9599
 9600                                   ;*TK INITIALIZE ROUTINE
 9601                                   ;*THIS ROUTINE WILL INITIALIZE THE TTY KEYBOARD INPUT QUEUE
 9602                                   ;*SETUP THE INTERRUPT VECTOR AND TURN ON THE KEYBOARD INTERRUPT
 9603                                   ;
 9604                                   ;*CALL
 9605                                   ;*      JSR     PC,$TKINT
 9606                                   ;*      RETURN
 9607                                   ;
 9608  057146  005067  177754           $TKINT: CLR     $TKCNT          ;;CLEAR COUNT OF ITEMS IN QUEUE
 9609  057152  012767  057134  177750           MOV     #$TKQSRT,$TKQIN ;;MOVE THE STARTING ADDRESS OF THE
 9610  057160  016767  177744  177744           MOV     $TKQIN,$TKQOUT  ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
 9611  057166  012737  057216  000060           MOV     #$TKSRV,@#TKVEC ;;INITIALIZE THE KEYBOARD VECTOR
 9612  057174  012737  000200  000062           MOV     #200,@#TKVEC+2  ;;"BR" LEVEL 4
 9613  057202  005777  121732                   TST     @$TKB           ;;CLEAR DONE FLAG
 9614  057206  012777  000100  121722           MOV     #BIT06,@$TKS    ;;ENABLE INTERRUPT
 9615  057214  000207                           RTS     PC              ;;RETURN TO CALLER
 9616
 9617                                   ;*TK SERVICE ROUTINE
 9618                                   ;*THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT
 9619                                   ;
 9620  057216  117746  121716           $TKSRV: MOVB    @$TKB,-(SP)     ;;PICKUP THE CHARACTER
 9621  057222  042716  177600                   BIC     #^C177,(SP)     ;;STRIP THE JUNK
 9622  057226  021627  000003                   CMP     (SP),#3         ;;IS IT A CONTROL C?
 9623  057232  001006                           BNE     1$              ;;BRANCH IF NO
 9624  057234  104400  057527                   TYPE    ,$CNTLC         ;;TYPE A CONTROL-C (^C)
 9625  057240  004767  177702                   JSR     PC,$TKINT       ;;INIT THE KEYBOARD
 9626  057244  000167  164622                   JMP     OPERSEL         ;;CONTROL C RESTART
 9627  057250  022767  000011  177650   1$:     CMP     #9.,$TKCNT      ;;IS THE QUEUE FULL?
 9628  057256  001004                           BNE     2$              ;;BRANCH IF NO
 9629  057260  104400  001210                   TYPE    ,$BELL          ;;RING THE TTY BELL
 9630  057264  005726                           TST     (SP)+           ;;CLEAN CHARACTER OFF OF STACK
 9631  057266  000002                           RTI                     ;;RETURN
 9632  057270  005267  177632           2$:     INC     $TKCNT          ;;COUNT THIS CHARACTER
 9633  057274  112677  177630                   MOVB    (SP)+,@$TKQIN   ;;AND PUT IT IN QUEUE
 9634  057300  005267  177624                   INC     $TKQIN          ;;UPDATE THE POINTER
 9635  057304  026727  177620  057145           CMP     $TKQIN,#$TKQEND ;;GO OFF THE END?
 9636  057312  001003                           BNE     3$              ;;BRANCH IF NO
 9637  057314  012767  057134  177606           MOV     #$TKQSRT,$TKQIN ;;RESET THE POINTER
 9638  057322  000002                   3$:     RTI                     ;;RETURN
 9639                                   ;*****************************************************************
 9640                                   ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
 9641                                   ;*CALL:
 9642                                   ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
```

```
                                        ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
                                        ;
                                $RDCHR: MOV     (SP),-(SP)              ;;PUSH DOWN THE PC AND
                                        MOV     4(SP),2(SP)             ;;THE PS
                                        CLR     4(SP)                   ;;GET READY FOR A CHARACTER
                                        CLR     @#PS                    ;;ALLOW INTERRUPTS
                                1$:     TST     $TKCNT                  ;;WAIT ON A CHARACTER
                                        BEQ     1$
                                        DEC     $TKCNT                  ;;DECREMENT THE COUNTER
                                        MOVB    @$TKQOUT,4(SP)          ;;GET ONE CHARACTER
                                        INC     $TKQOUT                 ;;UPDATE THE POINTER
                                        CMP     $TKQOUT,#$TKQEND        ;;DID IT GO OFF OF THE END?
                                        BNE     2$                      ;;BRANCH IF NO
                                        MOV     #$TKQSRT,$TKQOUT        ;;RESET THE POINTER
                                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
                                $RDLIN: MOV     R3,-(SP)                ;;SAVE R3
                                1$:     MOV     #$TTYIN,R3              ;;GET ADDRESS
                                2$:     CMP     #$TTYIN+9.,R3           ;;BUFFER FULL?
                                        BLOS    4$                      ;;BR IF YES
                                        RDCHR                           ;;GO READ ONE CHARACTER FROM THE TTY
                                        MOVB    (SP)+,(R3)              ;;GET CHARACTER
                                        CMPB    #177,(R3)               ;;IS IT A RUBOUT
                                        BNE     3$                      ;;SKIP IF NOT
                                4$:     TYPE    ,$QUES                  ;;TYPE A '?'
                                        BR      1$                      ;;CLEAR THE BUFFER AND LOOP
                                3$:     MOVB    (R3),9$                 ;;ECHO THE CHARACTER
                                        TYPE    ,9$
                                        CMPB    #15,(R3)+               ;;CHECK FOR RETURN
                                        BNE     2$                      ;;LOOP IF NOT RETURN
                                        CLRB    -1(R3)                  ;;CLEAR RETURN (THE 15)
                                        TYPE    ,$LF                    ;;TYPE A LINE FEED
                                        MOV     (SP)+,R3                ;;RESTORE R3
                                        MOV     (SP),-(SP)              ;;ADJUST THE STACK AND PUT ADDRESS OF THE
                                        MOV     4(SP),2(SP)             ;;      FIRST ASCII CHARACTER ON IT
                                        MOV     #$TTYIN,4(SP)
                                        RTI                             ;;RETURN
                                9$:     .BYTE   0                       ;;STORAGE FOR ASCII CHAR. TO TYPE
                                        .BYTE   0                       ;;TERMINATOR
                                $TTYIN: .BLKB   9.                      ;;RESERVE 9. BYTES FOR TTY INPUT
                                $CNTLC: .ASCIZ  /^C/<15><12>            ;;CONTROL "C"
                                                                        ;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

057534  011646                  $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
057536  016666  000004  000002          MOV     4(SP),2(SP)     ;;INPUT NUMBER
057544  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
057546  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
057550  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
057552  104414                  1$:     RDLIN                   ;;READ AN ASCIZ LINE
057554  012600                          MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
057556  010067  000100                  MOV     R0,5$           ;;AND SAVE IT
057562  005001                          CLR     R1              ;;CLEAR DATA WORD
057564  005002                          CLR     R2
057566  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
057570  001420                          BEQ     3$              ;;IF ZERO GET OUT
057572  122716  000060                  CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
057576  003026                          BGT     4$              ;;IS AN OCTAL DIGIT
057600  122716  000067                  CMPB    #'7,(SP)
057604  002423                          BLT     4$
057606  006301                          ASL     R1              ;;*2
057610  006102                          ROL     R2
057612  006301                          ASL     R1              ;;*4
057614  006102                          ROL     R2
057616  006301                          ASL     R1              ;;*8
057620  006102                          ROL     R2
057622  042716  177770                  BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
057626  062601                          ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
057630  000756                          BR      2$              ;;LOOP
057632  005726                  3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
057634  010166  000012                  MOV     R1,12(SP)       ;;SAVE THE RESULT
057640  010267  000026                  MOV     R2,$HIOCT
057644  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
057646  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
057650  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
057652  000002                          RTI                     ;;RETURN
057654  005726                  4$:     TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
057656  105010                          CLRB    (R0)            ;;SET A TERMINATOR
057660  104400                          TYPE                    ;;TYPE UP THRU THE BAD CHAR.
057662  000000                  5$:     .WORD   0
057664  104400  001214                  TYPE    ,$QUES          ;;"?" "CR" & "LF"
057670  000730                          BR      1$              ;;TRY AGAIN
057672  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

057674                                    $ERROR:

057674  012737  177777  015122                    MOV     #-1,@#ERFLG$      ;SET ERROR FLAG
057702                                    REGSA1:


057702  105267  121175                    7$:     INCB    $ERFLG            ;;SET THE ERROR FLAG
057706  001775                                    BEQ     7$                ;;DON'T LET THE FLAG GO TO ZERO
057710  016737  121166  177570                    MOV     $TSTNM,@#DISPLAY  ;;DISPLAY TEST NUMBER AND ERROR FLAG
057716  032737  002000  177570                    BIT     #BIT10,@#SWR      ;;BELL ON ERROR?
057724  001402                                    BEQ     1$                ;;NO - SKIP
057726  104400  001210                            TYPE    ,$BELL            ;;RING BELL
057732  005267  121154                    1$:     INC     $ERTTL            ;;COUNT THE NUMBER OF ERRORS
057736  011667  121154                            MOV     (SP),$ERRPC       ;;GET ADDRESS OF ERROR INSTRUCTION
057742  162767  000002  121146                    SUB     #2,$ERRPC
057750  117767  121142  121136                    MOVB    @$ERRPC,$ITEMB    ;;STRIP AND SAVE THE ERROR ITEM CODE
057756  032737  020000  177570                    BIT     #BIT13,@#SWR      ;;SKIP TYPEOUT IF SET
057764  001004                                    BNE     2$                ;;SKIP TYPEOUTS
057766  004737  060036                            JSR     PC,@#$ERRTYP      ;;GO TO USER ERROR ROUTINE
057772  104400  001215                            TYPE    ,$CRLF
057776  005737  177570                    2$:     TST     @#SWR             ;;HALT ON ERROR
060002  100001                                    BPL     3$                ;;SKIP IF CONTINUE
060004  000000                                    HALT                      ;;HALT ON ERROR!
060006  032737  001000  177570            3$:     BIT     #BIT09,@#SWR      ;;LOOP ON ERROR SWITCH SET?
060014  001402                                    BEQ     4$                ;;BR IF NO
060016  016716  121066                            MOV     $LPERR,(SP)       ;;FUDGE RETURN FOR LOOPING
060022  005767  121160                    4$:     TST     $ESCAPE           ;;CHECK FOR AN ESCAPE ADDRESS
060026  001402                                    BEQ     5$                ;;BR IF NONE
060030  016716  121152                            MOV     $ESCAPE,(SP)      ;;FUDGE RETURN ADDRESS FOR ESCAPE
060034                                    5$:
060034  000002                                    RTI                       ;;RETURN
```

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

                                .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.

060036                          $ERRTYP:
060036  104400  001215                TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
060042  010046                        MOV     R0,-(SP)        ;;SAVE R0
060044  005000                        CLR     R0              ;;PICKUP THE ITEM INDEX
060046  153700  001114                BISB    @#$ITEMB,R0
060052  001004                        BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                                ;;TYPE THE PC OF THE ERROR
060054  016746  121036                MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
                                                                ;;ERROR ADDRESS
060060  104402                        TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
060062  000445                        BR      10$             ;;GET OUT
060064  005300                1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
060066  006300                        ASL     R0              ;;      WORK FOR THE ERROR TABLE
060070  006300                        ASL     R0
060072  006300                        ASL     R0
060074  062700  001220                ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
060100  012067  000004                MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
060104  001404                        BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
060106  104400                        TYPE                    ;;TYPE THE "ERROR MESSAGE"
060110  000000                2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
060112  104400  001215                TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
060116  012067  000004        3$:     MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
060122  001404                        BEQ     5$              ;;SKIP TYPEOUT IF 0
060124  104400                        TYPE                    ;;TYPE THE "DATA HEADER"
060126  000000                4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
060130  104400  001215                TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
060134  010146                5$:     MOV     R1,-(SP)        ;;SAVE R1
060136  012001                        MOV     (R0)+,R1        ;;PICKUP "DATA TABLE" POINTER
060140  001415                        BEQ     9$              ;;BR IF NO DATA TO BE TYPED
060142  012000                        MOV     (R0)+,R0        ;;PICKUP "DATA FORMAT" POINTER
060144  105720                6$:     TSTB    (R0)+           ;;"OCTAL" OR "DECIMAL"
060146  001003                        BNE     7$              ;;BR IF DECIMAL
060150  013146                        MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
060152  104402                        TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
060154  000402                        BR      8$
060156                          7$:
060156  013146                        MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
060160  104410                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
060162  005711                8$:     TST     (R1)            ;;IS THERE ANOTHER NUMBER?
060164  001403                        BEQ     9$              ;;BR IF NO
060166  104400  060206                TYPE    ,11$            ;;TYPE TWO(2) SPACES
060172  000764                        BR      6$              ;;LOOP

060174  012601                9$:     MOV     (SP)+,R1        ;;RESTORE R1
060176  012600                10$:    MOV     (SP)+,R0        ;;RESTORE R0
060200  104400  001215                TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
```

```
 9846  060204  000207                        RTS     PC              ;;RETURN
 9847  060206  020040      000       11$:    .ASCIZ  / /             ;;TWO(2) SPACES
 9848          060212                        .EVEN
```

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

                                .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

060212  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
060216  116667  000001  000211          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
060224  112667  000207                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
060230  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
060234  000406                          BR      $TYPON
060236  112767  000001  000171  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
060244  112767  000006  000165          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
060252  112767  000005  000154  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
060260  010346                          MOV     R3,-(SP)        ;;SAVE R3
060262  010446                          MOV     R4,-(SP)        ;;SAVE R4
060264  010546                          MOV     R5,-(SP)        ;;SAVE R5
060266  116704  000145                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
060272  005404                          NEG     R4
060274  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
060300  110467  000132                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
060304  116704  000125                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
060310  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
060314  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
060316  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
060320  000404                          BR      3$              ;;GO DO MSB
060322  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
060324  006105                          ROL     R5
060326  006105                          ROL     R5
060330  010503                          MOV     R5,R3
060332  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
060334  105367  000076                  DECB    $OMODE          ;;TYPE THIS DIGIT?
060340  100016                          BPL     7$              ;;BR IF NO
060342  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
```

```
 9903  060346  001002                          BNE     4$              ;;TEST FOR 0
 9904  060350  005704                          TST     R4              ;;SUPPRESS THIS 0?
 9905  060352  001403                          BEQ     5$              ;;BR IF YES
 9906  060354  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
 9907  060356  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
 9908  060362  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
 9909  060366  110367  000040                  MOVB    R3,8$           ;;SAVE FOR TYPING
 9910  060372  104400  060432                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
 9911  060376  105367  000032          7$:     DECB    $OCNT           ;;COUNT BY 1
 9912  060402  003347                          BGT     2$              ;;BR IF MORE TO DO
 9913  060404  002402                          BLT     6$              ;;BR IF DONE
 9914  060406  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
 9915  060410  000744                          BR      2$              ;;GO DO THE LAST DIGIT
 9916  060412  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
 9917  060414  012604                          MOV     (SP)+,R4        ;;RESTORE R4
 9918  060416  012603                          MOV     (SP)+,R3        ;;RESTORE R3
 9919  060420  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
 9920  060426  012616                          MOV     (SP)+,(SP)
 9921  060430  000002                          RTI                     ;;RETURN
 9922  060432     000                  8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
 9923  060433     000                          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
 9924  060434     000                  $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
 9925  060435     000                  $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
 9926  060436  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.

060440  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
060442  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
060446  005740                          TST     -(R0)           ;;BACKUP BY 2
060450  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
060452  016000  060460                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
060456  000200                          RTS     R0              ;;GO TO ROUTINE

                                .SBTTL  TRAP TABLE

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

                                ;       ROUTINE
                                ;       -------
060460                          $TRPAD:
060460  057020                          $TYPE   ;;CALL=TYPE     TRAP+0(104400)  TTY TYPEOUT ROUTINE
060462  060236                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
060464  060212                          $TYPOS  ;;CALL=TYPOS    TRAP+4(104404)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
060466  060252                          $TYPON  ;;CALL=TYPON    TRAP+6(104406)  TYPE OCTAL NUMBER (AS PER LAST CALL)
060470  056574                          $TYPDS  ;;CALL=TYPDS    TRAP+10(104410) TYPE DECIMAL NUMBER (WITH SIGN)
060472  057324                          $RDCHR  ;;CALL=RDCHR    TRAP+12(104412) TTY TYPEIN CHARACTER ROUTINE
060474  057410                          $RDLIN  ;;CALL=RDLIN    TRAP+14(104414) TTY TYPEIN STRING ROUTINE
060476  057534                          $RDOCT  ;;CALL=RDOCT    TRAP+16(104416) READ AN OCTAL NUMBER FROM TTY
060500  045134                          T.SCOP  ;;CALL=SCOP1    TRAP+20(104420) MY LOCAL SCOPES
060502  045206                          CHECKT  ;;CALL=CHECKD   TRAP+22(104422) CHECK DVA,RDY,DPR,DRY
060504  045524                          WAIT.T  ;;CALL=WAT      TRAP+24(104424) WAIT LOOP
```

```
 9963                                   ;*****************************************************************
 9964
 9965                                   .SBTTL  POWER DOWN AND UP ROUTINES
 9966
 9967                                   ;POWER DOWN ROUTINE
 9968  060506  012737  060634  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
 9969  060514  012737  000340  000026         MOV     #340,@#PWRVEC+2 ;;PRIO:7
 9970  060522  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 9971  060524  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 9972  060526  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 9973  060530  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 9974  060532  010446                        MOV     R4,-(SP)        ;;PUSH R4 ON STACK
 9975  060534  010546                        MOV     R5,-(SP)        ;;PUSH R5 ON STACK
 9976  060536  010667  000076                MOV     SP,$SAVR6       ;;SAVE SP
 9977  060542  012737  060554  000024        MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
 9978  060550  000000                        HALT
 9979  060552  000776                        BR      .-2             ;;HANG UP
 9980
 9981                                   ;POWER UP ROUTINE
 9982  060554  016706  000060         $PWRUP: MOV     $SAVR6,SP       ;;GET SP
 9983  060560  005067  000054                CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
 9984  060564  005267  000050         1$:    INC     $SAVR6          ;;WAIT FOR THE INC
 9985  060570  001375                        BNE     1$              ;;OF  WORD
 9986  060572  012605                        MOV     (SP)+,R5        ;;POP STACK INTO R5
 9987  060574  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
 9988  060576  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
 9989  060600  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
 9990  060602  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
 9991  060604  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
 9992  060606  012737  060506  000024        MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
 9993  060614  012737  000340  000026        MOV     #340,@#PWRVEC+2 ;;PRIO:7
 9994  060622  104400                        TYPE                    ;REPORT THE POWER FAILURE
 9995  060624  060642                $PWRMG: .WORD   $POWER           ;;POWER FAIL MESSAGE POINTER
 9996  060626  012716                        MOV     (PC)+,(SP)      ;;RESTART AT BEGIN
 9997  060630  017346                $PWRAD: .WORD   BEGIN           ;;RESTART ADDRESS
 9998  060632  000002                        RTI
 9999  060634  000000                $ILLUP: HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
10000  060636  000776                        BR      .-2             ;;  BEFORE THE POWER DOWN WAS COMPLETE
10001  060640  000000                $SAVR6: 0                       ;;PUT THE SP HERE
10002  060642  005015  047520  042527 $POWER: .ASCIZ  <15><12>"POWER"
10003  060650  000122
10004                                          .EVEN
10005
10006  000001                         .END
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
ACL    = 000040          2219#
ACU    = 100000          2172#
AOE    = 001000          2088#
AS       015046          1670    1673    2300#   4136*   4148    4318*   4329    4458*   4468
ATA    = 100000          2076#   4133    4315    4455
ATABLE   017326          2394#   2724
ATTENT   015132          2335#   2722*   2724*   4136    4318    4458
AT0    = 000001          2110#
AT1    = 000002          2111#
AT2    = 000004          2112#
AT3    = 000010          2113#
AT4    = 000020          2114#
AT5    = 000040          2115#
AT6    = 000100          2116#
AT7    = 000200          2117#
A16    = 000400          2051#   3973
A17    = 001000          2052#   3973
BA       015024          1666    2289#   4129*   4309*   4449*
BAI    = 000010          2024#   3975    7924
BASECH   050576          2544    8317#
BEGIN    017346           171    2403#   9997
BEGIN2   017336           173    2401#
BITST    044720          2568    7206#
BIT0   = 000001           144#   7661    7696    7698
BIT00  = 000001           134#    144
BIT01  = 000002           133#    143
BIT02  = 000004           132#    142
BIT03  = 000010           131#    141
BIT04  = 000020           130#    140
BIT05  = 000040           129#    139
BIT06  = 000100           128#    138    9614
BIT07  = 000200           127#    137
BIT08  = 000400           126#    136    9441
BIT09  = 001000           125#    135    9449    9784
BIT1   = 000002           143#   7675
BIT10  = 002000           124#   9770
BIT11  = 004000           123#   9456
BIT12  = 010000           122#
BIT13  = 020000           121#   7691    7693    9777
BIT14  = 040000           120#   7668
BIT15  = 100000           119#   7663    7670    7677    7686    7688
BIT2   = 000004           142#
BIT3   = 000010           141#
BIT4   = 000020           140#
BIT5   = 000040           139#
BIT6   = 000100           138#
BIT7   = 000200           137#
BIT8   = 000400           136#
BIT9   = 001000           135#
BLT1     044746          7212#   7217
BLT2     044770          7212    7213    7219#
BLT3     045000          7220    7221#
BPTVEC= 000014            151#
CA       015042          2298#
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
CC       015066  2308#
CHECKD=  104422  9961#
CHECKE   045376  4628  4767  4948  5127  5313  5462  5644  5818  6006  6145  6320  6496  6683
                 6875  7367#
CHECKT   045206  3968  4054  4231  4392  4618  4732  4900  5083  5260  5427  5596  5775  5951
                 6111  6272  6452  6630  6820  7310#  7507  7606  7779  9961
CLAREA   045070  3940  4775  4782  5471  5478  6154  6161  7254#
CLDISK   045152  2721  2762  2802  2859  3915  3961  4046  4223  4384  4534  4687  4888  5071
                 5249  5382  5584  5764  5939  6066  6260  6440  6619  6808  6934  6969  7003
                 7290#  7496  7594  7778  7965  8383
CLR    = 000040  2026#  2884  2926  2950  2980  3007  3038  3066  3105  3142  3212  3256  3295
                 3355  3402  3461  3495  3522  3550  3581  3593  3614  3626  3647  3677  3716
                 3726  3745  3755  3778  3809  3841  3880  7295
COMHD    051456  3977  4079  4255  4907  5090  5266  5603  5781  5958  6279  6459  6636  6827
                 7513  7611  7799  8457#
COMPA    052514  8605#  8648  8720#  8863#
COMPAR   046046  2836  4152  4169  4335  4473  4633  4793  4972  5155  5342  5489  5665  5844
                 6032  6172  6340  6523  6713  6902  7530#  7820  7846
COMWHD   054564  4416  4623  4742  5437  6121  8960#
COUNTD   053162  8857#  8861#  8876
CPHALT   005116  1204#  3969  4055  4232  4393  4619  4629  4733  4768  4901  4949  5084  5128
                 5261  5314  5428  5463  5597  5645  5776  5819  5952  6007  6112  6146  6273
                 6321  6453  6497  6631  6684  6821  6876  7508  7607  7780
CRC      046360  3954  4040  4217  4378  4562  4601  4711  4879  5053  5232  5406  5575  5746
                 5921  6090  6251  6416  6600  6791  7490  7588  7646#  7749
CSF    = 000002  2159#
CSU    = 000010  2161#
CS1      015030  1655  1658  1666  1673  1680  1690  1693  1697  1713  2293#  4130#  4310#  4450#
                 6952  7313  7317  7324  7370  7378
CS2      015026  1655  1658  1666  1680  1713  2290#  4311#  4312#  4451#  4452#
CYL      051602  3947#  3955  4033#  4041  4153  4210#  4218  4871#  4880  5045#  5054  5224#  5233
                 5567#  5576  5738#  5747  5913#  5922  6243#  6252  6408#  6417  6592#  6601  6783#
                 6792  7483#  7491  7580#  7589  7743#  7750  8484#
DAREAD   051656  8529  8540#
DATENV   047664  1709  4697#  4865#  5039#  5218#  5392#  5561#  5732#  5907#  6076#  6237#  6402#  6586#
                 6777#  8040#  8748#  8765#  8814#  8829#
DAWORD   051662  4877#  5051#  5230#  5573#  5744#  5919#  6249#  6414#  6598#  6789#  7488#  7585#  7748#
                 8541#
DB       015020  1666  2287#
DCK    = 100000  2094#  5108  5284  5304  5799  5976  5996  6477  6654  6674  6845  6865  7875
                 7880  7896  7899
DCL    = 000100  2220#
DCLEAR   015154  2362#
DENVL  = 000200  2104#  4314
DE1    = 000040  2066#
DFF20  = 000002  2062#
DF1      012512  303  422  429  1720#
DF11     012530  411  1727#
DF14     012537  442  1730#
DF15     012547  451  1733#
DF16     012552  462  1734#
DF17     012557  475  1736#
DF2      012517  1722#
DF20     012566  488  1739#
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
DF21    012575              499   1743#
DF22    012602              516    530   1745#
DF24    012606              545    558   1747#
DF26    012615              571   1750#
DF27    012625              586   1753#
DF3     012523              391    398   1724#
DF30    012633              599   1755#
DF31    012641              354    362    729    737   1758#
DF32    012651              338    379   1761#
DF33    012662              321   1764#
DF34    012672              617   1767#
DF35    012701              636    708   1770#
DF36    012711              651    668   1773#
DF37    012717              691   1775#
DF40    012730              754   1778#
DF42    014732              760    767    794   1996#
DF44    014735              774    780    787    801    808    815    822    836    843    850    857    864    871
                            878    885    892    899    920   1997#
DF5   = 000001             2061#
DF54    014742              829    906    913   1999#
DH1     005444              298    417   1242#
DH11    005674              403   1270#
DH14    006051              434   1290#
DH15    006250              448   1312#
DH16    006300              456   1316#
DH17    006436              467   1333#
DH2     005562              385   1256#
DH20    006613              480   1353#
DH21    006767              493   1373#
DH22    007103              510   1387#
DH24    007177              538    551   1398#
DH26    007355              562   1418#
DH27    007553              578   1440#
DH30    007711              592   1457#
DH31    010043              344    719   1473#
DH32    010241              327    368   1495#
DH33    010456              312   1519#
DH34    010655              607   1541#
DH35    011030              627    698   1560#
DH36    011225              642    659   1582#
DH37    011363              679   1599#
DH40    011602              746   1625#
DH42    014405              758    765    792   1954#
DH44    014462              772    778    785    799    806    813    820    834    841    848    855    862    869
                            876    883    890    897    918   1962#
DH54    014576              827    904    911   1976#
DIGB  = 000004             2063#
DISK    053520             1700   3941   3990   4635   4795   4841   5014   5063*  5194   5241*  5491   5537   5707
                           5756*  5883   5931*  6174   6214   6377   6562   6610*  6612*  6753   6801*  6802*  7730
                           7048   8286   8300*  8301*  8882   8942*  9367
DISPLA= 177570               66#  9470*  9769#
DLT   = 100000             2036#
DL64  = 000020             2065#
DMD   = 000001             2098#  2804   2860   3916   4105   4281   4314   7931   7959   8227   8465   8609   8614
```

```
                        8728    8741    8744    8758    8761    8801    8811    8826    8968    9120    9123    9131    9141
                        9279    9288
DPR     = 000400        2069#   7338    7341    7390
DRY     = 000200        2068#   7338    7346    7385
DST       015034        1677    2295#   4135#   4317#   4457#
DS1       015052        1655    1658    1670    1673    1680    1690    1693    1697    1713    2302#   4133#   4315#   4455#
                        7336    7341    7346    7385    7390
DT        015054        2303#
DTAGAP    054524        8945#
DTE     = 010000        2091#   4131    4313    4453
DTSY    = 001000        2106#   8630    8693    8696
DT1       011760         302     421     428    1648#
DT11      012022         410    1655#
DT14      012042         441    1658#
DT15      012064         450    1661#
DT16      012074         461    1663#
DT17      012112         474    1666#
DT2       011774        1650#
DT20      012132         487    1670#
DT21      012152         498    1673#
DT22      012166         515     529    1675#
DT24      012200         544     557    1677#
DT26      012220         570    1680#
DT27      012242         585    1683#
DT3       012006         390     397    1652#
DT30      012260         598    1686#
DT31      012276         353     361     728     736    1690#
DT32      012320         337     378    1693#
DT33      012344         320    1697#
DT34      012366         615    1700#
DT35      012406         634     706    1703#
DT36      012430         649     666    1706#
DT37      012446         689    1709#
DT40      012472         753    1713#
DT42      014674         759     766     793    1990#
DT44      014704         773     779     786     800     807     814     821     835     842     849     856     863     870
                         877     884     891     898     919    1992#
DT54      014720         828     905     912    1994#
DVA     = 004000        2054#   6952    7313    7317    7378
ECDATA    047644        8021#   8069    8228#   8292#   8294#   8738#   8740#   8755#   8757#   8804#   8808#   8819#   8823#
ECH     = 000100        2085#   5304    5996    6674    6865
ECI     = 004000        2185#   4051    4389    7503    7602    7796
ECORR     050270        5121    5297    5812    5989    6490    6667    6858    8222#
ECTEST    047702        8060#   8256    8295    8749    8766    8915    8830
EC1       015060        1703    1706    1709    2305#
EC2       015062        1703    1706    1709    2306#   4303#   4933    5117    5293    5629    5808    5985    6305    6486
                        6663    6854
EMTVEC= 000030           154#   2415#   2416#   2521#   2548#
EM1       002130         297     576     931#
EM11      002301         402     415     560     950#
EM14      002334         433     955#
EM15      002354         446     958#
EM16      002425         455     965#
EM17      002446         466     968#
```

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EM2     002213          310     325     342     940#
EM20    002472          479     972#
EM21    002513          492     975#
EM22    002535          503     979#
EM24    003136          535    1026#
EM25    003231          548    1036#
EM30    003271          591    1042#
EM31    003413          604    1057#
EM32    003536          621    1072#
EM33    004025          641    1104#
EM34    004077          654    1112#
EM35    004172          673    1122#
EM36    004471          696    1155#
EM37    004657          716    1176#
EM40    004745          743    1186#
EM42    012740          757    1783#
EM43    013023          764    1793#
EM44    013067          771    1801#
EM45    013124          777    1807#
EM46    013154          784    1812#
EM47    013203          791    1817#
EM50    013235          798    1823#
EM51    013273          805    1830#
EM52    013314          812    1834#
EM53    013354          819    1841#
EM54    013416          826    1848#
EM55    013455          833    1855#
EM56    013470          840    1858#
EM57    013506          847    1862#
EM6     002242          366     384     944#
EM60    013535          854     861    1867#
EM61    013624         1878#
EM62    013674          868    1886#
EM63    013751          875    1895#
EM64    014027          882    1904#
EM65    014063          889    1910#
EM66    014145          896    1920#
EM67    014217          903    1929#
EM70    014304          910    1939#
EM71    014356          917    1947#
ERCRC   054744         8985*   9035#   9204#
ERFLGS  015122         2324#   3976#   3987    3998    4075#   4251#   4412#   4616#   4625    4739#   4750    4788#   4906#
                       4922    4965#   5089#   5105    5149#   5265#   5281    5336#   5434#   5445    5484#   5602#   5618
                       5660#   5780#   5796    5839#   5957#   5973    6027#   6118#   6129    6167#   6278#   6294    6335#
                       6458#   6474    6518#   6635#   6651    6708#   6826#   6842    6897#   7551    7798#   7809    8526
                       9072    9763#
ERHDGP  054746         8986#   9045#   9214#
ERHEAD  054742         8984#   9021#   9193#
ERPOS   050266         8218#   8224#   8241
ERR     = 040000       2075#   4133    4315    4455
ERRVEC= 000004          147#   2523#   2530#   2550#   9432    9433#   9435#   9438#
ERSTAR  051430         8383#
ERUNIT  051426         8382#   8384
ERWORD  051722         1650    1652    1690    1693    1697    2843    3992#   3997#   4177    4343    4481    7544#   7550#
```

```
                        8596*   8632*   8652*   8656*   8678*   8698*   9149*   9155*   9159*   9177*   9184*   9190*   9203*
                        9207*   9211*   9222*
ER1     015032          1655    1658    1670    1680    1690    1693    1697    1703    1713    2294*   4131*   4313*   4453*
                        4925    5108    5284    5304    5621    5799    5976    5996    6297    6477    6654    6674    6845
                        6865
ER2     015036          1670    2296*
ER3     015044          1670    2299*
EXT1  = 000001          2139*
EXT10 = 000010          2142*
EXT2  = 000002          2140*
EXT20 = 000020          2143*
EXT4  = 000004          2141*
EXT40 = 000040          2144*
E00     023524          2889    2902*
E11     025110          3194    3202*
E12     025236          3235    3242*
E44     027704          3857    3965*
FEN   = 000200          2165*
FER   = 000020          2083*
FILLEC  050442          4854    5027    5207    5550    5720    5896    6226    6390    6575    6766    8276*
FIRST   017324          2385*   2432    2499*
FMT22 = 010000          2186*   3947    3966    4033    4051    4210    4228    4372    4389    4540    4558    4595    4613
                        4705    4721    4740    4871    4894    4952    5045    5077    5131    5224    5255    5317    5400
                        5416    5435    5567    5590    5648    5738    5770    5822    5913    5945    6010    6084    6100
                        6119    6243    6266    6324    6408    6446    6500    6592    6625    6687    6783    6814    6879
                        7483    7503    7580    7602    7743    7796    7925
FNWORD  054764          4377*   4600*   4710*   5405*   6089*   9076*
FORMAT  053164          8858*   8875
FOUT    054770          9073    9079*
FSYNER  054740          8983*   9007*   9180*
FUTABL  015146          2358*
GCRC    054734          4380    4603    4713    5408    6092    8994*   9199    9202
GECC1   047646          1700    1703    1709    4695*   4757    4780    4863*   4931    5037*   5115    5216*   5291    5390*
                        5452    5476    5559*   5627    5730*   5806    5905*   5983    6074*   6135    6159    6235*   6303
                        6400*   6484    6584*   6661    6775*   6852    8025*   8067    8153*   8284*   8300
GECC2   047650          1700    1703    1709    4696*   4761    4781    4864*   5038*   5217*   5391*   5456    5477    5560*
                        5731*   5906*   6075*   6139    6160    6236*   6401*   6585*   6776*   8028*   8068    8154*   8285*
                        8301
GNS   = ****** U          167    2440    2444    2448    2452    2456    2460    2464    2468    2472    2476    2480    2484
                        2488    2492    2496    2504    2538    2542    2607    2633    2637    2641    2645    2652    2678
                        2684    2690    2727    2734    2741    2768    2772    2776    2783    3156    3160    3164    3168
                        7007    7013    7118    7124    7131    7135    7139    7146    7150    8320    8326    8338    8344
                        8350    8354    8360    8366    8370    9387    9952    9953    9954    9955    9956    9957    9958
                        9959    9960    9961    9962
GO    = 000001          2048*   2815    7932    7960    8466    8969
GRV   = 000010          2064*
HADTMP  047670          4694*   4862*   5036*   5215*   5389*   5558*   5729*   5904*   6073*   6234*   6399*   6583*   6774*
                        8050*   8243
HARDER  047662          4694    4862    5036    5215    5389    5558    5729    5904    6073    6234    6399    6583    6774
                        8037*
HCCRCE  046762          7776*
HCE   = 000200          2086*   7865    7869    7875    7880
HCI   = 002000          2184*
HCRC  = 000400          2087*   7887    7890    7896    7899
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
HDESYN  054750          8987*   9058*   9225*
HDWSYN  053516          8940*
HEADER  053472          8937*
HEDGAP  051616          8480*   8499*   8659*
HEDSYN  051620          8481*   8512*   8679*   8700*
HEGAP   053504          8650    8939*
IAE    = 002000          2089*
IE     = 000100          2049*   3473    3506    3822    3853    3860    6939    6974
ILF    = 000001          2079*
ILLEGL  015210          2376*
ILR    = 000002          2080*
IOTVEC= 000020           152*   2413*   2414*
IR     = 000100          2027*   4311    4451
IXE    = 004000          2169*
I00     023500          2893*   2899
I02     023604          2936*
I03     023700          2962*
I04     024000          2991*
I05     024100          3020*
I06     024200          3050*
I07     024300          3079*
I14     025430          3305*
I15     025632          3367*
I16     025774          3416*
I24     026346          3529*
KEY1    051606          3950*   4037*   4214*   4875*   5049*   5228*   5571*   5742*   5917*   6247*   6412*   6596*   6787*
                        7486*   7583*   7746*   8486*
KEY2    051610          3951*   4038*   4215*   4876*   5050*   5229*   5572*   5743*   5918*   6248*   6413*   6597*   6788*
                        7487*   7584*   7747*   8487*
KIPAR0= 172340           207*
KIPAR1= 172342           208*
KIPAR2= 172344           209*
KIPAR3= 172346           210*
KIPAR4= 172350           211*
KIPAR5= 172352           212*
KIPAR6= 172354           213*
KIPAR7= 172356           214*
KIPDR0= 172300           196*
KIPDR1= 172302           197*
KIPDR2= 172304           198*
KIPDR3= 172306           199*
KIPDR4= 172310           200*
KIPDR5= 172312           201*
KIPDR6= 172314           202*
KIPDR7= 172316           203*
LA      015064          2307*   4134*   4316*   4456*
LAD     045132          7220*   7272*   7276
LERR    044714          7203*   7209*   7232
LST    = 002000          2071*
LST14A  025460          3301    3315*
LST15A  025662          3361    3380*
LST16A  026032          3408    3433*
L00     023474          2891*
L02     023602          2934*
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
L03       023674          2958#
L04       023772          2988#
L05       024070          3015#
L06       024172          3046#
L07       024270          3074#
L10       024410          3116#
L11       025046          3186#
L12       025174          3227#
L13       025306          3265#
L14       025424          3303#   3313
L15       025624          3363#   3376
L16       025764          3410#   3429
L21       026156          3473#
L22       026242          3501#
L30       026444          3558#
L31       026544          3589#
L34       026650          3622#
L35       026752          3654#
L36       027066          3688#
L40       027202          3724#
L41       027304          3753#
L42       027414          3788#
L43       027530          3819#
L44       027640          3850#
L45       027762          3889#
MAKECY    047524          2861    3917    7951#
MASK      044712          7202#   7206*   7222*   7223    7224*   7227*   7228    7229*
MCLK   =  000002          2099#   4106    4107    4109    4110    4282    4283    4285    4286    4944    4945    5640    5641
                          6316    6317    8254    8255    8262    8263    8611    8612    8614    8615    8617    8618    8733
                          8750    8801    8816    9123    9133    9306    9308    9309    9310    9311    9325    9326    9327
                          9328
MCPE   =  020000          2055#
MHS    =  001000          2167#
MID       047514          7927*   7934#
MIDDLE    047412          7916#
MINX   =  000004          2100#   9287
MMVEC  =  000250           185#
MOL    =  010000          2073#   2763    2779
MPE    =  000400          2029#
MR        015050          1706    2301#   4132*   4314*   4454*
MRD    =  000020          2102#   8731    8736    8744    8753    8761
MSE    =  000020          2162#
MSTCK  =  000010          2101#   4106    4107    4119    4120    4282    4283    4295    4296    4440    4441    8610    8612
                          8614    8615    8733    8801    9122    9123    9280    9281    9282    9283    9287    9305    9308
                          9309    9325    9326    9335    9336
MWR    =  000040          2103#   8802    8817    9124    9134
MXF    =  001000          2030#   3527    3529    3533
NCODE     047654          4693    4861    5035    5214    5388    5557    5728    5903    6072    6233    6398    6582    6773
                          8034#
NCOUNT    047656          4693*   4861*   5035*   5214*   5388*   5557*   5728*   5903*   6072*   6233*   6398*   6582*   6773*
                          8035#   8234#
NED    =  010000          2033#   3182    3191    3232    3276    3901    8386
NEM    =  004000          2032#
NHS    =  002000          2168#
```

```
NOPERA  015146          2359#
NOSYNC  051716          7156*   8530    8593#   8667    8691    9416#
NOUNIT  015112          2317#   2655*   2665*   2697*   2704    7027#
NOWORD  051650          3952#   8537#
NUNIT   015114          2319#   2704*   2705*
N11     025076          3179    3196#
N12     025224          3221    3237#
N14     025452          3309    3312#
N36     027126          3687    3701#
OCYL  = 100000          2222#
OF      015040          2297#
OFREV = 000200          2183#
OFSETC  015200          2372#
OF100 = 000004          2178#
OF200 = 000010          2179#
OF25  = 000001          2176#
OF400 = 000020          2180#
OF50  = 000002          2177#
OF800 = 000040          2181#
OPERSE  044072          7114#   9626
OPI   = 020000          2092#
OR    = 000200          2028#   4312    4452
OUT     051666          8527    8534    8539    8544#
000     023526          2900    2904#
010     024420          3114    3122#
021     026174          3471    3480#
043     027556          3817    3829#
044     027662          3848    3859#
PAR   = 000010          2082#
PAT   = 000020          2025#
PC    =%000007            78#   2431*   2572*   2602*   2721*   2762*   2802*   2850*   2859*   3915*   3961*   3968*   3977*
                        3986*   4046*   4054*   4079*   4085*   4162*   4183*   4223*   4231*   4255*   4261*   4349*   4384*
                        4392*   4416*   4422*   4487*   4534*   4618*   4623*   4628*   4641*   4643*   4687*   4732*   4742*
                        4767*   4803*   4812*   4854*   4888*   4900*   4907*   4924*   4948*   4966*   4982*   4986*   5027*
                        5071*   5083*   5090*   5107*   5127*   5150*   5165*   5169*   5207*   5249*   5260*   5266*   5283*
                        5303*   5313*   5337*   5352*   5356*   5382*   5427*   5437*   5462*   5499*   5508*   5550*   5584*
                        5596*   5603*   5620*   5644*   5661*   5675*   5679*   5720*   5764*   5775*   5781*   5798*   5818*
                        5838*   5854*   5858*   5896*   5939*   5951*   5958*   5975*   5993*   6006*   6026*   6042*   6046*
                        6066*   6111*   6121*   6145*   6182*   6191*   6226*   6260*   6272*   6279*   6296*   6320*   6336*
                        6350*   6354*   6390*   6440*   6452*   6459*   6476*   6496*   6517*   6533*   6537*   6575*   6619*
                        6630*   6636*   6653*   6673*   6683*   6707*   6723*   6727*   6766*   6808*   6820*   6827*   6844*
                        6864*   6875*   6898*   6912*   6916*   6934*   6945*   6951*   6969*   6983*   7003*   7059*   7062*
                        7076*   7193*   7212*   7213*   7232*   7234*   7298*   7312*   7355*   7358*   7369*   7394*   7397*
                        7496*   7507*   7513*   7516*   7553*   7555*   7594*   7606*   7611*   7614*   7755*   7778*   7779*
                        7799*   7808*   7828*   7836*   7854*   7859*   7937*   7965*   8174*   8180*   8207*   8249*   8256*
                        8295*   8308*   8328*   8383*   8551*   8625*   8629*   8637*   8639*   8641*   8643*   8645*   8653*
                        8664*   8686*   8690*   8749*   8766*   8772*   8815*   8830*   8840*   8883*   8889*   8895*   8899*
                        8902*   9086*   9156*   9172*   9185*   9197*   9208*   9218*   9369*   9377*   9576*   9583*   9588*
                        9615*   9625*   9779*   9846*   9996
PCJSR   015130          1680    1683    1686    1693    1697    1706    2333#   7310*   7311*   7367*   7368*   7776*   7777*
                        7953*   7954*   8222*   8223*   8457*   8458*   8960*   8961*
PGE   = 002000          2031#
PIE1  = 100000          7988#   8137    8152
PIE10 = 000100          7997#
```

```
PIE11 = 000040          7998*   8104
PIE12 = 000020          7999*   8137
PIE13 = 000010          8000*
PIE14 = 000004          8001*
PIE15 = 000002          8002*
PIE16 = 000001          8003*
PIE17 = 100000          8004*
PIE18 = 040000          8005*
PIE19 = 020000          8006*
PIE2  = 040000          7989*   8095
PIE20 = 010000          8007*
PIE21 = 004000          8008*   8112
PIE22 = 002000          8009*   8143
PIE23 = 001000          8010*   8120
PIE24 = 000400          8011*   8143
PIE25 = 000200          8012*
PIE26 = 000100          8013*
PIE27 = 000040          8014*
PIE28 = 000020          8015*
PIE29 = 000010          8016*
PIE3  = 020000          7990*   8137
PIE30 = 000004          8017*
PIE31 = 000002          8018*
PIE32 = 000001          8019*   8076    8084
PIE4  = 010000          7991*
PIE5  = 004000          7992*
PIE6  = 002000          7993*
PIE7  = 001000          7994*
PIE8  = 000400          7995*
PIE9  = 000200          7996*
PIP   = 020000          2074*
PIRQ  = 177772            64*
PIRQVE= 000240           158*
PKACK   015204          2374*   2806
PLU   = 020000          2171*
POSITI  047660          1703    1709    4692*   4860*   5034*   5213*   5387*   5556*   5727*   5902*   6071*   6232*   6397*
                        6581*   6772*   8036*   8177    8232    8240*   8241    8243    8283*

PRE   = 000020          2218*
PROG  = 001000          2070*   7337
PR0   = 000000            81*
PR1   = 000040            82*
PR2   = 000100            83*
PR3   = 000140            84*
PR4   = 000200            85*
PR5   = 000240            86*
PR6   = 000300            87*
PR7   = 000340            88*
PS    = 177776            61*     62      2407*   2429*   3786*   3820*   3851*   6938*   6973*   7004*   7115*   9649*
PSEL  = 002000          2053*   3502    3724    3729
PSU   = 000001          2215*
PSW   = 177776            62*
PUTREG  044652          3986    4085    4261    4422    4924    4966    5107    5150    5283    5303    5337    5620    5661
                        5798    5838    5975    5993    6026    6296    6336    6476    6517    6653    6673    6707    6844
                        6864    6898    6945    6951    6983    7180*   7312    7369    7808    8174    8180    8249
```

```
PWRVEC= 000024   153*  2419*  2420*  9968*  9969*  9977*  9992*  9993*
P12     047674  8052*  8106*  8107*  8136
P22     047676  8053*  8114*  8115*  8141
P24     047700  8054*  8122*  8123*  8142
P3      047672  8051*  8097*  8098*  8135
RCOM    056106  9355*  9360*
RCYL    051706  8563*  8601*  8636
RDCHR = 104412  9670   9957*
RDHEAD  051724  8482   8601*
RDLIN = 104414  9712   9958*
RDOCT = 104416  2506   7141   7152   8329   8346   9959*
RDY   = 000200  2050*  3822   6939   6952   6974   7313   7324   7370
READ    052516  8625   8629   8637   8639   8641   8643   8645   8686   8690   8725*  9369   9377
READAT  015172  2369*
READIN  015206  2375*
RECALI  015152  2361*
REDATA  056110  8540   9359*
REFOR   015174  2370*  4058   4905   5088   5264   5601   5779   5956   6277   6457   6634   6825
REGADR  044716  1648   1683   1686   1990   1992   1994   2591*  2845*  2894*  2931*  2955*  2985*  3012*
                3043*  3071*  3109*  3174*  3217*  3273*  3300*  3360*  3407*  3466*  3498*  3526*  3555*
                3586*  3619*  3657*  3691*  3721*  3750*  3783*  3812*  3844*  3898*  4179*  4345*  4483*
                7204*  7208*  7868*  7879*  7889*  7900*  7970*
REGSA1  057702  2521   9764*
REINTO  016256  2383*  2811   2818*  2831   2837   4048   4129   4154   4325   4329*  4337   4464   4468*
                4475   4776   4777   4780*  4781*  4783   4784   4794   4890   4974   5073   5157   5251
                5344   5472   5473   5476*  5477*  5479   5480   5490   5586   5667   5766   5846   5941
                6034   6155   6156   6159*  6160*  6162   6163   6173   6262   6342   6442   6525   6621
                6715   6810   6904   7499   7598   7822   7847
RELEAS  015156  2363*
RESVEC= 000010   148*
RETCL   015202  2373*
RHAS    014776  2271*  2585   2609   3267   3891
RHBA    014754  2256*  3299   3359   3406   3963*  4048*  4225*  4386*  4608*  4719*  4890*  5073*  5251*
                5414*  5586*  5766*  5941*  6098*  6262*  6442*  6621*  6810*  7499*  7598*  7793*  7922*
RHCA    014772  2269*  3967*  4053*  4230*  4391*  4614*  4741*  4898*  5081*  5259*  5436*  5594*  5774*
                5949*  6120*  6270*  6450*  6629*  6818*  7506*  7605*  7785*  7926*  7956*
RHCC    015016  2279*  7186   7966   7970
RHCS1   014760  2264*  2806*  2815*  2886   3184   3225   3263   3465   3497   3656   3690   3720   3749
                3782   3811   3843   3887   4082   4258   4419   4610*  7290   7919*  7932*  7958*  7960*
                8322   8356   8466*  8969*
RHCS2   014756  2257*  2567   2610   2671*  2884*  2926*  2950*  2980*  3007*  3038*  3066*  3105*  3142*
                3173   3212*  3216   3256*  3260   3272   3295*  3355*  3402*  3461*  3495*  3522*  3525
                3550*  3554   3581*  3585   3614*  3618   3647*  3651   3677*  3681   3716*  3726*  3745*
                3755*  3778*  3809*  3841*  3880*  3884   3897   3975*  7291   7924*
RHDB    014750  2254*  2525   8330
RHDST   014764  2266*  3965*  4049*  4226*  4387*  4609*  4730*  4893*  5076*  5254*  5425*  5589*  5769*
                5944*  6109*  6265*  6445*  6624*  6813*  7502*  7601*  7790*  7923*  7957*
RHDS1   015002  2273*  7292
RHDT    015004  2274*  2672   2674   2686   2743   2747   2749
RHEC1   015010  2276*  8177
RHEC2   015012  2277*  2898   3107   4303   8171
RHER1   014762  2265*  2613   7293   7864   7868   7874   7879   7886   7889   7894   7900
RHER2   014766  2267*
RHER3   014774  2270*
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
RHLA    015014          2278#
RHMR    015000          2272#  2804#  2860#  3916#  4104   4280   4944#  4945#  5640#  5641#  6316#  6317#  7931#
                        7959#  8236   8465#  8607   8874   8968#  9119   9277
RHOF    014770          2268#  3966#  4051#  4228#  4389#  4613#  4740#  4894#  5077#  5255#  5435#  5590#  5770#
                        5945#  6119#  6266#  6446#  6625#  6814#  7503#  7602#  7796#  7925#
RHSN    015006          2275#  2736   2746   2748
RHWC    014752          2255#  2810   2824   2845   2930   2954   2984   3011   3042   3070   3962#  4047#  4063
                        4143   4179   4224#  4240   4324   4345   4385#  4401   4463   4483   4607#  4717#  4889#
                        5072#  5250#  5412#  5585#  5765#  5940#  6096#  6261#  6441#  6620#  6809#  7184   7186
                        7498#  7597#  7791#  7921#
RKEY1   051712          8565#  8603#  8640
RKEY2   051714          8566#  8604#  8642
RMR   = 000004          2081#
RNCTR1  054562          8959#  8971#  8972#
RNO     056104          9354#  9359#
RNWAT1  054626          8971#
RPTRP1  043364          6936   6950#
RPTRP2  043470          6971   6982#
RPVEC   014746          2244#  2430#  3470   3471#  3480#  3816   3817#  3829#  3847   3848#  3867#  6935   6970
                        8340   8347#  8362   9390#
RPVECT  056220          2430   9384#  9390
RSETR   051710          8564#  8602#  8638
RSYNC   051704          4557   4573   4580   8562#  8628   8633   8665   8676   8689   8699   9175   9178   9220
                        9224
RUNCTR  051454          8456#  8468#  8469#
RUNWAT  051520          8468#
R0    =%000000            69#  2524#  2527#  2612#  2616#  2658#  2661#  2666#  2700#  2723#  2724   2809#  2823#
                        2836#  2861#  3176#  3178#  3218#  3220#  3684#  3686#  3917#  3940#  3989#  3993   4062#
                        4104#  4105#  4106#  4107#  4109#  4110#  4119#  4120#  4142#  4152#  4169#  4239#  4280#
                        4281#  4282#  4283#  4285#  4286#  4295#  4296#  4323#  4335#  4400#  4440#  4441#  4462#
                        4473#  4527#  4529#  4537#  4540#  4542#  4543#  4544#  4554#  4557#  4558#  4559#  4560#
                        4561#  4566   4569#  4573#  4576#  4580#  4582#  4589#  4633#  4682#  4684#  4718#  4719
                        4721#  4723#  4724#  4725#  4727#  4775#  4782#  4793#  4841#  4842#  4846   4849#  4943#
                        4946#  4951#  4952#  4955#  4956#  4957#  4960#  4972#  5014#  5015#  5019   5022#  5121#
                        5130#  5131#  5134#  5135#  5136#  5139#  5155#  5194#  5195#  5199   5202#  5297#  5316#
                        5317#  5320#  5321#  5322#  5325#  5342#  5377#  5379#  5413#  5414   5416#  5418#  5419#
                        5420#  5422#  5471#  5478#  5489#  5537#  5538#  5542   5545#  5639#  5642#  5647#  5648#
                        5651#  5652#  5653#  5657#  5665#  5707#  5708#  5712   5715#  5812#  5821#  5822#  5825#
                        5826#  5827#  5830#  5844#  5883#  5884#  5888   5891#  5989#  6009#  6010#  6013#  6014#
                        6015#  6018#  6032#  6061#  6063#  6097#  6098   6100#  6102#  6103#  6104#  6106#  6154#
                        6161#  6172#  6214#  6215#  6219   6222#  6315#  6318#  6323#  6324#  6327#  6328#  6329#
                        6332#  6340#  6377#  6378#  6382   6385#  6490#  6499#  6500#  6503#  6504#  6505#  6508#
                        6523#  6562#  6563#  6567   6570#  6667#  6686#  6687#  6690#  6691#  6692#  6695#  6713#
                        6753#  6754#  6758   6761#  6858#  6878#  6879#  6882#  6883#  6884#  6887#  6902#  6935#
                        6936#  6937#  6970#  6971#  6972#  7029#  7031   7069#  7071   7073   7076   7181   7184#
                        7187   7192#  7258   7259   7260   7270#  7409   7410#  7411   7413   7414   7415   7416#
                        7460   7461   7462   7469#  7536   7537   7538   7539   7540   7541#  7569#  7647   7648#
                        7656   7708#  7725   7728#  7731   7754#  7776   7783   7784   7785   7786   7787   7788
                        7789   7791   7793   7794   7820#  7846#  7860   7904#  7917   7936#  7953   7955   7975#
                        8061   8078#  8085#  8088#  8089#  8090   8135#  8136#  8138   8140#  8141#  8142#  8144
                        8206#  8222   8224   8267#  8277   8307#  8330#  8332#  8333#  8459   8550#  8607#  8609#
                        8610#  8611#  8612#  8614#  8615#  8617#  8618#  8630   8693   8696   8728#  8731#  8733#
                        8736   8745#  8750#  8753   8762#  8794   8799#  8801#  8802   8811#  8816#  8817   8826#
                        8839#  8864   8874#  8910#  8962   9085#  9119#  9120#  9122#  9123#  9124   9131#  9133#
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
                    9134    9141*   9271    9277*   9279*   9280*   9281*   9282*   9283*   9287*   9288*   9305*   9306*
                    9308*   9309*   9310*   9311*   9325*   9326*   9327*   9328*   9335*   9336*   9346*   9488    9498*
                    9502    9518    9519    9532*   9568    9569*   9570    9573*   9709    9713*   9714    9717    9737*
                    9740*   9802    9803*   9804*   9811*   9812*   9813*   9814*   9815*   9816    9821    9827    9829*
                    9830    9844*   9936    9937*   9938    9939*   9940*   9941*   9970    9991*
R1      =%000001      70#   2525*   2526    2532    2585*   2586*   2587    2591    2609*   2618    2621    2667    3177*
                    3181    3186    3196*   3197    3219*   3223    3227    3237*   3238    3685*   3688    3701*   3702
                    3974*   3990*   3993    3996    4006    4058*   4103*   4113*   4118*   4121*   4235*   4279*   4289*
                    4294*   4297*   4396*   4439*   4442*   4528*   4530*   4683*   4685*   4737*   4905*   4958*   4961*
                    5088*   5137*   5140*   5264*   5323*   5326*   5378*   5380*   5432*   5601*   5654*   5658*   5779*
                    5828*   5831*   5956*   6016*   6019*   6062*   6064*   6116*   6277*   6330*   6333*   6457*   6506*
                    6509*   6634*   6693*   6696*   6825*   6885*   6888*   6939*   6974*   7030*   7031    7034    7182
                    7185*   7187*   7191*   7255    7258*   7261    7263*   7269*   7290*   7297*   7319    7326    7330
                    7373    7381    7457    7460*   7463    7468*   7511*   7531    7536*   7545    7548    7556    7568*
                    7610*   7649    7653*   7661    7668    7675    7683*   7686*   7688*   7691*   7693*   7696*   7698*
                    7703    7707*   7726    7729*   7732*   7734*   7738*   7753*   7784*   7918    7933*   7935*   8062
                    8067*   8075    8083    8111    8119    8134*   8143*   8144*   8151*   8153    8169    8205*   8225
                    8226*   8227*   8246    8254*   8255*   8262*   8263*   8266*   8278    8286*   8289    8306*   8331*
                    8334*   8460    8475*   8478*   8479    8480    8481    8482*   8535*   8540*   8549*   8601    8602
                    8603    8604    8605    8606    8702*   8703*   8861    8862    8863    8865    8869*   8872*   8894*
                    8897*   8901*   8904*   8909*   8911*   8963    8978*   8981*   8982    8983    8984    8985    8986
                    8987    8988*   9074*   9084*   9112    9113    9114    9115    9116    9117    9118*   9146*   9157*
                    9174*   9175    9179    9186*   9187    9192    9198*   9199    9201    9209*   9213    9219*   9220
                    9223    9227*   9228*   9270    9272    9322*   9333*   9345*   9347*   9359    9360    9361    9381*
                    9382*   9489    9502*   9503    9507    9531*   9710    9715*   9723*   9725*   9727*   9730*   9733
                    9736*   9826    9827*   9832    9836    9838    9843*   9971    9990*
R11       025030    3181*
R15       025654    3371    3375*
R16       026024    3424    3428*
R2      =%000002      71#   2526*   2610*   2611*   2615*   2893*   2894    2895    2930*   2931    2934*   2936*   2937
                    2954*   2955    2958*   2960*   2962*   2964*   2966    2984*   2985    2988*   2990*   2991*   2993
                    3011*   3012    3015*   3017*   3019*   3020*   3022*   3024    3042*   3043    3046*   3048*   3050*
                    3052    3070*   3071    3074*   3076*   3078*   3079*   3081*   3083    3107*   3108*   3109    3118
                    3173*   3174    3186*   3190    3216*   3217    3227*   3231    3260*   3265*   3267*   3269    3271*
                    3272*   3273    3275    3299*   3300    3305*   3306    3359*   3360    3363*   3367*   3368    3406*
                    3407    3410*   3414*   3416*   3418*   3420    3465*   3466    3473*   3476    3497*   3498    3502*
                    3505    3525*   3526    3529*   3531    3554*   3555    3558*   3562    3585*   3586    3589*   3593*
                    3595    3618*   3619    3622*   3626*   3628    3651*   3654*   3656*   3657    3659    3681*   3688*
                    3690*   3691    3693    3720*   3721    3724*   3728    3749*   3750    3753*   3757    3782*   3783
                    3788*   3790    3792    3811*   3812    3822*   3826    3843*   3844    3853*   3959    3884*   3889*
                    3891*   3893*   3895*   3897*   3898    3900    3991*   3997    4011*   4108*   4111*   4284*   4287*
                    4959*   4960    5138*   5139    5324*   5325    5655*   5657    5829*   5830    6017*   6018    6331*
                    6332    6507*   6508    6694*   6695    6886*   6887    7183    7186*   7188*   7190*   7256    7259*
                    7261*   7262*   7264*   7265*   7268*   7291*   7295*   7296*   7458    7461*   7463*   7467*   7532
                    7537*   7545    7549    7556    7567*   7650    7670*   7672*   7673*   7689    7706*   7727    7730*
                    7731*   7736*   7752*   8063    8068*   8094    8103    8133*   8137*   8138*   8150*   8152*   8154
                    8204*   8279    8287*   8298*   8305*   8384*   8386    8461    8548*   8616*   8619*   8623*   8626*
                    8651*   8656    8662*   8684*   8687*   8726    8732*   8767*   8771*   8795    8800*   8831*   8838*
                    8862*   8866    8885*   8908*   8964    9083*   9132*   9142*   9154*   9159    9164*   9182*   9190
                    9195*   9206*   9211    9216*   9273    9303*   9312*   9314*   9324*   9329*   9344*   9365*   9370*
                    9375*   9378*   9490    9501*   9505*   9508    9515*   9516*   9517    9522*   9530*   9711    9716*
                    9724*   9726*   9728*   9734    9735*   9972    9989*
R3      =%000003      72#   2659*   2660*   2663*   2693*   2763    2779    7211*   7215*   7216    7219*   7221    7257
                    7260*   7263    7267*   7292*   7343    7348    7351    7387    7392    7459    7462*   7464*   7466*
```

```
                    7533    7538*   7542    7550    7561*   7566*   7651    7663*   7665*   7666*   7673    7680    7684
                    7705*   8064    8075*   8076*   8077*   8078    8083*   8084*   8085    8094*   8095*   8096*   8097
                    8103*   8104*   8105*   8106    8111*   8112*   8113*   8114    8119*   8120*   8121*   8122    8203*
                    8280    8288*   8296*   8304*   8462    8547*   8796    8806*   8810*   8821*   8825*   8835    8837*
                    8867    8870*   8871*   8882*   8884*   8890*   8896*   8900*   8903*   8907*   8965    9082*   9127*
                    9130*   9137*   9140*   9146    9147    9151    9183*   9187    9191    9274    9278*   9289    9337*
                    9343*   9367*   9368    9376    9491    9499*   9500*   9514*   9517*   9526*   9527*   9529*   9666
                    9667*   9668    9671*   9672    9676    9678    9680*   9682*   9883    9892*   9898*   9899*   9902*
                    9907*   9908*   9909    9918*   9973    9988*
R4      =%000004      73*   2613*   2614*   7207*   7208    7225*   7226    7293*   7534    7542*   7543*   7544    7565*
                    7652    7677*   7679*   7680*   7694    7704*   8065    8202*   8281    8289*   8290*   8303*   8385
                    8463    8546*   8868    8878*   8887    8891*   8906*   8966    9081*   9275    9342*   9884    9886*
                    9887*   9888*   9889    9890*   9904    9906*   9914*   9917*   9974    9997*
R44       027706    3863    3867*
R5      =%000005      74*   2568*   2664*   2671    2680    2693    2695    2699*   2843*   2844*   2845    2886*   2893
                    2897*   2898    3184*   3188    3225*   3229    3263*   3301*   3303    3312    3361*   3365    3375
                    3408*   3412    3428    3887*   3954*   4040*   4177*   4178*   4179    4217*   4343*   4344*   4345
                    4378*   4481*   4482*   4483    4553*   4555*   4562*   4568*   4570*   4575*   4577*   4581*   4583*
                    4588*   4590*   4601*   4711*   4726*   4728*   4840*   4843*   4847*   4850*   4879*   5013*   5016*
                    5020*   5023*   5053*   5193*   5196*   5200*   5203*   5232*   5406*   5421*   5423*   5536*   5539*
                    5543*   5546*   5575*   5706*   5709*   5713*   5716*   5746*   5882*   5885*   5889*   5892*   5921*
                    6090*   6105*   6107*   6213*   6216*   6220*   6223*   6251*   6376*   6379*   6383*   6386*   6416*
                    6561*   6564*   6568*   6571*   6600*   6752*   6755*   6759*   6762*   6791*   7206    7207    7209
                    7210*   7218*   7490*   7535    7564*   7588*   7648    7703*   7709*   7749*   7952    7955*   7956
                    7967    7969    7974*   8066    8201*   8282    8302*   8464    8545*   8608*   8621*   8650*   8661*
                    8681*   8727*   8769*   8797    8798*   8833*   8836*   8967    9080*   9121*   9144*   9276    9304*
                    9315*   9323*   9331*   9341*   9492    9494*   9496*   9503*   9507*   9522    9528*   9885    9891*
                    9893*   9895*   9896*   9897*   9898    9916*   9975    9986*
R6      =%000006      75*     77    2408*   2409*   2410
R7      =%000007      76*     78
SAVDT     015124    2326*   2749*
SAVER     045644    2809    2823    4062    4142    4239    4323    4400    4462    7456*
SAVSN     015126    2329*   2748*
SC      =  100000    2057*   4083    4130    4259    4310    4420    4450
SCOP1   =  104420    7233    9960*
SCRC      055016    9109*   9116*
SCYL      055006    9105*   9112*   9183
SC1     =  000100    2145*
SC10    =  001000    2148*
SC2     =  000200    2146*
SC20    =  002000    2149*
SC4     =  000400    2147*
SEARCH    055634    7933    8475    8978    9270*
SECGAP    053422    4527    4682    5377    6061    8935*   9118
SECOTR    051604    3949*   4035*   4212*   4873*   4874*   5047*   5048*   5226*   5227*   5569*   5570*   5740*   5741*
                    5915*   5916*   6245*   6246*   6410*   6411*   6594*   6595*   6785*   6786*   7484*   7485*   7581*
                    7582*   7744*   7745*   8472    8485*
SECTR     055632    9268*   9270*   9278
SEECOM    015176    2371*   7958
SEGPER    054736    8982*   8996*   9152*   9162*
SELECT    015116    2321*   2401*   2403*   2500    2707    7018
SELTST    022424    2627    2707*
SERCH     015160    2364*
SETCK1    030562    4082*
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
SETCK2  031256          4258#
SETCK3  031750          4419#
SETDSK  046634          7724#
SILOTB  053520          8941#
SKEY1   055012          9107#   9114#
SKEY2   055014          9108#   9115#
SKI   = 040000          2221#
SN      015056          2304#
SND1    020636          2435    2499#
SP    =%000006            77#   2412#   2507#   2508    2509    2519#   2531    2544#   2564#   2680#   2686#   2695#   2729#
                        2736#   2743#   2799#   2858#   2891#   2928#   2952#   2982#   3009#   3040#   3068#   3116#   3171#
                        3214#   3258#   3297#   3357#   3404#   3463#   3501#   3524#   3552#   3583#   3616#   3649#   3679#
                        3718#   3747#   3780#   3819#   3850#   3882#   3914#   3938#   3972#   3973#   3974    4007#   4008#
                        4009    4028#   4206#   4367#   4506#   4679#   4831#   4839#   4842    4845    4891#   4892#   4893
                        4931#   4932#   4933    4953#   4954#   4955    5004#   5012#   5015    5018    5074#   5075#   5076
                        5115#   5116#   5117    5132#   5133#   5134    5184#   5192#   5195    5198    5252#   5253#   5254
                        5291#   5292#   5293    5318#   5319#   5320    5374#   5527#   5535#   5538    5541    5587#   5588#
                        5589    5627#   5628#   5629    5649#   5650#   5651    5697#   5705#   5708    5711    5767#   5768#
                        5769    5806#   5807#   5808    5823#   5824#   5825    5873#   5881#   5884    5887    5942#   5943#
                        5944    5983#   5984#   5985    6011#   6012#   6013    6058#   6205#   6212#   6215    6218    6263#
                        6264#   6265    6303#   6304#   6305    6325#   6326#   6327    6369#   6375#   6378    6381    6427#
                        6428#   6429#   6431    6443#   6444#   6445    6484#   6485#   6486    6501#   6502#   6503    6553#
                        6560#   6563    6566    6622#   6623#   6624    6661#   6662#   6663    6688#   6689#   6690    6743#
                        6751#   6754    6757    6811#   6812#   6813    6852#   6853#   6854    6880#   6881#   6882    6932#
                        6950    6967#   6982    7009#   7015#   7023#   7066#   7120#   7126#   7142#   7143    7153    7154#
                        7181#   7182#   7183#   7190    7191    7192    7255#   7256#   7257#   7267    7268    7269    7276#
                        7310    7336#   7337#   7338    7357#   7367    7396#   7409#   7410    7415#   7416    7457#   7458#
                        7459#   7466    7467    7468    7500#   7501#   7502    7531#   7532#   7533#   7534#   7535#   7557#
                        7558#   7559    7564    7565    7566    7567    7568    7599#   7600#   7601    7647#   7649#   7650#
                        7651#   7652#   7704    7705    7706    7707    7708    7725#   7726#   7727#   7752    7753    7754
                        7786#   7788#   7790    7917#   7918#   7935    7936    7952#   7974    8061#   8062#   8063#   8064#
                        8065#   8066#   8169#   8170#   8171    8201    8202    8203    8204    8205    8206    8225#   8266
                        8277#   8278#   8279#   8280#   8281#   8282#   8302    8303    8304    8305    8306    8307    8322#
                        8333    8340#   8347    8356#   8362#   8457    8459#   8460#   8461#   8462#   8463#   8464#   8472#
                        8473#   8474    8545    8546    8547    8548    8549    8550    8606#   8702    8726#   8741#   8744#
                        8745    8758#   8761#   8762    8771    8794#   8795#   8796#   8797#   8836    8837    8838    8839
                        8864#   8865#   8866#   8867#   8868#   8875#   8876#   8877    8878    8906    8907    8908    8909
                        8910    8960    8962#   8963#   8964#   8965#   8966#   8967#   8975#   8976#   8977    9080    9081
                        9082    9083    9084    9085    9117#   9227    9271#   9272#   9273#   9274#   9275#   9276#   9341
                        9342    9343    9344    9345    9346    9361#   9381    9432#   9435    9437    9438    9466    9467
                        9471#   9488#   9489#   9490#   9491#   9492#   9493#   9494    9497#   9510    9512#   9514    9524
                        9526    9528    9529    9530    9531    9532    9534#   9535#   9568#   9569    9570#   9572    9573
                        9574#   9577    9579#   9581#   9587    9620#   9621#   9622    9630    9633    9646#   9647#   9648#
                        9653#   9666#   9671    9682    9683#   9684#   9685#   9707#   9708#   9709#   9710#   9711#   9713
                        9717#   9719    9721    9729#   9730    9732    9733#   9735    9736    9737    9739    9774    9786#
                        9789#   9802#   9807#   9826#   9832#   9836#   9843    9844    9875#   9876    9877    9878#   9883#
                        9884#   9885#   9891    9916    9917    9918    9919#   9920#   9936#   9937    9970#   9971#   9972#
                        9973#   9974#   9975#   9976    9982#   9986    9987    9988    9989    9990    9991    9996#
SR0   = 177572            189#
SR1   = 177574            190#
SR2   = 177576            191#
SR3   = 172516            192#
SSECTR  055010          9106#   9113#
SSYN    051614          8479#   8491#   8634#
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
SS1     032300          4526*   4661
SS10    032452          4519*   4582*   4584    4652*
SS12    032502          4520*   4597*   4653*
SS13    032510          4521*   4598*   4654*
SS14    032516          4522*   4599*   4655*
SS15    032556          4523*   4609*   4656*
SS2     032742          4658*
SS3     032332          4515*   4542*   4648*
SS4     032336          4516*   4543*   4649*
SS5     032342          4517*   4544*   4650*
SS7     032370          4518*   4559*   4651*
STACK = 001000            58*   2412    2519    2564    2799    2858    2891    2928    2952    2982    3009    3040    3068
                        3116    3171    3214    3258    3297    3357    3404    3463    3501    3524    3552    3583    3616
                        3649    3679    3718    3747    3780    3819    3850    3882    3914    3938    4028    4206    4367
                        4506    4679    4831    5004    5184    5374    5527    5697    5873    6058    6205    6369    6553
                        6743    6932    6967
START   017352          2402    2406*
STKLMT= 177774            63*
SWR   = 177570            65*     66    2534    2603    2625    4007    7274    7557    8162    8164    9427*   9441    9443
                        9449    9456    9770    9777    9781    9784
SW0   = 000001           116*
SW00  = 000001           106*    116
SW01  = 000002           105*    115
SW02  = 000004           104*    114
SW03  = 000010           103*    113
SW04  = 000020           102*    112
SW05  = 000040           101*    111
SW06  = 000100           100*    110
SW07  = 000200            99*    109     4009    7559
SW08  = 000400            98*    108
SW09  = 001000            97*    107     7274
SW1   = 000002           115*
SW10  = 002000            96*
SW11  = 004000            95*
SW12  = 010000            94*
SW13  = 020000            93*    2534    2603    2625
SW14  = 040000            92*
SW15  = 100000            91*
SW2   = 000004           114*
SW3   = 000010           113*
SW4   = 000020           112*
SW5   = 000040           111*
SW6   = 000100           110*    8164
SW7   = 000200           109*
SW8   = 000400           108*    8162
SW9   = 001000           107*
S11     025024          3178*   3200
S12     025160          3220*   3241
S36     027062          3686*   3703
TAGDTE  015144          2348*   4509*   4658*
TBITVE= 000014           149*
TDF   = 000040          2163*
TESDTE  015142          2344*   4074*   4250*   4411*   7165*   8646    9170    9425*
TESTAD  044070          7112*
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
TIMCNT  045522          6940    6975    7407#   7417    7423
TIMOT = 000004          2869#   2888    2889#   2904#   3113    3114#   3122#
TKVEC = 000060           156#   9611#   9612#
TMPILL  015136          2338#   3964#   3989    3995
TOLGAP  054526          3942    8870    8946#
TOTALA  015134          2336#   2618#   2620#   3144    3176    3218    3684
TPVEC = 000064           157#
TRAPVE= 000034           155#   2417#   2418#
TRE   = 040000          2056#   3652    3660    3682    3694    4130    4310    4450
TRK     051554          8474#   8477#
TRK1  = 004000          2150#
TRK10 = 040000          2153#
TRK2  = 010000          2151#
TRK20 = 100000          2154#
TRK4  = 020000          2152#
TRTVEC= 000014           150#
TSECC   015140          2340#   4691#   4859#   5033#   5212#   5386#   5555#   5726#   5901#   6070#   6231#   6396#   6580#
                        6771#   7157#   8879    9362    9372    9417#
TSECCG  047652          7161#   8031#   8155    8734    8746    8751    8763    8812    8827    8881#   8893#   9364#   9374#
                        9421#
TSTNM   017322          1648    1650    1652    1655    1658    1661    1663    1666    1670    1673    1675    1677    1680
                        1683    1686    1690    1693    1697    1700    1703    1706    1709    1713    1990    1992    1994
                        2384#   2520#   2566#   2584#   2761#   2800#   2883#   2925#   2949#   2979#   3006#   3037#   3065#
                        3104#   3141#   3211#   3255#   3294#   3354#   3401#   3460#   3494#   3521#   3549#   3580#   3613#
                        3646#   3676#   3715#   3744#   3777#   3808#   3840#   3879#   3939#   4029#   4207#   4368#   4507#
                        4681#   4833#   5006#   5186#   5376#   5529#   5699#   5875#   6060#   6206#   6370#   6554#   6745#
                        6931#   6966#   7120
TST1    020744          2501    2517#   7080
TST10   023402          2857#
TST11   023430          2881#
TST12   023534          2923#
TST13   023626          2940    2947#
TST14   023724          2969    2977#
TST15   024022          2996    3004#
TST16   024124          3027    3035#
TST17   024222          3055    3063#
TST2    021220          2562#
TST20   024324          3086    3102#
TST21   024426          3139#
TST22   025112          3199    3209#
TST23   025240          3239    3253#
TST24   025360          3279    3292#
TST25   025560          3314    3352#
TST26   025720          3377    3399#
TST27   026072          3430    3458#
TST3    021264          2582#
TST30   026202          3492#
TST31   026300          3509    3519#
TST32   026376          3536    3547#
TST33   026500          3566    3578#
TST34   026604          3599    3611#
TST35   026710          3632    3644#
TST36   027012          3663    3674#
TST37   027136          3697    3699    3713#
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TST4    021336          2589    2599#
TST40   027240          3732    3742#
TST41   027342          3761    3775#
TST42   027450          3796    3806#
TST43   027564          3838#
TST44   027714          3877#
TST45   030034          3904    3913#
TST46   030062          3936#
TST47   030402          3988    4010    4027#
TST5    022440          2708    2718#   7026    7035
TST50   031074          4088    4205#
TST51   031566          4265    4366#
TST52   032202          4425    4505#
TST53   032756          4626    4660    4678#
TST54   033404          4752    4800    4830#
TST55   034122          4923    4979    5003#
TST56   034646          5106    5162    5183#
TST57   035410          5282    5349    5373#
TST6    022676          2760#
TST60   036034          5447    5496    5526#
TST61   036552          5619    5672    5696#
TST62   037276          5797    5851    5872#
TST63   040040          5974    6039    6057#
TST64   040464          6131    6179    6204#
TST65   041202          6295    6347    6368#
TST66   041736          6475    6530    6552#
TST67   042514          6652    6720    6742#
TST7    023240          2764    2798#
TST70   043272          6843    6909    6929#
TST71   043404          6948    6953    6964#
TST72   043500          6980    7001#
TTNO  = 000071          2520#   2566#   2584#   2761#   2800#   2883#   2925#   2949#   2979#   3006#   3037#   3065#   3104#
                        3141#   3211#   3255#   3294#   3354#   3401#   3460#   3494#   3521#   3549#   3580#   3613#   3646#
                        3676#   3715#   3744#   3777#   3808#   3840#   3879#   3939#   4029#   4207#   4368#   4507#   4681#
                        4833#   5006#   5186#   5376#   5529#   5699#   5875#   6060#   6206#   6370#   6554#   6745#   6931#
                        6966#
TUF   = 000100          2164#
TY      051720          8595#
TYPDS = 104410          2681    2696    7010    7016    7024    7067    9837    9956#
TYPE  = 104400          2438    2442    2446    2450    2454    2458    2462    2466    2470    2474    2478    2482    2486
                        2490    2494    2502    2536    2540    2605    2631    2635    2639    2643    2650    2676    2682
                        2686    2694    2725    2731    2732    2738    2739    2745    2766    2770    2774    2781    3154
                        3158    3162    3166    3969    4055    4232    4393    4619    4629    4733    4768    4901    4949
                        5084    5128    5261    5314    5428    5463    5597    5645    5776    5819    5952    6007    6112
                        6146    6273    6321    6453    6497    6631    6684    6821    6876    7005    7011    7022    7025
                        7065    7068    7116    7122    7128    7129    7133    7137    7144    7148    7508    7607    7780
                        8318    8324    8336    8342    8348    8352    8358    8364    8368    9385    9533    9624    9629
                        9674    9677    9681    9741    9743    9772    9780    9801    9818    9820    9823    9825    9840
                        9845    9910    9952#   9994
TYPOC = 104402          2546    2687    2730    2737    2744    7121    7127    8323    8341    8357    8363    9389    9809
                        9833    9953#
TYPON = 104406          9955#
TYPOS = 104404          9954#
T.SCOP  045134          7274#   9960
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DZRPTD.SUB CROSS REFERENCE TABLE

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UN       021254          2567*  2569#
UNIT     015110          2316#  2508*  2656*  2703*  2709*  2723   2729   7009   7029   7034*  7296
UNITS    015070          2315#  2654*  2659   2663   2703   7030
UNITSL   015120          2322#  2509*  2709
UNLOAD   015150          2360#
UNS    = 040000          2093#
UPE    = 020000          2034#  3556   3563   3589   3596   3654
USI    = 000001          2021#  3191   3232   3261   3265   3276   3622   3629   3885   3889   3901
US2    = 000002          2022#  3191   3232   3261   3265   3276   3622   3629   3885   3889   3901
US4    = 000004          2023#  3191   3232   3261   3265   3276   3622   3629   3885   3889   3901
UWR    = 000010          2217#
U11      025002          3145   3171#
VUF    = 000002          2216#
VU30   = 010000          2170#
VV     = 000100          2067#  2818   7337
WAIT.T   045524          7409#  9962
WAT    = 104424          9962#
WC       015022          1666   2288#  4064   4128*  4170   4241   4308*  4336   4402   4448*  4474   7185
WCE    = 040000          2035#
WCF    = 000040          2084#
WCRC     053502          3956   4042   4219   4881   5055   5234   5577   5748   5923   6253   6418   6602   6793
                         7492   7590   7751   8644   8938#
WCU    = 000001          2158#
WCYL     054724          4372*  4375   4595*  4602   4705*  4712   5400*  5407   6084*  6091   8990#
WECC1    054520          1700   4757   5452   6135   8943#
WECC2    054522          1700   4761   5456   6139   6427   6430*  6431*  8944#
WKEY1    054730          4375*  4598*  4708*  5403*  6087*  8992#
WKEY2    054732          4376*  4599*  4709*  5404*  6088*  8993#
WLE    = 004000          2090#
WORD     052512          8624*  8628*  8636*  8638*  8640*  8642*  8644*  8685*  8689*  8719*  8729*  8742*  8759*
                         9368*  9376*
WRCHDA   046210          7580#
WRCHDT   015164          2366#  7511
WRCHEK   015162          2365#  7610
WRCHHD   045676          7483#
WRDATA   053170          8535   8860#  9074
WRFROM   015212          2382#  2825   2831*  2838   4144   4148*  4171   4225   4309   4386   4449   4537   4563
                         4564   4608   4634   4718   4951   4973   5130   5145*  5156   5316   5332*  5343   5413
                         5647   5666   5821   5837*  5845   6009   6025*  6033   6097   6323   6341   6499   6524
                         6686   6702*  6704*  6714   6878   6894*  6895*  6903   7821   7922
WRHEAD   055020          8988   9112#
WRIDAT   015166          2367#  3972   4235
WRIFOR   015170          2368#  4396   4610   4737   5432   6116   7919
WRITE    052750          8653   8664   8793*  8883   8889   8895   8899   8902   9156   9172   9185   9197   9208
                         9218
WRL    = 004000          2072#
WRU    = 000400          2166#
WSECTR   054726          4374*  4597*  4707*  5402*  6086*  8975   8991#
WSSYNC   053470          8936#
WSU    = 000004          2160#
WTRK     054662          8977*  8980#
WWORD    052746          8654   8658   8661   8665   8672   8677   8681   8788#  8835*  8884   8890   8896   8900
                         8903   9157   9161   9174   9186   9198   9209   9219
X        051612          3953*  4039*  4216*  4878*  5052*  5231*  5574*  5745*  5920*  6250*  6415*  6599*  6790*
```

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                    7489*  7586*  7794*  7811   8488*  8528
XE2       022150    2623   2657*
XI1       025104    3151   3198*
Y         051652    8538*
Y1        024476    3150   3153*
ZCODE     047666    1709   4698*  4866*  5040*  5219*  5393*  5562*  5733*  5908*  6077*  6238*  6403*  6587*
                    6778*  8043*  8237*
ZER     = 000400    2105*  8246
ZWORDS    053166    8859*  8877*
$BDADR    001122     242*  1655   1658   1680   1713   7319*  7326*  7330*  7343*  7348*  7351*  7373*  7381*
                    7387*  7392*
$BDDAT    001126     244*  1648   1652   1658   1663   1675   1677   1683   1686   1690   1693   1992   2587*
                    2588   2937*  2939   2966*  2968   2993*  2995   3024*  3026   3052*  3054   3083*  3085
                    3110*  3190*  3191*  3193   3231*  3232*  3234   3275*  3276*  3278   3306*  3308   3368*
                    3370   3420*  3423   3467*  3505*  3506*  3508   3531*  3533*  3535   3562*  3563*  3565
                    3595*  3596*  3598   3628*  3629*  3631   3659*  3660*  3662   3693*  3694*  3696   3728*
                    3729*  3731   3757*  3758*  3760   3792*  3793*  3795   3813*  3859*  3860*  3862   3900*
                    3901*  3903   3996*  7226*  7228*  7230   7428*  7549*  7864*  7865   7874*  7875   7886*
                    7887   7894*  7896   7966*  7967   8658*  8677*  9151*  9161*  9179*  9192*  9201*  9213*
                    9223*
$BELL     001210     270*  9629   9690   9772   9792
$CMTAG    001100     230*  2407   2408   2415   2421   2422
$CM1    = 000006     256*   257*   258*   259*   260*   261*   262*
$CM2    = 000014     256*   257*   258*   259*   260*   261*   262*
$CM3    = 000006     254*   256
$CM4    = 000006     262*   263*   264*   265*   266*   267*   268*
$CNTLC    057527    9624   9690*
$CRLF     001215     272*  2694   2731   2738   2745   7128   9690   9746   9780   9792   9801   9820   9825
                    9845
$DBLK     057010    9499   9533   9541*
$DOAGN    044044    7061   7070   7080*
$DTBL     057000    9502   9537*
$ENDAD    044034     224    226   7071   7074   7076*
$ENDCT    043764    7063*
$ENDMG    044050    7022   7065   7081*
$ENULL    044065    7025   7068   7084*
$EOP      043730    2547   2648   7028   7053*
$EOPCT    043756    7060*  7064
$ERFLG    001103     233*  9406   9445   9447   9453*  9474   9767*  9792
$ERMAX    001115     239*  2423*  9447   9469*  9474
$ERROR    057674    2415   2548   9761*
$ERRPC    001116     240*  1648   1650   1652   1655   1658   1661   1663   1666   1670   1673   1675   1677
                    1680   1683   1686   1690   1693   1697   1700   1703   1706   1709   1713   1990   1992
                    1994   9774*  9775*  9776   9792   9807
$ERRTB    001220     290*  9815
$ERRTY    060036    9779   9800*
$ERTTL    001112     237*  7015   7017*  9773*  9792
$ESCAP    001206     269*  2422*  9468*  9787   9789   9792
$FILLC    001150     252*  9577   9589
$FILLS    001147     251*  9589
$GDADR    001120     241*
$GDDAT    001124     243*  1648   1650   1652   1675   1683   1686   1690   1693   1697   1992   1994   2590*
                    2932*  2939   2956*  2968   2986*  2995   3013*  3026   3044*  3054   3072*  3085   3111*
                    3181*  3182*  3193   3223*  3234   3261*  3278   3303*  3305   3308   3365*  3367   3370
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                    3412*  3416   3421*  3423   3468*  3476*  3499*  3508   3527*  3535   3556*  3558   3565
                    3587*  3598   3620*  3631   3652*  3662   3682*  3696   3722*  3731   3751*  3760   3784*
                    3795   3814*  3826*  3845*  3862   3885*  3903   3995*  7221*  7223*  7225   7230   7548*
                    7869*  7880*  7890*  7899*  7969*  8633*  8657*  8674*  8676*  8699*  9150*  9160*  9178*
                    9191*  9202*  9212*  9224*
$GET42  044006      7069*
$HD   = 000000        11
$HIOCT  057672      9734*  9745*
$ICNT   001104       234*  9460*  9461   9463*  9473
$ILLUP  060634      9968   9999*
$ITEMB  001114       238*  9776*  9792   9804
$LF     001216       273*  9681   9690   9746   9792
$LPADR  001106       235*  2424*  2720*  7143*  7154   9451*  9466*  9471   9473
$LPERR  001110       236*  2425*  7126   7153*  9451   9467*  9473   9786
$MXCNT  056572      9464   9473*
$NULL   001146       250*  9579   9589
$NWTST= 000001      2513*  2515   2555*  2557   2579*  2596*  2711*  2713   2752*  2754   2789*  2791   2854*
                    2878*  2920*  2944*  2974*  3001*  3032*  3060*  3099*  3136*  3206*  3250*  3289*  3349*
                    3396*  3455*  3489*  3516*  3544*  3575*  3608*  3641*  3671*  3710*  3739*  3772*  3803*
                    3835*  3874*  3910*  3927*  3929   4014*  4016   4189*  4191   4355*  4357   4492*  4494
                    4669*  4671   4819*  4821   4992*  4994   5172*  5174   5364*  5366   5515*  5517   5685*
                    5687   5861*  5863   6048*  6050   6193*  6195   6356*  6358   6540*  6542   6730*  6732
                    6921*  6923   6958*  6960   6992*  6994
$OCNT   060434      9882*  9911*  9924*
$OMODE  060436      9877*  9881*  9886   9889*  9900*  9926*
$OVER   056556      9428   9444   9452   9462   9470*
$PASS   001100       231*  3147   7021*  7023   7057*  7058*  7066   7081   9458   9474
$POWER  060642      9995  10002*
$PWRAD  060630      9997*
$PWRDN  060506      2419   9968*  9992
$PWRMG  060624      9995*
$PWRUP  060554      9977   9982*
$QUES   001214       271*  9674   9690   9743   9746   9792
$RDCHR  057324      9646*  9957
$RDDEC= ****** U    9960
$RDLIN  057410      9666*  9958
$RDOCT  057534      9707*  9959
$RDSZ = 000011      9659*
$REGAD  001152       254*
$REG0   001154       256*
$REG1   001156       257*
$REG2   001160       258*
$REG3   001162       259*
$REG4   001164       260*
$REG5   001166       261*
$RESET  044032      7072   7075*
$SAVRE= ****** U    9960
$SAVR6  060640      9976*  9982   9983*  9984*  10001*
$SCOPE  056306      2413   9415*
$SETUP= 000017      2407*  2413   2415   2417   2419   2421   2422   2424   7055
$SS1  = 000000      2427*
$STUP = 177777      2407*
$SVLAD  056530      9436   9465*
$SWR  = 167700        1*    11     44     45     46     47     48     49     50     268    269    270    2421
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                    2422    2424    2425    2518    2563    2583    2600    2719    2761    2799    2858    2882    2924
                    2948    2978    3005    3036    3064    3103    3140    3210    3254    3293    3353    3400    3459
                    3493    3520    3548    3579    3612    3645    3675    3714    3743    3776    3807    3839    3878
                    3914    3937    4028    4206    4367    4506    4679    4831    5004    5184    5374    5527    5697
                    5873    6058    6205    6369    6553    6743    6930    6965    7002    7050    7056    7069    7081
                    9407    9408    9409    9410    9411    9427    9439    9441    9442    9445    9446    9447    9454
                    9455    9456    9467    9470    9473    9753    9754    9755    9756    9757    9770    9777    9781
                    9784    9792
$SWRMK= 000000        50      51    9411    9412    9443
$TIMES  001204      268*   2421*   2518*   2563*   2583*   2600*   2719*   2882*   2924*   2948*   2978*   3005*   3036*
                    3064*   3103*   3140*   3210*   3254*   3293*   3353*   3400*   3459*   3493*   3520*   3548*   3579*
                    3612*   3645*   3675*   3714*   3743*   3776*   3807*   3839*   3878*   7002*   7056*   9454*   9461
                    9464*   9473
$TKB    001140      247*   9593    9613    9620
$TKCNT  057126     9593*   9608*   9627    9632*   9650    9652*
$TKINT  057146     2431    2602    8328    9608*   9625
$TKQEN= 057145     9597*   9635    9655
$TKQIN  057130     9594*   9609*   9610    9633*   9634*   9635    9637*
$TKQOU  057132     9595*   9610*   9653    9654*   9655    9657*
$TKQSR  057134     9596*   9609    9637    9657
$TKS    001136      246*   2410    3963    3964    9593    9614*
$TKSRV  057216     9611    9620*
$TMPO   001170      262*   1663    2667*   2668*   2888*   2904    3113*   3122    3188*   3229*   3269*   3470*   3480
                   3790*   3816*   3829    3847*   3867    4082*   4083    4258*   4259    4419*   4420    7413*   7419
                   7424    7428    7539*   7553    7655*   7701*
$TMP1   001172      263*   1661    1663    1677    2532*   6940*   6941*   6975*   6976*   7414*   7419    7424    7540*
                   7555
$TMP2   001174      264*   1677    7417*   7421*   7423*   7426*   7657*   7699*
$TMP3   001176      265*   1663    1677    7411*   7412*   7656*   7658    7659*
$TMP4   001200      266*   7658*   7682*
$TMP5   001202      267*   7654*   7660*   7666    7783*   7862    7884
$TN   = 000073        1*     11    2501    2513    2518*   2520    2555    2563*   2566    2579    2583*   2584    2589
                    2596   2600*   2708    2711    2719*   2752    2761*   2764    2789    2799*   2800    2854    2858*
                    2878   2882*   2920    2924*   2925    2940    2944    2948*   2949    2969    2974    2978*   2979
                    2996   3001    3005*   3006    3027    3032    3036*   3037    3055    3060    3064*   3065    3086
                    3099   3103*   3104    3136    3140*   3141    3198    3206    3210*   3211    3239    3250    3254*
                    3255   3279    3289    3293*   3294    3314    3349    3353*   3354    3377    3396    3400*   3401
                    3430   3455    3459*   3460    3489    3493*   3494    3509    3516    3520*   3521    3536    3544
                    3548*  3549    3566    3575    3579*   3580    3599    3608    3612*   3613    3632    3641    3645*
                    3646   3663    3671    3675*   3676    3697    3699    3710    3714*   3715    3732    3739    3743*
                    3744   3761    3772    3776*   3777    3796    3803    3807*   3808    3835    3839*   3840    3874
                    3878*  3879    3904    3910    3914*   3927    3937*   3939    3988    4010    4014    4028*   4029
                    4088   4189    4206*   4207    4265    4355    4367*   4368    4425    4492    4506*   4507    4626
                    4660   4669    4679*   4681    4752    4799    4819    4831*   4833    4923    4978    4992    5004*
                    5006   5106    5161    5172    5184*   5186    5282    5348    5364    5374*   5376    5447    5495
                    5515   5527*   5529    5619    5671    5685    5697*   5699    5797    5850    5861    5873*   5875
                    5974   6038    6048    6058*   6060    6131    6178    6193    6205*   6206    6295    6346    6356
                    6369*  6370    6475    6529    6540    6553*   6554    6652    6719    6730    6743*   6745    6843
                    6908   6921    6930*   6931    6948    6953    6958    6965*   6966    6980    6992    7002*
$TPB    001144      249*   9587*   9589
$TPFLG  001151      253*   9564    9589
$TPS    001142      248*   9585    9589
$TRAP   060440     2417    9936*
$TRP  = 000026     9943*   9953*   9954*   9955*   9956*   9957*   9958*   9959*   9960*   9961*   9962*   9963*
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H08


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$TRPAD  060460          9940    9951#
$TSTNM  001102           232#   7020#   7055#   9406    9443    9465#   9470    9474    9769    9792
$TTYIN  057516          9667    9668    9685    9689#
$TYPBN= ****** U        9957
$TYPDS  056574          9487#   9956
$TYPE   057020          9564#   9943    9952
$TYPEC  057110          9576    9583    9585#   9586
$TYPOC  060236          9880#   9953
$TYPON  060252          9879    9882#   9955
$TYPOS  060212          9875#   9954
$XTSTR  056334          9430#
$$TRP = 000002          9942#   9953    9954    9955    9956    9957    9958    9959    9960    9961    9962    9963
$OFILL  060435          9876#   9880#   9890    9925#
.       = 060652           163#    167     169#    172#    217#    225#    228#    274    1646#   1782#   1988#   2315#   2382#
                        2383#   2411    2424    2425    2438    2441#   2442    2446    2450    2454    2458    2461#   2462
                        2465#   2466    2470    2474    2478    2482    2485#   2486    2490    2494    2502    2536    2539#
                        2540    2605    2631    2634#   2635    2638#   2639    2643    2650    2653#   2676    2679#   2682
                        2685#   2688    2691#   2725    2728#   2732    2739    2766    2769#   2770    2773#   2774    2781
                        2784#   3154    3158    3162    3165#   3166    7005    7011    7014#   7081    7085    7116    7122
                        7129    7132#   7133    7137    7140#   7144    7147#   7148    7151#   8318    8324    8336    8339#
                        8342    8348    8352    8358    8364    8368    8935#   8936#   8937#   8938#   8939#   8940#   8942#
                        8943#   8944#   8945#   8946#   9385    9388#   9473    9474    9541#   9589    9593    9596#   9597
                        9598#   9689#   9690    9691    9746    9792    9848#   9979   10000
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
CHECKA     38#  4628  4766  4948  5127  5312  5461  5644  5818  6005  6144  6320  6496  6682  6874
CHECKB     38#  3968  4054  4231  4392  4618  4732  4900  5083  5260  5427  5596  5775  5951  6111
         6272  6452  6630  6820  7507  7606  7779
COMMEN      13   159#
ENDCOM      20   159#
ERROR       59#  2533  2571  2592  2847  2902  2941  2970  2997  3028  3056  3087  3120  3202  3242
         3280  3310  3373  3426  3478  3510  3537  3567  3600  3633  3664  3698  3733  3762  3797
         3827  3865  3905  4000  4003  4087  4159  4180  4263  4346  4423  4484  4640  4642  4759
         4763  4802  4804  4927  4935  4981  4983  5110  5119  5164  5166  5286  5295  5307  5351
         5353  5454  5458  5498  5500  5623  5631  5674  5676  5801  5810  5853  5855  5978  5987
         5999  6041  6043  6137  6141  6181  6183  6299  6307  6349  6351  6479  6488  6532  6534
         6656  6665  6677  6722  6724  6847  6856  6868  6911  6913  6946  6954  6984  7320  7327
         7331  7344  7349  7352  7374  7382  7388  7393  7429  7827  7829  7853  7855  7870  7881
         7891  7901  7971  8175  8181  8250
ESCAPE     159#
HCOMPR      38#
HCOMPW      38#
MAKECL      38#  2854  3910
MSG       2513#  2515  2554#  2557  2711#  2713  2752#  2754  2788#  2791  3927#  3929  4013#  4016  4188#
          4191  4354#  4357  4492#  4494  4668#  4671  4818#  4821  4991#  4994  5171#  5174  5363#  5366
          5514#  5517  5684#  5687  5860#  5863  6047#  6050  6192#  6195  6355#  6358  6539#  6542  6729#
          6732  6920#  6923  6957#  6960  6992#  6994
MULT       159#
NEWTST     159#  2513  2555  2579  2596  2711  2752  2789  2854  2878  2920  2944  2974  3001  3032
          3060  3099  3136  3206  3250  3289  3349  3396  3455  3489  3516  3544  3575  3608  3641
          3671  3710  3739  3772  3803  3835  3874  3910  3927  4014  4189  4355  4492  4669  4819
          4992  5172  5364  5515  5685  5861  6048  6193  6356  6540  6730  6921  6958  6992
POP        159#  7190  7267  7466  7563  7704  7752  7935  7973  8200  8265  8302  8544  8701  8771
          8836  8906  9079  9226  9340  9380  9528  9735  9986
PUSH       159#  7180  7254  7456  7530  7646  7649  7724  7916  7951  8060  8225  8276  8459  8606
          8725  8793  8864  8962  9117  9271  9361  9487  9709  9970
RFORGC      38#  4799  4978  5161  5348  5495  5671  5850  6038  6178  6346  6529  6719  6908
SAVE        38#  9762
SAVTST      38#  2520  2566  2584  2761  2800  2883  2925  2949  2979  3006  3037  3065  3104  3141
          3211  3255  3294  3354  3401  3460  3494  3521  3549  3580  3613  3646  3676  3715  3744
          3777  3808  3840  3879  3939  4029  4207  4368  4507  4681  4833  5006  5186  5376  5529
          5699  5875  6060  6206  6370  6554  6745  6931  6966
SCOPE       60#  2517  2562  2582  2599  2718  2760  2798  2857  2881  2923  2947  2977  3004  3035
          3063  3102  3139  3209  3253  3292  3352  3399  3458  3492  3519  3547  3578  3611  3644
          3674  3713  3742  3775  3806  3838  3877  3913  3936  4027  4205  4366  4505  4678  4830
          5003  5183  5373  5526  5696  5872  6057  6204  6368  6552  6742  6929  6964  7001  7054
SETTRA    9943#  9953  9954  9955  9956  9957  9958  9959  9960  9961  9962
SETUP      159#  2407
SKIP        38#   159#  2501  2589  2708  2764  2940  2969  2996  3027  3055  3086  3198  3239  3279
          3314  3377  3430  3509  3536  3566  3599  3632  3663  3697  3699  3732  3761  3796  3904
          3988  4010  4626  4660  4752  4923  5106  5282  5447  5619  5797  5974  6131  6295  6475
          6652  6843  6948  6953  6980
SLASH      159#
SMORE       38#  9416
SPACE      159#
STARS       30    36   159#   218   274  2004  2006  2040  2042  2513  2516  2555  2561  2579  2581
          2596  2598  2711  2717  2752  2759  2789  2797  2854  2856  2878  2880  2920  2922  2944
          2946  2974  2976  3001  3003  3032  3034  3060  3062  3099  3101  3136  3138  3206  3208
          3250  3252  3289  3291  3349  3351  3396  3398  3455  3457  3489  3491  3516  3518  3544
```

DZRPTD.SUB CROSS REFERENCE TABLE

```
            3546    3575    3577    3608    3610    3641    3643    3671    3673    3710    3712    3739    3741    3772    3774
            3803    3805    3835    3837    3874    3876    3910    3912    3927    3935    4014    4026    4189    4204    4355
            4365    4492    4504    4669    4677    4819    4829    4992    5002    5172    5182    5364    5372    5515    5525
            5685    5695    5861    5871    6048    6056    6193    6203    6356    6367    6540    6551    6730    6741    6921
            6928    6958    6963    6991    6992    7000    7044    7090    7109    7170    7178    7197    7200    7239    7252
            7303    7307    7361    7365    7400    7405    7446    7454    7476    7479    7520    7528    7572    7575    7618
            7644    7712    7722    7759    7774    7907    7914    7941    7949    7980    7983    8210    8215    8270    8273
            8312    8315    8391    8392    8451    8454    8554    8578    8585    8587    8712    8714    8779    8781    8847
            8849    8920    8926    8927    8953    8955    9088    9090    9237    9239    9350    9352    9383    9392    9400
            9474    9542    9589    9639    9659    9692    9746    9792    9849    9927    9963
TJUMP         38#   4088    4265    4425
TRMTRP      9943#
TSCLR         38#
TSCLR1        38#
TSCLR2        38#
TSCLR3        38#
TSCLR4        38#
TSCLR5        38#
TYPBIN       159#
TYPDEC       159#   7066    9835
TYPNUM       159#
TYPOCS       159#
TYPOCT       159#   2736    2743    9807    9832
TYPTXT       159#   2437    2442    2446    2450    2454    2458    2462    2466    2470    2474    2478    2482    2486    2490
            2494    2502    2536    2540    2605    2630    2635    2639    2643    2650    2676    2682    2688    2725    2732
            2739    2766    2770    2774    2781    3153    3158    3162    3166    7005    7011    7116    7122    7129    7133
            7137    7144    7148    8317    8324    8336    8342    8348    8352    8358    8364    8368    9384
WDATAR        38#
XREAD         38#
$$CMRE       218#    256     257     258     259     260     261
$$CMTM       218#    262     263     264     265     266     267
$$ESCA       159#
$$NEWT       159#   2513    2555    2579    2596    2711    2752    2789    2854    2878    2920    2944    2974    3001    3032
            3060    3099    3136    3206    3250    3289    3349    3396    3455    3489    3516    3544    3575    3608    3641
            3671    3710    3739    3772    3803    3835    3874    3910    3927    4014    4189    4355    4492    4669    4819
            4992    5172    5364    5515    5685    5861    6048    6193    6356    6540    6730    6921    6958    6992
$$SET       9943#   9953    9954    9955    9956    9957    9958    9959    9960    9961    9962
$$SKIP       159#
.EQUAT         1#     54
.FLOAT        38#
.HEADE         1#
.KT11          1#    180
.SETUP         1#   2406
.SWRHI         1#     39
.SWRLO         1#     51#     52
.$CATC         1#    160
.$CMTA         1#    218
.$EOP          1#   7044
.$ERRO         1#   9746
.$ERRT         1#   9792
.$POWE         1#   9963
.$RDOC         1#   9692
.$READ         1#   9589
.$SCOP         1#   9400
```

DZRPTD.SUB CROSS REFERENCE TABLE

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.$TRAP      1#   9927
.$TYPD      1#   9474
.$TYPE      1#   9542
.$TYPO      1#   9849
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DZRPTD.SUB CROSS REFERENCE TABLE

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ADD     2844  2897  3108  4178  4344  4482  7142  7210  7262  7357  7396  7666  7673  7680  9507
        9574  9730  9815  9978  9888
ASL     9723  9725  9727  9812  9813  9814
ASLB    9512
ASR     8098  8107  8115  8123
BCC     2670  3221  8291  8730  8743  8760  9513
BCS     3179  3687
BEQ     2501  2589  2622  2626  2673  2675  2708  2764  2940  2969  2996  3027  3055  3086  3199
        3239  3279  3309  3371  3424  3509  3536  3566  3599  3632  3663  3697  3732  3761  3796
        3863  3904  3994  4010  4084  4260  4421  4758  4762  4926  4934  5109  5118  5285  5294
        5306  5453  5457  5622  5630  5800  5809  5977  5986  5998  6136  6140  6298  6306  6478
        6487  6655  6664  6676  6846  6855  6867  6953  7019  7028  7032  7070  7231  7275  7315
        7339  7546  7560  7652  7669  7676  7861  7863  7867  7878  7885  7888  7898  7968  8070
        8091  8158  8165  8172  8178  8245  8387  8529  8649  8655  8666  8671  8673  8692  8694
        8735  8737  8747  8752  8754  8764  8803  8813  8818  8828  8880  8888  9125  9135  9148
        9158  9176  9188  9200  9210  9221  9290  9363  9442  9444  9446  9450  9459  9651  9718
        9768  9771  9785  9788  9817  9822  9828  9839  9905
BGE     9462
BGT     7061  9521  9720  9912
BHI     9448
BHIS    8242
BIC     2507  3191  3232  3276  3506  3533  3563  3596  3629  3660  3694  3729  3758  3793  3860
        3901  4008  4107  4110  4120  4283  4286  4296  4311  4441  4451  4932  4945  5116  5292
        5628  5641  5807  5984  6304  6317  6429  6430  6485  6662  6853  7058  7223  7228  7337
        7558  7686  7691  7696  8084  8137  8143  8152  8170  8255  8263  8332  8473  8612  8615
        8618  8976  9281  9283  9309  9311  9326  9328  9336  9621  9729  9902
BICB    3050  3079
BIS     2815  2818  3182  3473  3822  3853  3973  3975  4106  4109  4119  4130  4131  4133  4282
        4285  4295  4310  4312  4313  4315  4440  4450  4452  4453  4455  4944  5640  6316  6431
        7688  7693  7698  7924  7932  7960  8076  8095  8104  8112  8120  8135  8136  8138  8141
        8142  8144  8254  8262  8333  8466  8610  8611  8617  8731  8733  8750  8816  8969  9122
        9133  9280  9282  9287  9305  9306  9308  9310  9325  9327  9335  9515  9516  9907  9908
BISB    2991  3020  9804
BIT     2534  2603  2625  2763  2779  4083  4259  4420  7274  7317  7324  7341  7346  7370  7378
        7385  7390  7419  7424  7661  7668  7675  8162  8164  8246  8386  8630  8693  8696  8736
        8753  8802  8817  9124  9134  9441  9449  9456  9770  9777  9784
BLOS    2899  9669
BLT     9504  9520  9582  9722  9913
BMI     7685  7690  7695  9428  9511
BNE     2411  2433  2528  2535  2604  2617  2662  2701  2780  3145  3150  3194  3235  3313  3376
        3429  3703  3988  3999  4012  4112  4114  4122  4288  4290  4298  4443  4531  4556  4571
        4578  4584  4591  4626  4659  4686  4729  4752  4844  4851  4923  4947  4962  5017  5024
        5106  5141  5197  5204  5282  5327  5381  5424  5447  5540  5547  5619  5643  5659  5710
        5717  5797  5832  5886  5893  5974  6020  6065  6108  6131  6217  6224  6295  6319  6334
        6380  6387  6475  6510  6565  6572  6652  6697  6756  6763  6843  6889  6942  6977  7072
        7074  7189  7217  7266  7318  7325  7342  7347  7372  7380  7386  7391  7420  7422  7425
        7427  7465  7552  7562  7700  7702  7733  7739  7810  7812  8163  8233  8235  8247  8297
        8299  8335  8470  8527  8534  8620  8622  8627  8631  8647  8663  8688  8697  8768  8770
        8832  8834  8873  8886  8892  8898  8905  8973  9073  9143  9145  9165  9171  9196  9217
        9313  9316  9330  9332  9334  9338  9371  9373  9379  9457  9509  9571  9578  9623  9628
        9636  9656  9673  9679  9778  9805  9831  9903  9985
BPL     9495  9525  9565  9586  9782  9901
BR      2402  2434  2439  2443  2447  2451  2455  2459  2463  2467  2471  2475  2479  2483  2487
        2491  2495  2503  2529  2537  2541  2606  2632  2636  2640  2644  2651  2677  2683  2689
```

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        2692  2726  2733  2740  2767  2771  2775  2782  2900  3155  3159  3163  3167  3200  3241
        3314  3377  3430  3699  3857  4002  4660  4760  5455  6138  6948  6980  7006  7012  7033
        7117  7123  7130  7134  7138  7145  7149  7322  7329  7345  7350  7376  7384  7389  7554
        7664  7671  7678  7687  7692  7697  7838  7872  7883  7893  8079  8145  8166  8176  8236
        8238  8257  8293  8319  8325  8337  8343  8349  8353  8359  8365  8369  8388  8389  8539
        8613  8635  8660  8675  8680  8682  8695  8739  8756  8807  8822  9128  9138  9163  9181
        9194  9205  9215  9307  9386  9430  9436  9439  9452  9455  9506  9523  9567  9584  9675
        9731  9744  9810  9834  9841  9879  9894  9915  9979 10000
CLC     7214  8087  8809  8824  9129  9139
CLR     2403  2409  2421  2422  2590  2611  2654  2656  2664  2665  2722  2934  2958  2988  3015
        3046  3074  3110  3111  3177  3219  3271  3363  3410  3467  3468  3499  3587  3620  3685
        3722  3751  3784  3813  3814  3820  3845  3851  3895  3949  3950  3951  3965  3967  3976
        4035  4037  4038  4039  4049  4053  4212  4214  4215  4226  4230  4374  4375  4376  4387
        4391  4515  4518  4519  4520  4523  4529  4554  4560  4561  4569  4576  4589  4614  4616
        4692  4695  4696  4697  4698  4708  4709  4724  4725  4739  4741  4788  4849  4860  4863
        4864  4865  4866  4878  4898  4906  4965  5022  5034  5037  5038  5039  5040  5052  5081
        5089  5149  5202  5213  5216  5217  5218  5219  5231  5259  5265  5336  5379  5387  5390
        5391  5392  5393  5403  5404  5419  5420  5434  5436  5484  5545  5556  5559  5560  5561
        5562  5574  5594  5602  5660  5715  5727  5730  5731  5732  5733  5745  5774  5780  5839
        5891  5902  5905  5906  5907  5908  5920  5949  5957  6027  6063  6071  6074  6075  6076
        6077  6087  6088  6103  6104  6118  6120  6167  6222  6232  6235  6236  6237  6238  6250
        6270  6278  6335  6385  6397  6400  6401  6402  6403  6415  6450  6458  6518  6570  6581
        6584  6585  6586  6587  6599  6629  6635  6708  6761  6772  6775  6776  6777  6778  6790
        6818  6826  6897  7017  7020  7055  7056  7115  7156  7157  7161  7165  7297  7486  7487
        7489  7506  7583  7584  7586  7605  7653  7654  7665  7672  7679  7736  7798  7926  7957
        8140  8228  8283  8284  8285  8294  8624  8657  8674  8685  8740  8757  8808  8823  8893
        9150  9160  9212  9374  9416  9417  9421  9425  9454  9468  9498  9501  9608  9640  9649
        9715  9716  9803  9892  9983
CLRB    2620  9453  9527  9680  9740
CMP     2410  2531  2672  2674  2898  2939  2968  2995  3026  3054  3085  3147  3193  3197  3234
        3238  3278  3308  3370  3423  3508  3535  3565  3598  3631  3662  3696  3702  3731  3760
        3795  3862  3903  3993  4009  4757  4761  4846  4933  5019  5108  5117  5199  5284  5293
        5304  5452  5456  5542  5629  5712  5799  5808  5888  5976  5985  5996  6135  6139  6219
        6305  6382  6477  6486  6567  6654  6663  6674  6758  6845  6854  6865  6950  6952  6982
        7031  7071  7073  7230  7313  7338  7545  7556  7559  7862  7865  7875  7884  7887  7896
        7967  8171  8177  8241  8243  8665  9175  9187  9199  9220  9437  9461  9519  9622  9627
        9635  9655  9668
CMPB    3144  9443  9447  9577  9672  9678  9719  9721
COM     6428  7219  7222  7224  7227  7229  8077  8096  8105  8113  8121
DEC     2527  2616  2661  2700  2705  2964  3022  3081  3418  4011  4111  4113  4121  4287  4289
        4297  4442  4530  4555  4570  4577  4583  4590  4649  4650  4654  4655  4658  4685  4728
        4843  4850  4946  4961  5016  5023  5140  5196  5203  5326  5380  5423  5539  5546  5642
        5658  5709  5716  5831  5885  5892  6019  6064  6107  6216  6223  6318  6333  6379  6386
        6509  6564  6571  6696  6755  6762  6888  6941  6976  7027  7059  7188  7264  7265  7421
        7426  7464  7561  7699  7701  7732  7738  8234  8296  8298  8334  8469  8619  8621  8626
        8662  8687  8767  8769  8831  8833  8872  8885  8891  8897  8904  8972  9142  9144  9164
        9195  9216  9312  9315  9329  9331  9333  9337  9370  9378  9652  9811
DECB    9581  9900  9911
EMT       59
HALT     167  3971  4057  4234  4395  4621  4630  4735  4769  4903  4950  5086  5129  5263  5315
        5430  5464  5599  5646  5778  5820  5954  6008  6114  6147  6275  6322  6455  6498  6633
        6685  6823  6877  7510  7609  7782  8372  9391  9566  9783  9978  9999
INC     2615  2697  2699  2960  3017  3076  3196  3237  3414  3701  4648  4651  4652  4653  4656
        7021  7057  7543  8237  8240  8748  8765  8814  8829  9460  9505  9632  9634  9654  9773
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DZRPTD.SUB CROSS REFERENCE TABLE

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        9906    9914    9984
INCB    9465    9767
IOT       60
JMP      171     173    2435    2547    2623    2627    2648    3151    4088    4265    4425    4661    7026    7035    7080
         9153    9626
JSR     2431    2568    2602    2721    2762    2802    2809    2823    2836    2859    2861    3915    3917    3940    3954
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ERRORS DETECTED:  0

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H09

Spooler runtime 11 Seconds, 73 KCS, 1087 disk reads, 0 disk writes, 316 pages

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