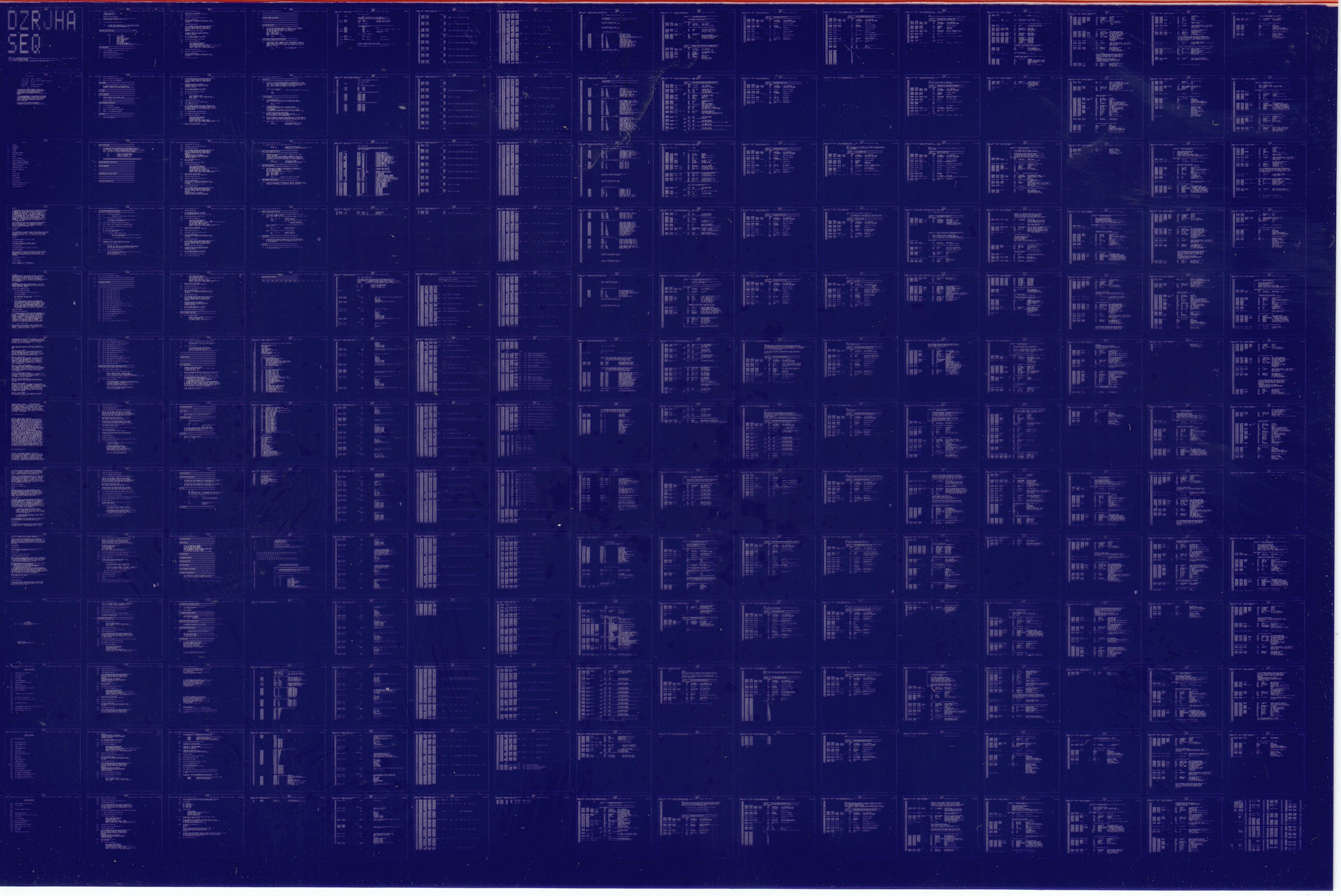
RP04/05/06

DISKLESS CONTROL PART 2

MD-11-DZRJH-A

EP DZRJH A DL A NOV 1976

FICHE 1 OF 2 MADE IN US



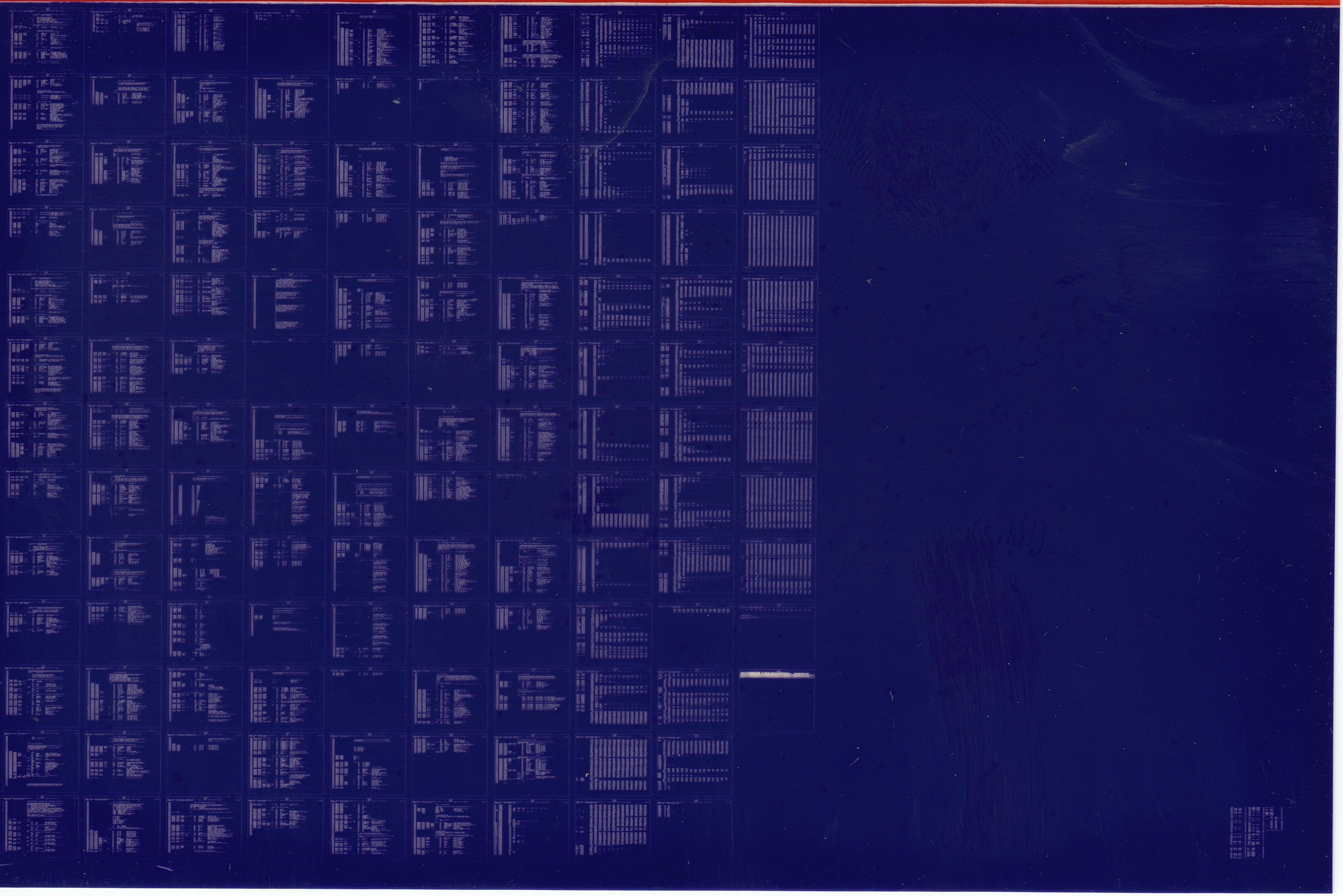
RP04/05/06

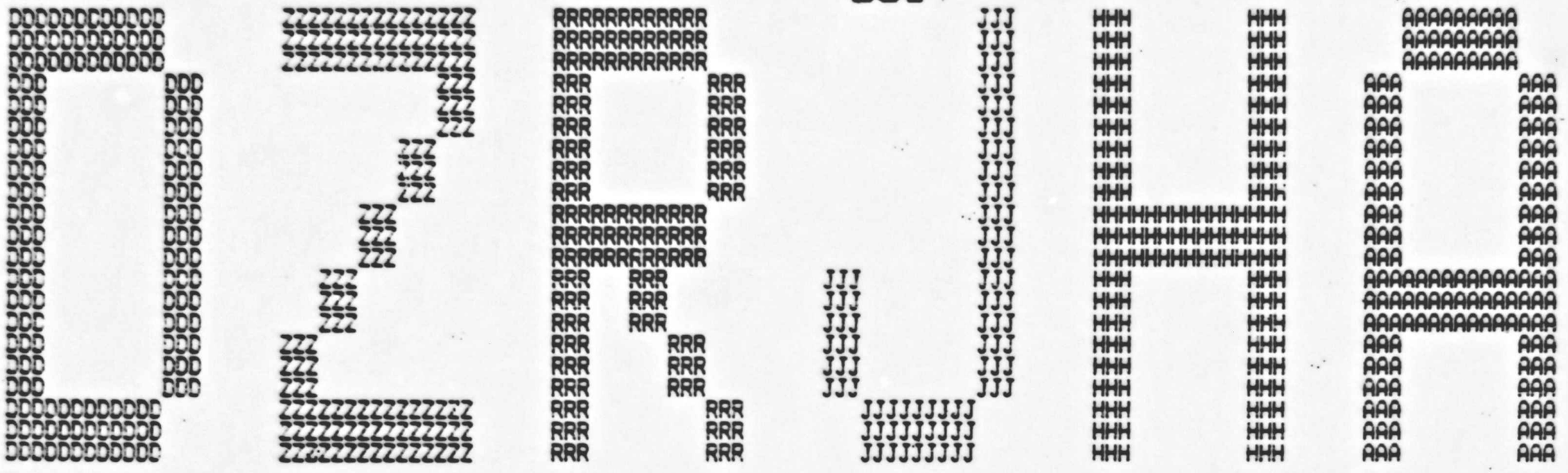
DISKLESS CONTROL PART 2

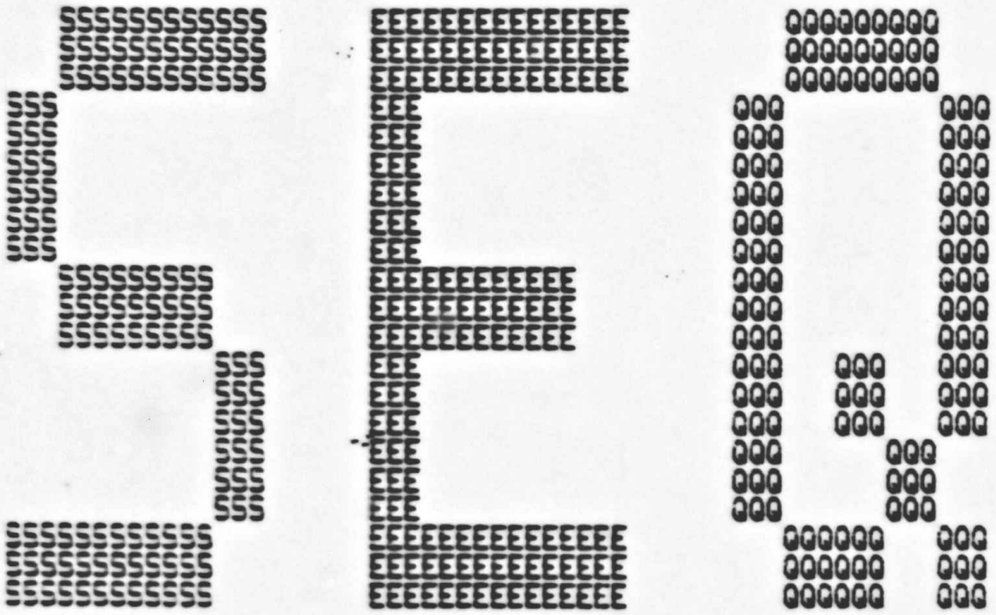
MD-11-DZRJH-A

EP DZRJH A DL A NOV 1976

FICHE 2 OF 2 MADE IN US







```
LPTSPL Version 101(2111) Running on MTA140
 *START* User WELLINGHAM,A[400,3722]  Job  DZRJHA Seq. 5165 Date 07-May-76 14:13:29 Monitor     RV242A KI10 SYS#514 *START*
Request created: 07-May-76 14:05:58
File: RPSB:DZRJHA.SEQ<055>[400,3722] Created: 03-May-76 10:14:22 Printed: 07-May-76 14:13:36
QUEUE Switches:  /FILE:ASCII /COPIES:1 /SPACING:1 /LIMIT:585 /FORMS:NORMAL
```

IDENTIFICATION

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

PRODUCT NAME: RP04/5/6 DISKLESS CONTROLLER TEST-PART II

DATE CREATED: MAY 1976

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: PETE BLACKSTONE

CONTENTS

SEQ 0002

1.0 ABSTRACT

THIS DIAGNOSTIC TESTS THE RH11 AND DCL OF AN RP04/5/6 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.

THE DIAGNOSTIC DOES NOT DO ANY TESTING OF THE RH70 CONTROLLER WHEN IT IS USED TO TEST RP04/5/6 DISK DRIVES CONNECTED TO THAT TYPE OF CONTROLLER. IT IS ASSUMED THAT THE RH70 SPECIFIC CONTROLLER DIAGNOSTICS HAVE BEEN SUCCESSFULLY RUN TO COMPLETION BEFORE THIS PROGRAM IS RUN.

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP-11 COMPUTER WITH CONSOLE TELETYPE, AND AN RP04/5/6 DISK SYSTEM. THE RP04/5/6 DISK SYSTEM WILL CONSIST OF AN RH11/RH70 CONTROLLER, AND 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-DZRJG-
(LATEST REV) HAS BEEN RUN WITHOUT ERRORS

3.0 LOADING PROCEDURE

USE STANDARD PROCEDURE FOR LOADING .ABS TAPES

4.0 STARTING PROCEDURE

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

4.1 CONTROL SWITCH SETTINGS

SEE SECTION 5.1

4.2 STARTING ADDRESS

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

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

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

4.3 PROGRAM AND/OR OPERATOR ACTION

1. LOAD THE PROGRAM INTO MEMORY.

2. SET STARTING ADDRESS ON THE SWITCH REGISTER

3. PRESS "LOAD ADDRESS".

4. SET "OPERATIONAL SWITCH SETTINGS" (SEE SECTION 5.1)
   WORST CASE IS ALL SWITCHES DOWN.

5. PRESS "START".

6. FOR THE FIRST PASS EACH TEST WILL BE EXECUTED ONCE
   ON THE DRIVES PRESENT OR DRIVE SELECTED BEFORE "END
   PASS" IS PRINTED. THE FIRST PASS WILL REQUIRE OPERATOR
   INTERVENTION IF THE PROGRAM IS NOT RUN UNDER AN "ACT-11"
   MONITOR. THE SECOND AND SUBSEQUENT PASSES WILL EXECUTE
   EACH TEST FOUR TIMES ON EACH DRIVES PRESENT OR DRIVE
   SELECTED BEFORE "END PASS" IS PRINTED. THE SECOND
   AND SUBSEQUENT PASSED DO NOT NEED ANY OPERATOR INTERVENTION.

5.0 OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

IF THE PROGRAM IS BEING RUN ON A SWITCHLESS PROCESSOR (I.E.
AN 11/34) THE PROGRAM WILL DETERMINE THAT THE HARDWARE SWITCH
REGISTER IS NOT PRESENT AND WILL USE AN 'SOFTWARE' SWITCH
REGISTER. THE SETTINGS OF THE 'SOFTWARE' SWITCHES ARE
CONTROLLED THROUGH A KEYBOARD ROUTINE WHICH IS CALLED BY
TYPING A 'CONTROL G'. THE PROGRAM WILL RECOGNIZE THE
'CONTROL G' AT ANY TIME EXCEPT WHEN THE PROGRAM IS AT A
HIGHER PRIORITY PROCESSING AN RP04/5/6 INTERRUPT. THE
'SOFTWARE' SWITCH VALUES ARE ENTERED AS AN OCTAL NUMBER IN
RESPONSE TIO THE PROMPT FROM THE SWITCH ENTRY ROUTINE:

'SWR = NNNNNN NEW ='

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

ON PROCESSORS WITH HARDWARE SWITCH REGISTER, THE 'SOFTWARE' SWITCH REGISTER MAY BE USED. IF THE PROGRAM FINDS ALL 16 SWITCHES IN THE 'UP' POSITION, ALL SWITCH REGISTER REFERENCES WILL BE TO THE 'SOFTWARE' REGISTER AND THE PROCEDURES DESCRIBED ABOVE MUST BE FOLLOWED.

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

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

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

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

SWITCH 12 - RH70 CONTROLLER SELECT
THIS SWITCH MUST BE SET AT THE START OF THE PROGRAM WHEN THE DISK DRIVES TO BE TESTED ARE CONNECTED TO AN RH70 CONTROLLER. IT MUST NOT BE SET WHEN DISK DRIVES TO BE TESTED ARE CONNECTED TO AN RH11 CONTROLLER.

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

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

SWITCH 9 - LOOP ON ERROR
WHEN THIS SWITCH IS SET, IF THE PROGRAM FINDS AN ERROR THEN GENERALLY THE PROGRAM WILL LOOP BACK TO THE LAST

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

NOTE: 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 SWD8 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 T4ST 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.

SWITCH 12 MUST BE SET WHEN RUNNING ON AN RH70 CONTROLLER AND IT MUST NOT BE SET WHEN RUNNING ON AN RH11 CONTROL BECAUSE OF THIS FACT, THE PROGRAM CANNOT BE RUN IN CHAIN MODE WHEN USING THE SOFTWARE SWITCH REGISTER AS THE ROUTINE WHICH ASKS FOR THE SWTICH REGISTER SETTINGS IS NOT OPERABLE WHEN IN CHAIN MODE.

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

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
****
MNDEC-11-DZRJH-A,RP04/5/6 DSKLS CONTROLLER TST-PT 2
****

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PROGRAM BY PETE BLACKSTONE

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

29 **********

32

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
12	RH70 CONTROLLER SELECT
11	INHIBIT ITERATIONS
10	BELL ON ERROR
9	LOOP ON ERROR
8	LOOP ON TEST IN SWR<7:0>
7	STOP FURTHER COMPARES IF SW08 IS LOW
6	ECC TEST-COMPARE END RESULTS ONLY IF SW09 IS LOW

****
56 BASIC DEFINITIONS
****

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

63 MISCELLANEOUS DEFINITIONS

75 GENERAL PURPOSE REGISTER DEFINITIONS

87 PRIORITY LEVEL DEFINITIONS

97 "SWITCH REGISTER" SWITCH DEFINITIONS

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

                153     BASIC "CPU" TRAP VECTOR ADDRESSES

                ;*****************************************************************
        167     TRAP CATCHER
                ;*****************************************************************

                170     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

                ;*****************************************************************
        177     ACT11 HOOKS
                ;*****************************************************************

                ;*****************************************************************
        198     STARTING ADDRESSES
                ;*****************************************************************

                198     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

                ;*****************************************************************
        203     MEMORY MANAGEMENT DEFINITIONS
                ;*****************************************************************

                205     KT11 VECTOR ADDRESS

                209     KT11 STATUS REGISTER ADDRESSES

                216     KERNEL "I" PAGE DESCRIPTOR REGISTERS

                227     KERNEL "I" PAGE ADDRESS REGISTERS

                ;*****************************************************************
        240     COMMON TAGS
                ;*****************************************************************

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

```
                ;*********************************************************************
298             ;ERROR POINTER TABLE
                ;*********************************************************************

300             ;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:

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

944             ;*********************************************************************
                ;*********************************************************************

                ;*********************************************************************
2025            ;HARDWARE REGISTER BIT DEFINITIONS
                ;*********************************************************************

                ;*********************************************************************
2261            ;REGISTER ADDRESSES
                ;*********************************************************************

                ;*********************************************************************
2433
                ;*********************************************************************

                ;*********************************************************************
2434            ;***PROGRAM SETUP & SETUP TESTS***
                ;*********************************************************************

                ;*********************************************************************
2435
                ;*********************************************************************

                ;*********************************************************************
2444            ;INITIALIZE THE COMMON TAGS
                ;*********************************************************************
```

```
                ;*********************************************************************
2539            ;GET VALUE FOR SOFTWARE SWITCH REGISTER
                ;*********************************************************************

2568            ;TEST 1  REFERENCE EACH REGISTER

2570            ;               REFERENCE EACH REGISTER BY A MOVE INSTRUCTION

2613            ;TEST 2  RHCS2-CONTROL AND STATUS 2

2615            ;       THIS PARTIALLY TESTS RHCS2 TO ENABLE DETERMINATION
                ;       OF THE NUMBER OF DRIVES PRESENT

2624            ;CHECK TO SEE IF PROGRAM IS RUNNING WITH AN RH70

2644            ;TEST 3  PARTIAL TEST OF RHAS FOR UNIT NUMBERS PRESENT

2662            ;TEST 4  TEST FOR DRIVES PRESENT USING RHAS AND RHCS2

2718            ;SET UP UNITS TABLE

2754            ;NO...IT'S NOT AN RP04/RP05/RP06 DEVICE
                ;SO TYPE OUT THE DEVICE TYPE

2795            ;TEST 5  TYPE SERIAL NUMBER AND DRIVE TYPE

2797            ;               READ SERIAL NUMBER REGISTER AND DRIVE TYPE REGISTER
                ;               TYPE IT OUT AND PROCEED

2800            ;               TO LOOP HERE SET SWITCH 8 AND THIS TEST NO AND RESTART

2810            ;TEST FOR UNIT #0

2821            ;INCREMENT THE UNITS TABLE TO NEXT DRIVE (IF ANY)
                ; & DECREMENT THE "NOUNITS" PRESENT (TO BE TESTED)

2920            ;TEST 6  CHECK MOL TO BE LOW

2922            ;       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

2957            ;TEST 7  PACK ACKNOWLEDGE COMMAND TEST

2959            ;       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
```

```
                3022    TEST 10 MAKE CURRENT CYLINDER = 0
                ********************************************************************
        3034
                ********************************************************************
                ********************************************************************
        3035    ***DIAGNOSTIC CODE***
                ********************************************************************
                ********************************************************************
        3036
                ********************************************************************
                3047    TEST 11 BCTA LEGAL REGISTER RESPONSE TEST
                3089    TEST 12 BCTA MOVB LO BYTE TO WC
                3113    TEST 13 BCTA MOVB HI BYTE TO WC
                3143    TEST 14 BCTA BISB LO BYTE TO WC
                3170    TEST 15 BCTA BISB HI-BYTE TO WC
                3201    TEST 16 BCTA BICB LO-BYTE TO WC
                3229    TEST 17 BCTA BICB HI- BYTE TO WC
                3272    TEST 20 BCTA ILLEGAL REGISTER TEST
                3314    TEST 21 BCTB (NED) NON-EXISTANT DRIVE TEST. (SET)
                3384    TEST 22 BCTB (NED) NON-EXISTANT DRIVE TEST. (CLEARED)
                3428    TEST 23 BCTB AS REGISTER TEST
                3467    TEST 24 BCTC BUS ADDRESS REGISTER
                3527    TEST 25 BCTC BUS ADDRESS REGISTER LO-BYTE
                3574    TEST 26 BCTC BUS ADDRESS REGISTER HI-BYTE
                3633    TEST 27 RH11 INTERRUPT TEST
                3667    TEST 30 BCTD CLR L TEST
                3694    TEST 31 MXF TEST
                3700    CHECK TO SEE IF PROGRAM IS RUNNING WITH AN RH70
```

```
4107    ;*********************************************************************
        ;EXTENDED MEMORY, DRIVE TIMING & SECTOR SELECT TESTS
        ;*********************************************************************

4111    ;TEST 45 MAKE CURRENT CYLINDER = 0

4129    ;TEST 46 RHCS1 - BITS 8 AND 9 - EXTENDED ADDR (A16 & A 17)

4131    ;       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

4142    ;CHECK TO SEE IF PROGRAM IS RUNNING WITH AN RH70

4224    ;TEST 47 DRIVE TIMING ERROR

4226    ;       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'
```

```
4240    THESE ARE TO SETUP FOR DISKLESS USE

4253     THESE  ARE REGULAR SETUPS

4269    READ & SAVE REGISTERS FOR COMPARISON AFTER SIMULATED 'DTE'

4277    NOW 'GO' WILL BE GIVEN, EVERYTHING WILL BE TREATED
        NORMALLY FOR THE HEADER. BUT WHEN IT IS TIME TO READ
        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.

4300    NOW 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

4304    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.

4309    THIS GIVES 24 SECTOR CLOCKS WITH DIAGNOSTIC DATA CLOCKS
        WHICH EQUALS 3 BYTES OF DATA

4325    THIS GIVES 536 SECTOR CLOCKS WITHOUT DIAGNOSTIC DATA CLOCKS

4334    NOW 'DTE' SHOULD BE SET
        CHANGE SAVED REGISTERS TO EXPECTED VALUES

4348    NOW READ & SAVE REGISTERS AGAIN SO THAT COMPARISONS
        CAN BE DONE (USE THE 'WRFROM' SAVE BUFFER THIS TIME)

4356    FOR RHAS UPPER BYTE

4359    COMPARE THE HEADER READ

4376    COMPARE REGISTERS BEFORE COMMAND WITH REGISTERS AFTER COMMAND

4399    TEST 50 DRIVE TIMING ERROR

4401            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'
```

```
                4417    THESE ARE TO SETUP FOR DISKLESS USE

                4430     THESE  ARE REGULAR SETUPS & CHECKS

                4446    READ & SAVE REGISTERS FOR COMPARISON AFTER SIMULATED 'DTE'

                4453    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.

                4477    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

                4481    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

                4486    THIS GIVES 24 SECTOR CLOCKS WITH DIAGNOSTIC DATA CLOCKS

                4501    THIS GIVES 536 SECTOR CLOCKS WITHOUT DIAGNOSTIC DATA CLOCKS

                4511    ECC PATTERN REGISTER IS NOT CHECKED

                4515    NOW 'DTE' SHOULD BE SET, CHANGE SAVED REGISTERS TO EXPECTED VALUES

                4538    NOW READ & SAVE REGISTERS AGAIN SO THAT COMPARISONS

                4546    FOR RHAS UPPER BYTE

                4550    COMPARE CHANGED REGISTER SNAPSHOT BEFORE COMMAND WITH
                        SNAPSHOT AFTER COMMAND

                4574    TEST 51 DRIVE TIMING ERROR

                4576            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'

                4588    THESE ARE TO SET UP FOR DISKLESS USE ONLY

                4600     THESE  ARE REGULAR SETUPS & CHECKS
```

```
4616    READ & SAVE REGISTERS FOR COMPARISON AFTER SIMULATED 'DTE'

4623    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.

4647    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

4655    THIS GIVES 609 SECTOR CLOCKS WITHOUT DIAGNOSTIC DATA CLOCKS

4663    NOW 'DTE' SHOULD BE SET, CHANGE SAVED REGISTERS

4686    NOW READ & SAVE REGISTERS AGAIN SO THAT COMPARISONS CAN BE DONE

4693    FOR RHAS UPPER BYTE

4696    COMPARE CHANGED REGISTER SNAPSHOT BEFORE COMMAND
        WITH REGISTER SNAPSHOT AFTER COMMAND

4719    TEST 52 SECTOR SELECTION

4721            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

4740    THE FOLLOWING INITIALIZES FOR SECTOR 0

4752    CLEAR SIMULATED DISK AREA

4761    SETUP WRITE FROM BUFFER

4764    HEADER

4771    DATA IN WRITE FROM BUFFER ALTHOUGH THIS IS DATA AND NOT

4772    HEADER, THE SECTOR WITH SYNC BYTES WILL BE GIVEN AS DATA.
```

```
                4774    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

                4811    CLEAR REST OF 256 WORDS THAT IS 54 WORDS OF ZEROS

                4818    THESE ARE TO BE SET UP FOR DISKLESS USE ONLY

                4830    THESE ARE REGULAR SETUPS

                4857    NOW COMPARE "DISK" BUFFER WITH "REINTO" BUFFER

                4870    THE FOLLOWING INCREMENTS ARE TO CHANGE THE ABOVE SET UP
                        TO WRITE ON THE NEXT SECTOR

                ;*******************************************************************
        4890    ;DATA TRANSFER TESTS USING ECC
                ;*******************************************************************

                4895    TEST 53 WRITE ECC TEST 1

                4897            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.

                4914    THESE ARE FOR ECC TEST ONLY

                4928    THESE ARE TO BE SETUP FOR DISKLESS USE ONLY

                4940    THESE ARE REGULAR SETUPS

                4969    IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
                        FROM THE "COMWHD" ROUTINE THAT MEANS ALL HEADER ON DISK
                        IS GOOD IE. ONLY DATA IS TO BE CHECKED TO SEE IF THEY ARE
                        ALL ZEROS AND WRITE DATA GAP AND TOLERANCE GAP TO SEE IF
                        THEY ARE ALL ZEROS

                4980    COMPARE SOFTWARE GENERATED ECC WITH THAT GENERATED BY HARDWARE

                4998    FILL "REINTO" BUFFER WITH EXPECTED DATA

                5016    NOW COMPARE "DISK" BUFFER WITH "REINTO"

                5045    TEST 54 READ ECC ENABLED 1A

                5047            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
```

```
5082    THESE ARE FOR ECC TEST ONLY

5094    THESE ARE TO SETUP FOR DISKLESS USE ONLY

5111    THESE ARE REGULAR SETUPS

5137    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

5165    ADD 16 MAINTENANCE CLOCKS TO
        BRING EBL DOWN

5195    NOW READ DATA BUFFER WILL BE CHECKED

5218    TEST 55 READ ECC ENABLED 1B

5220            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

5234    SETUP FOR WHAT IS TO BE READ
        HEADER CRC IS RESTORED FROM A SUBROUTINE

5256    THESE ARE FOR ECC TEST ONLY

5268    THESE ARE TO SETUP FOR DISKLESS USE ONLY

5283    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

5294    THESE ARE REGULAR SETUPS

5320    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
```

```
5324    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

5368    ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
        NOW THE INSERTED ERROR WILL BE PUT IN

5378    NOW READ DATA BUFFER WILL BE CHECKED

5398    TEST 56 READ ECC ENABLED 1C

5400            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

5435    THESE ARE FOR ECC TEST ONLY

5447    THESE ARE TO SETUP FOR DISKLESS USE ONLY

5462    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

5472    THESE ARE REGULAR SETUPS

5496    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

5555    NOW THE INSERTED ERROR WILL BE PUT IN

5565    NOW READ DATA BUFFER WILL BE CHECKED

5590    TEST 57 WRITE ECC TEST 2

5592            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.
```

```
5609    THESE ARE FOR ECC TEST ONLY

5623    THESE ARE TO BE SETUP FOR DISKLESS USE ONLY

5635    THESE ARE REGULAR SETUPS

5664    IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
        FROM THE "COMWHD" ROUTINE THAT MEANS ALL HEADER ON DISK
        IS GOOD IE. ONLY DATA IS TO BE CHECKED TO SEE IF THEY ARE
        ALL ONES AND WRITE DATA GAP AND TOLERANCE GAP TO SEE IF
        THEY ARE ALL ZEROS

5675    COMPARE SOFTWARE GENERATED ECC WITH THAT GENERATED BY HARDWARE

5694    FILL "REINTO" BUFFER WITH EXPECTED DATA

5712    NOW COMPARE "DISK" BUFFER WITH "REINTO"

5741    TEST 60 READ ECC ENABLED 2A

5743            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

5778    THESE ARE FOR ECC TEST ONLY

5790    THESE ARE TO SETUP FOR DISKLESS USE ONLY

5807    THESE ARE REGULAR SETUPS

5833    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

5861    ADD 16 MAINTENANCE CLOCKS TO
        BRING EBL DOWN

5911    TEST 61 READ ECC ENABLED 2B

5913            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
```

```
5927    SETUP FOR WHAT IS TO BE READ
        HEADER CRC IS RESTORED FROM A SUBROUTINE

5949    THESE ARE FOR ECC TEST ONLY

5961    THESE ARE TO SETUP FOR DISKLESS USE ONLY

5976    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

5987    THESE ARE REGULAR SETUPS

6011    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.

6017    IN CHECKING READ DATA THE WRITE FROM BUFFER
        "WRFROM" IS FILLED WITH EXPECTED DATA AND
        COMPARISONS ARE MADE

6059    ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
        NOW THE INSERTED ERROR WILL BE PUT IN

6067    NOW READ DATA BUFFER WILL BE CHECKED

6087    TEST 62 READ ECC ENABLED 2C

6089            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

6124    THESE ARE FOR ECC TEST ONLY

6136    THESE ARE TO SETUP FOR DISKLESS USE ONLY.

6151    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

6162    THESE ARE REGULAR SETUPS
```

```
6188    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

6193    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

6247    ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
        NOW THE INSERTED ERROR WILL BE PUT IN

6255    NOW READ DATA BUFFER WILL BE CHECKED

6274    TEST 63 WRITE ECC TEST 3

6276            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 %2525.

6293    THESE ARE FOR ECC TEST ONLY

6307    THESE ARE TO BE SETUP FOR DISKLESS USE ONLY

6319    THESE ARE REGULAR SETUPS

6348    IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
        FROM THE "COMWHD" 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

6377    FILL "REINTO" BUFFER WITH EXPECTED DATA

6395    NOW COMPARE "DISK" BUFFER WITH "REINTO"

6419    TEST 64 READ ECC ENABLED 3A

6421            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

6434    SETUP FOR WHAT IS TO BE READ
        HEADER CRC IS RESTORED FROM A SUBROUTINE
```

```
                6454    THESE ARE FOR ECC TEST ONLY

                6466    THESE ARE TO SETUP FOR DISKLESS USE ONLY

                6483    THESE ARE REGULAR SETUPS

                6509    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

                6537    ADD 16 MAINTENANCE CLOCKS TO
                        BRING EBL DOWN

                6563    NOW READ DATA BUFFER WILL BE CHECKED

                6582    TEST 65 READ ECC ENABLED 3B

                6584            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

                6597    SETUP FOR WHAT IS TO BE READ
                        HEADER CRC IS RESTORED FROM A SUBROUTINE

                6619    THESE ARE FOR ECC TEST ONLY

                6631    THESE ARE TO SETUP FOR DISKLESS USE ONLY

                6646    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

                6663    THESE ARE REGULAR SETUPS

                6689    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

6737            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

6746            NOW READ DATA BUFFER WILL BE CHECKED

6766            TEST 66 READ ECC ENABLED 3C

6769                    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

6782            SETUP FOR WHAT IS TO BE READ
                HEADER CRC IS RESTORED FROM A SUBROUTINE

6803            THESE ARE FOR ECC TEST ONLY

6815            THESE ARE TO SETUP FOR DISKLESS USE ONLY

6830            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

6842            THESE ARE REGULAR SETUPS

6866            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.

6872            IN CHECKING READ DATA THE WRITE FROM BUFFER
                "WRFROM" IS FILLED WITH EXPECTED DATA AND
                COMPARISONS ARE MADE

6924            ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
                NOW THE INSERTED ERROR WILL BE PUT IN

6936            NOW READ DATA BUFFER WILL BE CHECKED

6956            TEST 67 READ ECC ENABLED 3D
```

```
                6958            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

                6973    SETUP FOR WHAT IS TO BE READ
                        HEADER CRC IS RESTORED FROM A SUBROUTINE

                6994    THESE ARE FOR ECC TEST ONLY

                7006    THESE ARE TO SETUP FOR DISKLESS USE ONLY

                7021    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

                7031    THESE ARE REGULAR SETUPS

                7057    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

                7062    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

                7116    ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
                        NOW THE INSERTED ERROR WILL BE PUT IN

                7125    NOW READ DATA BUFFER WILL BE CHECKED

                ;*******************************************************************
        7142    ;CURSORY INTERRUPT LOGIC TESTS
                ;*******************************************************************

                7147    TEST 70 PROGRAM INTERRUPT

                7149            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
```

```
                7184    TEST 71 INTERRUPT AT PROCESSOR AND DISK PRIORITY SAME

                7186            PROCESSOR PRIORITY IS SET AT 5 (SAME AS THE DISK)
                                IE AND RDY IS SET. THIS SHOULD NOT INTERRUPT

                7218    TEST 72 END OF DRIVE

                7220            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

                ;*****************************************************************
        7265
                ;*****************************************************************

                ;*****************************************************************
        7266    ;***SUBROUTINES***
                ;*****************************************************************

                ;*****************************************************************
        7267
                ;*****************************************************************

                ;*****************************************************************
        7272    END OF PASS ROUTINE
                ;*****************************************************************

                7275    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

                7316    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

                7318    PROGRAM GOES BACK - USUALLY BACK TO THE BEGINNING OF THE TEST.

                7320    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.
```

```
                ;*********************************************************************
7393            ;SAVE REGISTERS ROUTINE
                ;*********************************************************************

                ;*********************************************************************
7420            ;FLOAT 1 AND 0
                ;*********************************************************************

7423            ;FLOAT A ONE AND A ZERO THRU A DESIGNATED REGISTER
                ;ABSOLUTE ADDRESS OF REG. UNDER TEST IS IN R4

                ;*********************************************************************
7461            ;CLEAR MEMORY ROUTINE
                ;*********************************************************************

7465            ;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

                ;*********************************************************************
7496            ;LOCAL TRAPS
                ;*********************************************************************

7504            ;EXAMPLE OF THE USE OF THE ABOVE
                ;THIS WILL LOOP BETWEEN X: AND SCOP1 PROVIDED THERE IS NO "NEWTST"
                ;MOV     #X,     @#LAD
                ;X:      ---     ---
                ;        ---     ---
                ;        ---     ---
                ;SCOP1
```

```
                ;*********************************************************************
7513            ;CLEAR DISK ROUTINE
                ;*********************************************************************

                ;*********************************************************************
7526            ;CHECK DISK STATUS ROUTINES
                ;*********************************************************************

7529            ;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

7587            ;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

                ;*********************************************************************
7624            ;WAIT LOOP
                ;*********************************************************************

7626            ;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)

7658            ;CALL FOR THE ABOVE WAITLOOP IS

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

                ;*********************************************************************
7669            ;SAVE ROUTINE
                ;*********************************************************************
```

```
                ;*********************************************************************
7699            ;WRITE CHECK ROUTINE
                ;*********************************************************************

                ;*********************************************************************
7743            ;COMPARE ROUTINE
                ;*********************************************************************

7746            ;       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

                ;*********************************************************************
7795            ;WRITE CHECK DATA
                ;*********************************************************************

                ;*********************************************************************
7841            ;CRC GENERATION ROUTINE
                ;*********************************************************************

                ;*********************************************************************
7935            ;SIMULATED DISK SETUP
                ;*********************************************************************

                ;*********************************************************************
7982            ;CHECK HCE ROUTINE
                ;*********************************************************************

                ;*********************************************************************
8130            ;EXIT WRT HEADER & DATA ROUTINE
                ;*********************************************************************

                ;*********************************************************************
8164            ;JAM CURRENT CYLINDER ROUTINE
                ;*********************************************************************

8167            ;       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
```

```
                ;*********************************************************************
8203            ;ECC GENERATION AND COMPARISON ROUTINE
                ;*********************************************************************

                8206    THIS SUBROUTINE GENERATES AND TESTS ECC
                        CALL    JSR PC,ECTEST

                8386    CHECK HARDWARE

                ;*********************************************************************
8433            ;ECC GENERATION CONTROL ROUTINE
                ;*********************************************************************

                8436    THIS SUBROUTINE WILL CONTROL THE ECC GENERATION ROUTINE
                        FOR ERROR CORRECTION PROCESS
                        CALL    JSR,    PC,@#ECORR
                                XP      ;EXPECTED POSITION REGISTER WHEN CORRECTION IS COMPLETE

                ;*********************************************************************
8493            ;SOFTWARE DISK DATA ECC GEN. ROUTINE
                ;*********************************************************************

                8496    THIS SUBROUTINE GENERATES THE ECC FOR WHAT IS ON DISK AND INSERTS THEM
                        ON LOCATIONS "DISK+1000" AND "DISK+1002"

                ;*********************************************************************
8535            ;RH BASE ADDRESS CHANGE ROUTINE
                ;*********************************************************************

                8538            THIS ROUTINE WILL ALLOW THE CHANGE OF THE BASE
                                ADDRESS FROM 176700 TO ANY TYPED VALUE

                8603    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

                ;*********************************************************************
8615            ;DISK SIMULATION
                ;*********************************************************************

                8618    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

8669

8677    WRITE DATA COMMAND
        OR READ COMMAND, I.E DATA ONLY, OR HEADER AND DATA

8685    THIS SUBROUTINE IS THE FIRST IN A SERIES OF NESTED SUBROUTINES

8687    IT ISSUES DIAGNOSTIC MODE, AND EXTRA DIAGNOSTIC INDEX, AND THE
        'GO' BIT
```

```
8690    IT THEN CALLS THREE OTHER SUBROUTINES, WHICH IN TURN CALL
        OTHER SUBROUTINES.  THE SUBROUTINES CALLED HERE ARE:

8693            SEARCH          ;ISSUES SECTOR CLOCKS TO SET SECTOR FOUND FLOP
                RDHEAD          ;READS THE SECTOR HEADER
                WRDATA          ;WRITES THE SECTOR DATA (WRITE OPERATION)
                REDATA          ;READS THE SECTOR DATA (READ OPERATION)

8810    THE DISK SECTOR IS DEVIDED AS FOLLOWS

8812    19 WORDS OF 0, ONE WORD 144000
        THESE MAKE 39 BYTES FOR SECTOR GAP AND ONE SYNC. BYTE

8823    5 WORDS OF 0'S, ONE WORD 144000
        THESE MAKE 11 BYTES FOR HEADER GAP AND ONE SYNC. BYTE
        THESE ARE DCL GENERATED

8829    THERE ARE 256 WORDS OF DATA
        THERE ARE 2 WORDS FOR ECC GENERATED BY DCL
        15 WORDS OF 0'S FOR DATA GAP AND TOLERANCE GAP

8840    READ DISK HEADER

8912    CONTINUE WITH DIAGNOSTIC WRITE COMMAND

8951    READ COMMAND START FROM HERE

8983    READ ONE WORD IN "WORD"

9051    WRITE ONE WORD WHICH COMES BACK IN "WWORD"

9121    WRITE DATA HOUSEKEEPING ROUTINE

9196    THIS IS THE SIMULATED DISK
        ONLY ONE SECTOR OF SPACE IS ALLOCATED

9226    WRITE HEADER AND DATA

9233    THIS SUBROUTINE IS THE FIRST IN A SERIES OF NESTED SUBROUTINES

9235    IT ISSUES DIAGNOSTIC MODE, AN EXTRA DIAGNOSTIC INDEX, AND THE
        'GO' BIT

9238    IT THEN CALLS THREE OTHER SUBROUTINES, WHICH IN TURN CALL OTHER
        SUBROUTINES.  THE THREE SUBROUTINES CALLED HERE ARE:

9241            SEARCH          ;ISSUES SECTOR CLOCKS TO SET SECTOR FOUND FLOP
                WRHEAD          ;WRITES THE SECTOR HEADER
                WRDATA          ;WRITES THE ACTUAL SECTOR DATA
```

```
9245    ALL OF THE ABOVE MENTIONED "WRITING" IS ACTUALLY DONE INTO A CORE
        BUFFER AREA CALLED 'DISK' VIA THE MAINTENANCE REGISTER (RHMR)

9393    WRITE HEADER

9400    R0 = MAINT.REG.
        R1 = SIMULATED DISK
        R2 = BYTE COUNT
        R3 = WRITE WORD
        R5 = WORD COUNT

9563    SEARCH SECTOR

9571            R0=RHMR ADDRESS
                R1=PASSED ARGUMENT (SECTOR SEARCHED FOR)
                R2=CLOCK COUNT (PER BYTE)
                R3=SECTOR COUNTER FROM R1
                R5=BYTES PER WORD COUNT

9577    BEFORE INDEX IS GIVEN TWO SECTOR CLOCKS ARE GIVEN TO RESET
        SECTOR PULSE IN CASE IT IS SET.

9580    AT THE BEGINNING OF EACH SECTOR, ONE SECTOR CLOCK HAS TO RISE
        BEFORE MAINT. CLOCK, THEN EVERY EIGHT MAINT.CLOCKS, ONE SECTOR CLOCK
        IS IDENTICAL WITH THE MAINT. CLOCK
        THE SECTOR CLOCKS ARE NUMBERED AS FOLLOWS:

9585    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 WILL HAVE 608 SECTOR CLOCKS
        THE NEXT SECTOR THEN HAS ANOTHER 608 SECTOR CLOCKS
        AND SO ON

9623    FOR FIRST BYTE MAINT. SECTOR CLOCK WILL GO HIGH, THEN MAINT. CLOCK WILL GO HIGH
        BOTH WILL COME DOWN TOGETHER, THEN SEVEN MAINT. CLOCKS WILL BE GIVEN
        FOR SECOND BYTE, AND ALL OTHER BYTES TILL NEXT SECTOR, SECTOR CLOCK
        WILL BE IDENTICAL WITH ONE MAINT. CLOCK

9683    READ ONE SECTOR OF DATA
```

```
                ;*********************************************************************
9726            ;*********************************************************************

                ;*********************************************************************
9727            ;***SYSMAC LIBRARY ROUTINES***
                ;*********************************************************************

                ;*********************************************************************
9728            ;*********************************************************************

                ;*********************************************************************
9732            ;SCOPE HANDLER ROUTINE
                ;*********************************************************************

9735            ;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

                ;*********************************************************************
9806            ;CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
                ;*********************************************************************

9809            ;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
```

```
                ;*********************************************************************
9873            ;TYPE ROUTINE
                ;*********************************************************************

9876            ;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


                ;*********************************************************************
9943            ;TTY INPUT ROUTINE
                ;*********************************************************************

9954            ;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

9971            ;TK SERVICE ROUTINE
                ;THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT
                ;BY READING THE CHARACTER FROM THE INPUT BUFFER AND PUTTING
                ;IT IN THE QUEUE.
                ;IF THE CHARACTER IS A "CONTROL-C" (↑C) $TKINT IS CALLED AND
                ;UPON RETURN EXIT IS MADE TO THE "CONTROL-C" RESTART ADDRESS (OPERSEL)

10023           ;SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                ;ROUTINE IS ENTERED  FROM THE TRAP HANDLER, AND WILL
                ;SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP
                ;CALL WHEN OPERATING IN TTY INTERRUPT MODE.

10038           ;CONTROL IS PASSED TO THIS POINT FROM EITHER THE TTY INTERRUPT SERVICE
                ;ROUTINE OR FROM THE SOFTWARE SWITCH REGISTER TRAP CALL, AS A RESULT OF A
                ;CONTROL-G BEING TYPED, AND THE SOFTWARE SWITCH REGISTER BEING SELECTED.

10109           ;THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                ;CALL:
                        RDCHR                   ;;GET A CHARACTER FROM THE QUEUE
                        RETURN HERE             ;;CHARACTER IS ON THE STACK
                                                ;;WITH PARITY BIT STRIPPED OFF
```

```
                10133   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

                ********************************************************************
        10171   READ AN OCTAL NUMBER FROM THE TTY
                ********************************************************************

                10174   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

                ********************************************************************
        10224   ERROR HANDLER ROUTINE
                ********************************************************************

                10227   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

                ********************************************************************
        10272   ERROR MESSAGE TYPEOUT ROUTINE
                ********************************************************************

                10275   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.
```

```
                ;*********************************************************************
10328           ;BINARY TO OCTAL (ASCII) AND TYPE
                ;*********************************************************************

10331           ;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

                ;*********************************************************************
10405           ;TRAP DECODER
                ;*********************************************************************

10408           ;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.

                ;*********************************************************************
10421           ;TRAP TABLE
                ;*********************************************************************

10423           ;THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                ;BY THE "TRAP" INSTRUCTION.
```

```
                ;*****************************************************************
10444           ;POWER DOWN AND UP ROUTINES
                ;*****************************************************************

                ;*****************************************************************
                ;   39      40      56     167     177     188     203     240     298     2025    2261    2433    2434    2435    244
                ;*****************************************************************
```

DZRJHA.SUB TABLE OF CONTENTS

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


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

;/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*
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                        ;INTERNAL PROGRAM MACROS BEGIN HERE
                        ;**********************************

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

                        .SBTTL  OPERATIONAL SWITCH SETTINGS
                        ;*
                        ;*       SWITCH                  USE
                        ;*       ------          ------------------
                        ;*         15            HALT ON ERROR
                        ;*         14            LOOP ON TEST
                        ;*         13            INHIBIT ERROR TYPEOUTS
                        ;*         12            RH70 CONTROLLER SELECT
                        ;*         11            INHIBIT ITERATIONS
                        ;*         10            BELL ON ERROR
                        ;*          9            LOOP ON ERROR
                        ;*          8            LOOP ON TEST IN SWR<7:0>
                        ;*          7            STOP FURTHER COMPARES IF SW08 IS LOW
                        ;*          6            ECC TEST-COMPARE END RESULTS ONLY IF SW09 IS LOW
```

```
    55
```

```
                        .SBTTL  BASIC DEFINITIONS

                        ;*INITIAL ADDRESS OF THE STACK POINTER *** 1000 ***
001000                  STACK=  1000
                        .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
                        .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL

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

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

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

                        ;*"SWITCH REGISTER" SWITCH DEFINITIONS
100000                  SW15=   100000
040000                  SW14=   40000
020000                  SW13=   20000
010000                  SW12=   10000
004000                  SW11=   4000
002000                  SW10=   2000
001000                  SW09=   1000
000400                  SW08=   400
000200                  SW07=   200
000100                  SW06=   100
000040                  SW05=   40
000020                  SW04=   20
```

```
                        SW03=   10
                        SW02=   4
                        SW01=   2
                        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
```

```
   164          000064                  TPVEC=  64              ;;TTY PRINTER VECTOR
   165          000240                  PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR
   166
```

```
                                .SBTTL  TRAP CATCHER

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

                                .SBTTL  ACT11 HOOKS

                                ;;*****************************************************************
                                ;HOOKS REQUIRED BY ACT11
                        000200          $SVPC=.                 ;SAVE PC
                        000046          .=46
000046  044556                          $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                        000052          .=52
000052  020000                          .WORD   20000           ;;2)SET LOC.52 TO 20000
                        000200          .=$SVPC                 ;; RESTORE PC

                                .SBTTL  STARTING ADDRESSES

                        000200          .=200
000200  000137  017356                  JMP     @#BEGIN                 ;NORMAL START

                        000210          .=210
000210  000137  017346                  JMP     @#BEGIN2                ;SELECT DRIVE START


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

```
                        .SBTTL  MEMORY MANAGEMENT DEFINITIONS

                        ;*KT11 VECTOR ADDRESS

000250                  MMVEC=  250

                        ;*KT11 STATUS REGISTER ADDRESSES

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

                        ;*KERNEL "I" PAGE DESCRIPTOR REGISTERS

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

                        ;*KERNEL "I" PAGE ADDRESS REGISTERS

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


001110                          .=1110                  ;
```

```
                                .SBTTL  COMMON TAGS

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

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

```
  294  001222  077                 $QUES:  .ASCII  /?/             ;;QUESTION MARK
  295  001223  015                 $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
  296  001224  000012              $LF:    .ASCIZ  <12>            ;;LINE FEED
  297                              ;;**************************************************************************
```

```
                                .SBTTL  ERROR POINTER TABLE

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

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

001226                          $ERRTB:



                                ;ITEM1
001226  002136                          EM1             ;WRONG DATA IN READING OR WRITING HARDWARE REGISTER
001230  005452                          DH1             ;PC
                                                        ;REG. ADDR.
                                                        ;GOOD DATA
                                                        ;RECEIVED DATA
001232  011766                          DT1             ;$ERRPC,$TSTNM,REGADR,$GDDAT,$BDDAT
001234  012520                          DF1             ;0,0,0,0,0



                                ;ITEM2
001236  002221                          EM2             ;ERROR ON  DATA COMMAND

001240  010464                          DH33            ;PC
                                                        ;PC OF JSR
                                                        ;TEST NO
                                                        ;WORD NO.
                                                        ;GOOD DATA
                                                        ;CONTENTS OF RHCS1
                                                        ;CONTENTS OF RHDS1
                                                        ;CONTENTS OF RHER1
001242  012352                          DT33            ;$ERRPC,PCJSR,$TSTNM,ERWORD,$GDDAT,CS1,DS1,ER1
001244  012670                          DF33            ;0,0,0,1,0,0,0,0



                                ;ITEM3
001246  002221                          EM2             ;ERROR ON  DATA COMMAND

001250  010247                          DH32            ;PC
                                                        ;PC OF JSR
                                                        ;TEST NO
```

```
                                                        ;WORD NO.
                                                        ;GOOD DATA
                                                        ;BAD DATA
                                                        ;CONTENTS OF RHCS1
                                                        ;CONTENTS OF RHDS1
                                                        ;CONTENTS OF RHER1

001252  012326                          DT32            ;$ERRPC,PCJSR,$TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1
001254  012657                          DF32            ;0,0,0,1,0,0,0,0,0,

                        ;ITEM4
001256  002221                          EM2             ;ERROR ON  DATA COMMAND

001260  010051                          DH31            ;PC
                                                        ;TEST NO
                                                        ;WORD NO.
                                                        ;GOOD DATA
                                                        ;BAD DATA
                                                        ;CONTENTS OF RHCS1
                                                        ;CONTENTS OF RHDS1
                                                        ;CONTENTS OF RHER1

001262  012304                          DT31            ;$ERRPC,$TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1
001264  012647                          DF31            ;0,0,1,0,0,0,0,0,

                        ;ITEM5
001266  000000                          0               ;
001270  000000                          0               ;
001272  012304                          DT31            ;$ERRPC,$TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1
001274  012647                          DF31            ;0,0,1,0,0,0,0,0,

                        ;ITEM6
001276  002250                          EM6             ;ERROR ON WRITE HEADER AND DATA

001300  010247                          DH32            ;PC
                                                        ;PC OF JSR
                                                        ;TEST NO
                                                        ;WORD NO.
                                                        ;GOOD DATA
                                                        ;BAD DATA
                                                        ;CONTENTS OF RHCS1
                                                        ;CONTENTS OF RHDS1
                                                        ;CONTENTS OF RHER1

001302  012326                          DT32            ;$ERRPC,PCJSR,$TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1
001304  012657                          DF32            ;0,0,0,1,0,0,0,0,0,

                        ;ITEM7
```

```
                                ;ITEM10
001316  000000                          0                       ;
001320  000000                          0                       ;
001322  012014                          DT3                     ;$ERRPC,$TSTNM,ERWORD,$GDDAT,$BDDAT
001324  012531                          DF3                     ;0,0,1,0,0,

                                ;ITEM11
001326  002307                          EM11                    ;CONTROLLER OR DRIVE STATUS
001330  005702                          DH11                    ;PC
                                                                ;TEST NO
                                                                ;FAILING REG. ADDR
                                                                ;CONTENTS OF RHCS1
                                                                ;CONTENTS OF RHCS2
                                                                ;CONTENTS OF RHDS1
                                                                ;CONTENTS OF RHER1
001332  012030                          DT11                    ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001334  012536                          DF11                    ;0,0,0,0,0,0

                                ;ITEM12
001336  002307                          EM11                    ;WRONG DATA FROM SILO

001340  005452                          DH1                     ;PC
                                                                ;REG.ADDR
                                                                ;GOOD DATA
                                                                ;RECEIVED DATA
001342  011766                          DT1                     ;$ERRPC,REGADR,$GDDAT,$BDDAT
001344  012520                          DF1                     ;0,0,0,0

                                ;ITEM13
001346  000000                          0
001350  000000                          0
001352  011766                          DT1                     ;$ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT
001354  012520                          DF1                     ;0,0,0,0,0

                                ;ITEM14
001356  002342                          EM14                    ;REGISTER FAILED
001360  006057                          DH14                    ;PC
                                                                ;FAILING REG. ADDR
                                                                ;CONTENTS OF FAILING REG.
                                                                ;CONTENTS OF RHCS1
```

```
                                                        ;CONTENTS OF RHCS2
                                                        ;CONTENTS OF RHDS1
                                                        ;CONTENTS OF RHER1
001362  012050                              DT14          ;$ERRPC,$BDADR,$BDDAT,CS1,CS2,DS1,ER1
001364  012545                              DF14          ;0,0,0,0,0,0,0

                                ;ITEM15
001366  002362                              EM15          ;SPECIFIED REG. NON EXISTANT SO ABORT
                                                        ;PROGRAM
001370  006256                              DH15          ;PC
                                                        ;ADDR. OF REG
001372  012072                              DT15          ;$ERRPC,TEMP1
001374  012555                              DF15          ;0,0

                                ;ITEM16
001376  002433                              EM16          ;WAIT LOOP FAILED
001400  006306                              DH16          ;PC
                                                        ;WAT PC
                                                        ;BIT WANTED
                                                        ;REG. ADR.
                                                        ;REG. CONT.
001402  012102                              DT16          ;$ERRPC,$TMP3,$TMP1,$TMP0,$BDDAT
001404  012560                              DF16          ;0,0,0,0

                                ;ITEM17
001406  002454                              EM17          ;WRITE CHECK FAILING
001410  006444                              DH17          ;PC
                                                        ;TEST NO
                                                        ;CONTENTS OF RHBA
                                                        ;CONTENTS OF RHDB
                                                        ;CONTENTS OF RHWC
                                                        ;CONTENTS OF RHCS1
                                                        ;CONTENTS OF RHCS2
001412  012120                              DT17          ;$ERRPC,$TSTNM,$BA,DB,WC,CS1,CS2
001414  012565                              DF17          ;0,0,0,0,0,0,0

                                ;ITEM20
001416  002500                              EM20          ;REGISTER FAILING
001420  006621                              DH20          ;PC
                                                        ;TST NO
                                                        ;CONTENTS OF RHER1
                                                        ;CONTENTS OF RHER2
                                                        ;CONTENTS OF RHER3
                                                        ;CONTENTS OF RHAS
                                                        ;CONTENTS OF RHDS1
001422  012140                              DT20          ;$ERRPC,TSTNM ER1,ER2,ER3,AS,DS1
001424  012574                              DF20          ;0,0,0,0,0,0,0

                                ;ITEM21
```

```
                                                ;INTERRUPT FAILING
001426  002521                          EM21    ;PC
001430  006775                          DH21    ;TEST NO
                                                ;CONTENTS OF RHCS1
                                                ;CONTENTS OF RHAS
                                                ;CONTENTS OF RHDS1
001432  012160                          DT21    ;$ERRPC,TSTNM,CS1,AS,DS1
001434  012603                          DF21    ;0,0,0,0,0

                        ;ITEM22
001436  002543                          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
001440  007111                          DH22    ;PC
                                                ;TEST NO
                                                ;RHAS UNIT
                                                ;RHCS2 UNIT
                                                ;
001442  012174                          DT22    ;$ERRPC,TSTNM$,$GDDAT,$BDDAT
001444  012610                          DF22    ;0,0,0,0

                        ;ITEM23
001446  000000                          0       ;MISSMATCH IN DRIVE PRESENT
                                                ;LOOKING AT RHAS AND RHCS2-NED(BIT#12)
                                                ;DRIVE PRESENT DO NOT AGREE
                                                ;177777-MEANS NOT PRESENT
001450  000000                          0       ;PC
                                                ;TEST NO
                                                ;RHAS UNIT
                                                ;RHCS2 UNIT
                                                ;
001452  012174                          DT22    ;$ERRPC,TSTNM$,$GDDAT,$BDDAT
001454  012610                          DF22    ;0,0,0,0

                        ;ITEM 24
001456  003144                          EM24    ;LOOK AHEAD REGISTER AT THE
                                                ;BEGINNING OF A SECTOR IS IN
                                                ;ERROR
001460  007205                          DH24    ;PC
                                                ;RHDST
                                                ;BAD RHLA
                                                ;GOOD RHLA
                                                ;SECTOR NO
                                                ;SECTOR CLOCK
001462  012206                          DT24    ;$ERRPC,DST,$BDDAT,$TMP1,$TMP2,$TMP3
001464  012614                          DF24    ;0,0,0,0,0
```

```
001466  003237                          ;ITEM 25
                                EM25            ;LOOK AHEAD REGISTER IS
                                                ;IN ERROR

001470  007205                  DH24            ;PC
                                                ;RHDST
                                                ;BAD RHLA
                                                ;GOOD RHLA
                                                ;SECTOR NO
                                                ;SECTOR CLOCK
001472  012206                  DT24            ;$ERRPC,DST,$BDDAT,$TMP1,$TMP2,$TMP3
001474  012614                  DF24            ;0,0,0,0,0
                                ;ITEM26
001476  002307                  EM11            ;CONTROLLER OR DRIVE STATUS

001500  007363                  DH26            ;PC
                                                ;PC OF JSR
                                                ;FAILING REGISTER ADDRESS
                                                ;CONTENTS OF RHCS1
                                                ;CONTENTS OF RHCS2
                                                ;CONTENTS OF RHDS1
                                                ;CONTENTS OF RHER1

001502  012226                  DT26            ;$ERRPC,PCJSR,$BDADR,CS1,CS2,DS1,ER1
001504  012623                  DF26            ;0,0,0,0,0,0,0,


                                ;ITEM27
001506  002136                  EM1             ;ERROR IN READING OR WRITING HARDWARE REGISTER

001510  007561                  DH27            ;PC
                                                ;PC OF JSR
                                                ;TEST NUMBER
                                                ;FAILING REGISTER
                                                ;GOOD DATA
                                                ;RECEIVED DATA

001512  012250                  DT27            ;$ERRPC,PCJSR,TSTNM,REGADR,$GDDAT,$BDDAT
001514  012633                  DF27            ;0,0,0,0,0,0


                                ;ITEM30
001516  003277                  EM30            ;CURRENT CYLINDER DOES NOT REFLECT DESIRED CYLINDER REG.
001520  007717                  DH30            ;PC
                                                ;PC OF JSR
                                                ;REGISTER ADDRESS
                                                ;GOOD DATA
                                                ;BAD DATA

001522  012266                  DT30            ;$ERRPC,PCJSR,REGADR,$GDDAT,$BDDAT
001524  012641                  DF30            ;0,0,0,0,0
```

```
                                ;ITEM31
001526  003421                          EM31            ;ECC GENERATED IS INCORRECT
                                                        ;EVERY WORD IN THIS SECTOR IS GIVEN IN "DATA USED"

001530  010663                          DH34            ;PC
                                                        ;TEST NUMBER
                                                        ;GOOD ECC1
                                                        ;GOOD EC2C
                                                        ;WRITTEN ECC1
                                                        ;WRITTEN ECC2
                                                        ;DATA USED

001532  012374                          DT34            ;$ERRPC,TSTNM,GECC1,GECC2,WECC1,WECC2,DISK

001534  012700                          DF34            ;0,0,0,0,0,0,0


                                ;ITEM32
001536  003544                          EM32            ;ON READ COMMAND AFTER DATA AND ECC HAVE BEEN READ
                                                        ;ECC REGISTER OR RHER1 IS IN ERROR
                                                        ;ONLY LOWER 11 BITS OF PATTERN REGISTER
                                                        ;CAN BE READ
                                                        ;THIS SHUOLD MATCH LOWER 11 BITS OF ECC1

001540  011036                          DH35            ;PC
                                                        ;TEST NUMBER
                                                        ;GOOD ECC1
                                                        ;GOOD ECC2
                                                        ;PATTERN REGISTER
                                                        ;RHER1

001542  012414                          DT35            ;$ERRPC,TSTNM,GECC1,GECC2,EC2,ER1

001544  012707                          DF35            ;0,0,0,0,0,0


                                ;ITEM33
001546  004033                          EM33            ;HIGH COUNT BIT NOT HIGH AFTER 38859 CLOCKS
001550  011233                          DH36            ;PC
                                                        ;PC OF JSR
                                                        ;TEST NUMBER
                                                        ;RHMR
                                                        ;POSITION REG.
                                                        ;PATTERN REGISTER

001552  012436                          DT36            ;$ERRPC,PCJSR,TSTNM,MR,EC1,EC2

001554  012717                          DF36            ;0,0,0,0,0,0

                                ;ITEM34
```

```
001556  004105                          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
001560  011233                          DH36            ;PC
                                                        ;PC OF JSR
                                                        ;TEST NUMBER
                                                        ;RHMR
                                                        ;POSITION REG.
                                                        ;PATTERN REGISTER

001562  012436                          DT36            ;$ERRPC,PCJSR,TSTNM,MR,EC1,EC2

001564  012717                          DF36            ;0,0,0,0,0,0


                        ;ITEM35
001566  004200                          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

001570  011371                          DH37            ;PC
                                                        ;TEST NUMBER
                                                        ;ECC POSITION
                                                        ;GOOD POSITION
                                                        ;GOOD ECC1
                                                        ;GOOD ECC2
                                                        ;ECC PATTERN
                                                        ;DATA ENVELOPE
                                                        ;N-CODE ZEROS

001572  012454                          DT37            ;$ERRPC,TSTNM,EC1,POSITI,GECC1,GECC2,EC2,DATENV,ZCODE

001574  012725                          DF37            ;0,0,0,0,0,0,0,0,0


                        ;ITEM36
001576  004477                          EM36            ;ON A READ COMMAND WITH NON CORRECTABLE
                                                        ;ERROR INSERTED DCK AND ECH SHOULD BE SET
001600  011036                          DH35            ;PC
                                                        ;TEST NUMBER
                                                        ;GOOD ECC1
                                                        ;GOOD ECC2
                                                        ;PATTERN REGISTER
                                                        ;POSITION REGISTER
                                                        ;RHER1

001602  012414                          DT35            ;$ERRPC,TSTNM,GECC1,GECC2,EC2,EC1,ER1
```

```
                                ;ITEM37
001606  004665                  EM37            ;ERROR ON  DATA COMMAND
                                                ;WITH A16 A17 USED
001610  010051                  DH31            ;PC
                                                ;TEST NO
                                                ;WORD NO.
                                                ;GOOD DATA
                                                ;BAD DATA
                                                ;CONTENTS OF RHCS1
                                                ;CONTENTS OF RHDS1
                                                ;CONTENTS OF RHER1
001612  012304                  DT31            ;$ERRPC,$TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1
001614  012647                  DF31            ;0,0,1,0,0,0,0,0,


                                ;ITEM40
001616  000000                  0               ;
001620  000000                  0               ;
001622  012304                  DT31            ;$ERRPC,$TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1
001624  012647                  DF31            ;0,0,1,0,0,0,0,0,


                                ;ITEM41
001626  004753                  EM40            ;THERE WAS A READ/WRITE HEADER & DATA
                                                ;ERROR DURING 'DTE' TEST SETUP - THE
                                                ;TEST IS ABORTED AT THAT POINT
001630  011610                  DH40            ;PC
                                                ;TEST NO
                                                ;FAILING REGISTER ADDRESS
                                                ;CONTENTS OF RHCS1
                                                ;CONTENTS OF RHCS2
                                                ;CONTENTS OF RHDS1
                                                ;CONTENTS OF RHER1
001632  012500                  DT40            ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001634  012736                  DF40            ;0,0,0,0,0,0
```

```
                                ;ITEM 42
001636  012746                          EM42
001640  014412                          DH42
001642  014674                          DT42    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS.
001644  014732                          DF42

                                ;ITEM 43

001646  013031                          EM43
001650  014412                          DH42
001652  014674                          DT42    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS.
001654  014732                          DF42

                                ;ITEM 44

001656  013075                          EM44
001660  014473                          DH44
001662  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001664  014735                          DF44

                                ;ITEM 45
001666  013132                          EM45
001670  014473                          DH44
001672  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001674  014735                          DF44

                                ;ITEM 46

001676  013161                          EM46
001700  014473                          DH44
001702  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001704  014735                          DF44

                                ;ITEM 47

001706  013210                          EM47
001710  014412                          DH42
001712  014674                          DT42    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS.
001714  014732                          DF42

                                ;ITEM 50

001716  013245                          EM50
001720  014473                          DH44
001722  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001724  014735                          DF44

                                ;ITEM 51

001726  013303                          EM51
001730  014473                          DH44
001732  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001734  014735                          DF44
```

```
                                ;ITEM 52
001736  013324                          EM52
001740  014473                          DH44
001742  014704                          DT44
001744  014735                          DF44

                                ;ITEM 53
001746  013364                          EM53
001750  014473                          DH44
001752  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001754  014735                          DF44

                                ;ITEM 54
001756  013424                          EM54
001760  014605                          DH54
001762  014720                          DT54    ;ERROR PC, TEST NUMBER.
001764  014742                          DF54

                                ;ITEM 55
001766  013463                          EM55
001770  014473                          DH44
001772  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
001774  014735                          DF44

                                ;ITEM 56
001776  013476                          EM56
002000  014473                          DH44
002002  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
002004  014735                          DF44

                                ;ITEM 57
002006  013513                          EM57
002010  014473                          DH44
002012  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
002014  014735                          DF44

                                ;ITEM 60
002016  013542                          EM60
002020  014473                          DH44
002022  014704                          DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
002024  014735                          DF44

                                ;ITEM 61
002026  013631                          EM61
002030  014473                          DH44
```

```
885  002032  014704                    DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
886  002034  014735                    DF44
887
888                                ;ITEM 62
889
890  002036  013701                    EM62
891  002040  014473                    DH44
892  002042  014704                    DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
893  002044  014735                    DF44
894
895                                ;ITEM 63
896
897  002046  013756                    EM63
898  002050  014473                    DH44
899  002052  014704                    DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
900  002054  014735                    DF44
901
902                                ;ITEM 64
903
904  002056  014034                    EM64
905  002060  014473                    DH44
906  002062  014704                    DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
907  002064  014735                    DF44
908
909                                ;ITEM 65
910
911  002066  014070                    EM65
912  002070  014473                    DH44
913  002072  014704                    DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
914  002074  014735                    DF44
915
916                                ;ITEM 66
917
918  002076  014152                    EM66
919  002100  014473                    DH44
920  002102  014704                    DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
921  002104  014735                    DF44
922
923                                ;ITEM 67
924
925  002106  014224                    EM67
926  002110  014605                    DH54
927  002112  014720                    DT54    ;ERROR PC, TEST NUMBER.
928  002114  014742                    DF54
929
930                                ;ITEM 70
931
932  002116  014311                    EM70
933  002120  014605                    DH54
934  002122  014720                    DT54    ;ERROR PC, TEST NUMBER.
935  002124  014742                    DF54
936
937                                ;ITEM 71
938
```

FLTINS.ITM ERROR POINTER TABLE

```
   939  002126  014363                    EM71
   940  002130  014473                    DH44
   941  002132  014704                    DT44    ;ERROR PC,TEST NUMBER, REGISTER ADDRESS CORRECT, ACTUAL.
   942  002134  014735                    DF44
```

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


002136  051127  047117  020107  EM1:    .ASCIZ  /WRONG DATA IN READING OR WRITING HARDWARE REGISTER/
002144  040504  040524  044440
002152  020116  042522  042101
002160  047111  020107  051117
002166  053440  044522  044524
002174  043516  044040  051101
002202  053504  051101  020105
002210  042522  044507  052123
002216  051105     000
002221     105  051122  051117  EM2:    .ASCIZ  /ERROR ON  DATA COMMAND/
002226  047440  020116  042040
002234  052101  020101  047503
002242  046515  047101  000104
002250  051105  047522  020122  EM6:    .ASCIZ  /ERROR ON WRITE HEADER AND DATA/
002256  047117  053440  044522
002264  042524  044040  040505
002272  042504  020122  047101
002300  020104  040504  040524
002306     000
002307     103  047117  051124  EM11:   .ASCIZ  /CONTROLLER OR DRIVE STATUS/
002314  046117  042514  020122
002322  051117  042040  044522
002330  042526  051440  040524
002336  052524  000123
002342  042522  044507  052123  EM14:   .ASCIZ  /REGISTER FAILED/
002350  051105  043040  044501
002356  042514  000104
002362  050123  041505  043111  EM15:   .ASCIZ  /SPECIFIED REGISTER NON EXISTANT SO ABORT/
002370  042511  020104  042522
002376  044507  052123  051105
002404  047040  047117  042440
002412  044530  052123  047101
002420  020124  047523  040440
002426  047502  052122     000
002433     127  044501  020124  EM16:   .ASCIZ  /WAIT LOOP FAILED/
002440  047514  050117  043040
002446  044501  042514  000104
002454  051127  052111  020105  EM17:   .ASCIZ  /WRITE CHECK FAILING/
002462  044103  041505  020113
002470  040506  046111  047111
002476  000107
002500  042522  044507  052123  EM20:   .ASCIZ  /REGISTER FAILING/
002506  051105  043040  044501
002514  044514  043516     000
```

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  997  002521    111  052116  051105  EM21:   .ASCIZ  /INTERRUPT FAILING/
  998  002526 052522  052120  043040
  999  002534 044501  044514  043516
 1000  002542    000
 1001  002543    105  051122  051117  EM22:   .ASCII  /ERROR ON DRIVE PRESENT/<15><12>
 1002  002550 047440  020116  051104
 1003  002556 053111  020105  051120
 1004  002564 051505  047105  006524
 1005  002572    012
 1006  002573    124  042510  052440          .ASCII  /THE UNIT NO'S FOUND BY SETTING RHAS/<15><12>
 1007  002600 044516  020124  047516
 1008  002606 051447  043040  052517
 1009  002614 042116  041040  020131
 1010  002622 042523  052124  047111
 1011  002630 020107  044122  051501
 1012  002636 005015
 1013  002640 047504  047040  052117          .ASCII  /DO NOT AGREE WITH THE UNIT NO. FOUND FROM/<15><12>
 1014  002646 040440  051107  042505
 1015  002654 053440  052111  020110
 1016  002662 044124  020105  047125
 1017  002670 052111  047040  027117
 1018  002676 043040  052517  042116
 1019  002704 043040  047522  006515
 1020  002712    012
 1021  002713    122  041510  031123          .ASCII  /RHCS2-'NED' BIT #12/<15><12>
 1022  002720 023455  042516  023504
 1023  002726 041040  052111  021440
 1024  002734 031061  005015
 1025  002740 033461  033467  033467          .ASCII  /177777-MEANS NO UNIT FOUND/<15><12>
 1026  002746 046455  040505  051516
 1027  002754 047040  020117  047125
 1028  002762 052111  043040  052517
 1029  002770 042116  005015
 1030  002774 047516  042524  020072          .ASCII  /NOTE: ON DUAL PORT SYSTEM, DRIVE ON OTHER PORT WILL NOT GIVE/<15><12>
 1031  003002 047117  042040  040525
 1032  003010 020114  047520  052122
 1033  003016 051440  051531  042524
 1034  003024 026115  042040  044522
 1035  003032 042526  047440  020116
 1036  003040 052117  042510  020122
 1037  003046 047520  052122  053440
 1038  003054 046111  020114  047516
 1039  003062 020124  044507  042526
 1040  003070 005015
 1041  003072 047047  042105  026047          .ASCIZ  /'NED', HENCE THERE WILL BE AN EXTRA DRIVE/
 1042  003100 044040  047105  042503
 1043  003106 052040  042510  042522
 1044  003114 053440  046111  020114
 1045  003122 042502  040440  020116
 1046  003130 054105  051124  020101
 1047  003136 051104  053111  000105
 1048  003144 047514  045517  040440  EM24:   .ASCIZ  /LOOK AHEAD REGISTER AT THE BEGINNING OF SECTOR IS IN ERROR/
 1049  003152 042510  042101  051040
 1050  003160 043505  051511  042524
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1051  003166  020122  052101  052040
1052  003174  042510  041040  043505
1053  003202  047111  044516  043516
1054  003210  047440  020106  042523
1055  003216  052103  051117  044440
1056  003224  020123  047111  042440
1057  003232  051122  051117     000
1058  003237     114  047517  020113  EM25:   .ASCIZ  /LOOK AHEAD REGISTER IS IN ERROR/
1059  003244  044101  040505  020104
1060  003252  042522  044507  052123
1061  003260  051105  044440  020123
1062  003266  047111  042440  051122
1063  003274  051117     000
1064  003277     103  051125  042522  EM30:   .ASCII  /CURRENT CYLINDER DOES NOT MATCH DESIRED CYLINDER REGIHSTER/<15><12>
1065  003304  052116  041440  046131
1066  003312  047111  042504  020122
1067  003320  047504  051505  047040
1068  003326  052117  046440  052101
1069  003334  044103  042040  051505
1070  003342  051111  042105  041440
1071  003350  046131  047111  042504
1072  003356  020122  042522  044507
1073  003364  051510  042524  006522
1074  003372     012
1075  003373     101  052106  051105          .ASCIZ  /AFTER A SEEK AND INIT/
1076  003400  040440  051440  042505
1077  003406  020113  047101  020104
1078  003414  047111  052111     000
1079  003421     105  041503  043440  EM31:   .ASCII  /ECC GENERATED IS INCORRECT/<15><12>
1080  003426  047105  051105  052101
1081  003434  042105  044440  020123
1082  003442  047111  047503  051122
1083  003450  041505  006524     012
1084  003455     105  042526  054522          .ASCIZ  /EVERY WORD ON THIS SECTOR IS THAT GIVEN IN "DATA USED"/
1085  003462  053440  051117  020104
1086  003470  047117  052040  044510
1087  003476  020123  042523  052103
1088  003504  051117  044440  020123
1089  003512  044124  052101  043440
1090  003520  053111  047105  044440
1091  003526  020116  042042  052101
1092  003534  020101  051525  042105
1093  003542  000042
1094  003544  047117  051040  040505  EM32:   .ASCII  /ON READ COMMAND, AFTER DATA AND ECC HAVE BEEN READ,/<15><12>
1095  003552  020104  047503  046515
1096  003560  047101  026104  040440
1097  003566  052106  051105  042040
1098  003574  052101  020101  047101
1099  003602  020104  041505  020103
1100  003610  040510  042526  041040
1101  003616  042505  020116  042522
1102  003624  042101  006454     012
1103  003631     105  041503  051040          .ASCII  /ECC REGISTERS OR RHER1 ARE IN ERROR/<15><12>
1104  003636  043505  051511  042524
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1105  003644  051522  047440  020122
1106  003652  044122  051105  020061
1107  003660  051101  020105  047111
1108  003666  042440  051122  051117
1109  003674  005015
1110  003676  047117  054514  046040          .ASCII  /ONLY LOWER 11 BITS OF PATTERN REG. CAN BE READ/<15><12>
1111  003704  053517  051105  030440
1112  003712  020061  044502  051524
1113  003720  047440  020106  040520
1114  003726  052124  051105  020116
1115  003734  042522  027107  041440
1116  003742  047101  041040  020105
1117  003750  042522  042101  005015
1118  003756  044124  051511  051440          .ASCIZ  /THIS SHOULD MATCH LOWER 11 BITS OF GOOD ECC1/
1119  003764  047510  046125  020104
1120  003772  040515  041524  020110
1121  004000  047514  042527  020122
1122  004006  030461  041040  052111
1123  004014  020123  043117  043440
1124  004022  047517  020104  041505
1125  004030  030503     000
1126  004033     110  043511  020110  EM33:   .ASCIZ  /HIGH COUNT BIT NOT SET AFTER 38859 CLOCKS/
1127  004040  047503  047125  020124
1128  004046  044502  020124  047516
1129  004054  020124  042523  020124
1130  004062  043101  042524  020122
1131  004070  034063  032470  020071
1132  004076  046103  041517  051513
1133  004104     000
1134  004105     132  051105  020117  EM34:   .ASCIZ  /ZERO DETECT BIT NOT HIGH WHEN 32 BIT ECC REG. HAS 21 ZEROS/
1135  004112  042504  042524  052103
1136  004120  041040  052111  047040
1137  004126  052117  044040  C"#3511
1138  004134  020110  044127  047105
1139  004142  031440  020062  044502
1140  004150  020124  041505  020103
1141  004156  042522  027107  044040
1142  004164  051501  031040  020061
1143  004172  042532  047522  000123
1144  004200  047520  044523  044524  EM35:   .ASCII  /POSITION REGISTER OR 11 BITS OF PATTERN REGISTER INCORRECT/<15><12>
1145  004206  047117  051040  043505
1146  004214  051511  042524  020122
1147  004222  051117  030440  020061
1148  004230  044502  051524  047440
1149  004236  020106  040520  052124
1150  004244  051105  020116  042522
1151  004252  044507  052123  051105
1152  004260  044440  041516  051117
1153  004266  042522  052103  005015
1154  004274  047514  042527  020122          .ASCII  /LOWER 11 BITS OF PATTERN REGISTER SHOULD MATCH LOWER/<15><12>
1155  004302  030461  041040  052111
1156  004310  020123  043117  050040
1157  004316  052101  042524  047122
1158  004324  051040  043505  051511
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 1159  004332  042524  020122  044123
 1160  004340  052517  042114  046440
 1161  004346  052101  044103  046040
 1162  004354  053517  051105  005015
 1163  004362  030461  041040  052111          .ASCII  /11 BITS OF GOOD ECC1/<15><12>
 1164  004370  020123  043117  043440
 1165  004376  047517  020104  041505
 1166  004404  030503  005015
 1167  004410  040504  020124  047105          .ASCIZ  /DAT ENVLOP GOOD POSITION AND N-CODE ZEROS ARE IN OCTAL/
 1168  004416  046126  050117  043440
 1169  004424  047517  020104  047520
 1170  004432  044523  044524  047117
 1171  004440  040440  042116  047040
 1172  004446  041455  042117  020105
 1173  004454  042532  047522  020123
 1174  004462  051101  020105  047111
 1175  004470  047440  052103  046101
 1176  004476     000
 1177  004477     117  020116  042522  EM36:   .ASCII  /ON READ COMMAND WITH NON-CORRECTABLE ERROR DCK AND ECH SHOULD BE SET/<1
 1178  004504  042101  041440  046517
 1179  004512  040515  042116  053440
 1180  004520  052111  020110  047516
 1181  004526  026516  047503  051122
 1182  004534  041505  040524  046102
 1183  004542  020105  051105  047522
 1184  004550  020122  041504  020113
 1185  004556  047101  020104  041505
 1186  004564  020110  044123  052517
 1187  004572  042114  041040  020105
 1188  004600  042523  006524     012
 1189  004605     111  020106  047520          .ASCIZ  /IF POSITION REGISTER =10040 OR 10041 IT IS GOOD/
 1190  004612  044523  044524  047117
 1191  004620  051040  043505  051511
 1192  004626  042524  020122  030475
 1193  004634  030060  030064  047440
 1194  004642  020122  030061  032060
 1195  004650  020061  052111  044440
 1196  004656  020123  047507  042117
 1197  004664     000
 1198  004665     127  044522  044524  EM37:   .ASCIZ  /WRITING WITH BUS ADDRESS HIGHER THAN 28K CAUSED ERROR/
 1199  004672  043516  053440  052111
 1200  004700  020110  052502  020123
 1201  004706  042101  051104  051505
 1202  004714  020123  044510  044107
 1203  004722  051105  052040  040510
 1204  004730  020116  034062  020113
 1205  004736  040503  051525  042105
 1206  004744  042440  051122  051117
 1207  004752     000
 1208  004753     124  042510  042522  EM40:   .ASCII  /THERE WAS A READ-WRITE HEADER & DATA ERROR DURING 'DTE'/<15><12>
 1209  004760  053440  051501  040440
 1210  004766  051040  040505  026504
 1211  004774  051127  052111  020105
 1212  005002  042510  042101  051105
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1213  005010  023040  042040  052101
1214  005016  020101  051105  047522
1215  005024  020122  052504  044522
1216  005032  043516  023440  052104
1217  005040  023505  005015
1218  005044  042524  052123  051440        .ASCIZ  /TEST SETUP - THE TEST WAS ABORTED AT THAT POINT/
1219  005052  052105  050125  026440
1220  005060  052040  042510  052040
1221  005066  051505  020124  040527
1222  005074  020123  041101  051117
1223  005102  042524  020104  052101
1224  005110  052040  040510  020124
1225  005116  047520  047111  000124
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  1226  005124  040506  040524  020114  CPHALT: .ASCII  /FATAL ERROR - SEE DOCUMENT FOR BEST CCURSE OF ACTION/<15><12>
  1227  005132  051105  047522  020122
  1228  005140  020055  042523  020105
  1229  005146  047504  052503  042515
  1230  005154  052116  043040  051117
  1231  005162  041040  051505  020124
  1232  005170  047503  051125  042523
  1233  005176  047440  020106  041501
  1234  005204  044524  047117  005015
  1235  005212  006440  103412  177777          .ASCII  / /<15><12><207><377><377><207><377><377><207><377><377>
  1236  005220  177607  103777  177777
  1237  005226  044124  020105  051120          .ASCII  /THE PROGRAM HAS HALTED DURING A TEST BECAUSE CONTROLLER/<15><12>
  1238  005234  043517  040522  020115
  1239  005242  040510  020123  040510
  1240  005250  052114  042105  042040
  1241  005256  051125  047111  020107
  1242  005264  020101  042524  052123
  1243  005272  041040  041505  052501
  1244  005300  042523  041440  047117
  1245  005306  051124  046117  042514
  1246  005314  006522     012
  1247  005317     117  020122  042504          .ASCII  /OR DEVICE HAS LOST 'READY', BECOME UNAVAILABLE,/<15><12>
  1248  005324  044526  042503  044040
  1249  005332  051501  046040  051517
  1250  005340  020124  051047  040505
  1251  005346  054504  026047  041040
  1252  005354  041505  046517  020105
  1253  005362  047125  053101  044501
  1254  005370  040514  046102  026105
  1255  005376  005015
  1256  005400  047507  042516  047440          .ASCIZ  /GONE OFFLINE, OR CANNOT CLEAR STATUS BITS/
  1257  005406  043106  044514  042516
  1258  005414  020054  051117  041440
  1259  005422  047101  047516  020124
  1260  005430  046103  040505  020122
  1261  005436  052123  052101  051525
  1262  005444  041040  052111  000123
  1263
  1264  005452  041520  020040  020040  DH1:     .ASCII  /PC     TEST    REG.    GOOD    ACTUAL /<15><12>
  1265  005460  020040  042524  052123
  1266  005466  020040  020040  042522
  1267  005474  027107  020040  020040
  1268  005502  047507  042117  020040
  1269  005510  020040  041501  052524
  1270  005516  046101  006411     012
  1271  005523     040  020040  020040          .ASCIZ  /       NO      ADDR.   DATA    DATA/
  1272  005530  020040  047040  020117
  1273  005536  020040  020040  040440
  1274  005544  042104  027122  020040
  1275  005552  042040  052101  020101
  1276  005560  020040  042040  052101
  1277  005566  000101
  1278  005570  041520  020040  020040  DH2:     .ASCII  /PC     TEST    WORD    GOOD    BAD/<15><12>
  1279  005576  020040  042524  052123
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1280  005604  020040  020040  047527
1281  005612  042122  020040  020040
1282  005620  047507  042117  020040
1283  005626  020040  040502  006504
1284  005634     012
1285  005635     040  020040  020040          .ASCIZ  /       NO      NO      DATA    DATA/
1286  005642  020040  047040  020117
1287  005650  020040  020040  047040
1288  005656  020117  020040  020040
1289  005664  042040  052101  020101
1290  005672  020040  042040  052101
1291  005700  000101
1292  005702  041520  020040  020040  DH11:   .ASCII  /PC     TEST    FAILING CONT.   CONT.   CONT.   CONT./<15><12>
1293  005710  020040  042524  052123
1294  005716  020040  020040  040506
1295  005724  046111  047111  020107
1296  005732  047503  052116  020056
1297  005740  020040  047503  052116
1298  005746  020056  020040  047503
1299  005754  052116  020056  020040
1300  005762  047503  052116  006456
1301  005770     012
1302  005771     040  020040  020040          .ASCIZ  /       NO      REG ADR RHCS1   RHCS2   RHDS1   RHER1/
1303  005776  020040  047040  020117
1304  006004  020040  020040  051040
1305  006012  043505  040440  051104
1306  006020  051040  041510  030523
1307  006026  020040  051040  041510
1308  006034  031123  020040  051040
1309  006042  042110  030523  020040
1310  006050  051040  042510  030522
1311  006056     000
1312  006057     120  020103  020040  DH14:   .ASCII  /PC     TEST    FAILING CONT.   CONT.   CONT.   CONT.   CONT.  /<15><12
1313  006064  020040  052040  051505
1314  006072  020124  020040  043040
1315  006100  044501  044514  043516
1316  006106  041440  047117  027124
1317  006114  020040  041440  047117
1318  006122  027124  020040  041440
1319  006130  047117  027124  020040
1320  006136  041440  047117  027124
1321  006144  020040  041440  047117
1322  006152  027124  006411     012
1323  006157     040  020040  020040          .ASCIZ  /       NO      REG ADR BAD REG RHCS1   RHCS2   RHDS1   RHER1  /
1324  006164  020040  047040  020117
1325  006172  020040  020040  051040
1326  006200  043505  040440  051104
1327  006206  041040  042101  051040
1328  006214  043505  051040  041510
1329  006222  030523  020040  051040
1330  006230  041510  031123  020040
1331  006236  051040  042110  030523
1332  006244  020040  051040  042510
1333  006252  030522  000011
```

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 1334  006256  041520  020040  020040  DH15:   .ASCIZ  /PC     TEST   REG ADR/
 1335  006264  020040  042524  052123
 1336  006272  020040  020040  042522
 1337  006300  020107  042101  000122
 1338  006306  041520  020040  020040  DH16:   .ASCII  /PC     TEST   WAT    BIT    REG    REG/<15><12>
 1339  006314  020040  042524  052123
 1340  006322  020040  020040  040527
 1341  006330  020124  020040  020040
 1342  006336  044502  020124  020040
 1343  006344  020040  042522  020107
 1344  006352  020040  020040  042522
 1345  006360  006507    012
 1346  006363     040  020040  020040          .ASCIZ  /      NO     PC     WANTED ADDRESS CONTENTS/
 1347  006370  020040  047040  020117
 1348  006376  020040  020040  050040
 1349  006404  020103  020040  020040
 1350  006412  053440  047101  042524
 1351  006420  020104  040440  042104
 1352  006426  042522  051523  041440
 1353  006434  047117  042524  052116
 1354  006442  000123
 1355  006444  041520  020040  020040  DH17:   .ASCII  /PC     TEST   CONT.  CONT.  CONT.  CONT.  CONT./<15><12>
 1356  006452  020040  042524  052123
 1357  006460  020040  020040  047503
 1358  006466  052116  020056  020040
 1359  006474  047503  052116  020056
 1360  006502  020040  047503  052116
 1361  006510  020056  020040  047503
 1362  006516  052116  020056  020040
 1363  006524  047503  052116  006456
 1364  006532     012
 1365  006533     040  020040  020040          .ASCIZ  /      NO     RHBA   RHDB   RHWC   RHCS1  RHCS2/
 1366  006540  020040  047040  020117
 1367  006546  020040  020040  051040
 1368  006554  041110  020101  020040
 1369  006562  051040  042110  020102
 1370  006570  020040  051040  053510
 1371  006576  020103  020040  051040
 1372  006604  041510  030523  020040
 1373  006612  051040  041510  031123
 1374  006620     000
 1375  006621     120  020103  020040  DH20:   .ASCII  /PC     TEST   CONT   CONT   CONT   CONT   CONT/<15><12>
 1376  006626  020040  052040  051505
 1377  006634  020124  020040  041440
 1378  006642  047117  020124  020040
 1379  006650  041440  047117  020124
 1380  006656  020040  041440  047117
 1381  006664  020124  020040  041440
 1382  006672  047117  020124  020040
 1383  006700  041440  047117  006524
 1384  006706     012
 1385  006707     040  020040  020040          .ASCIZ  /      NO     RHER1  RHER2  RHER3  RHAS   RHDS1/
 1386  006714  020040  047040  020117
 1387  006722  020040  020040  051040
```

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1388  006730  042510  030522  020040
1389  006736  051040  042510  031122
1390  006744  020040  051040  042510
1391  006752  031522  020040  051040
1392  006760  040510  020123  020040
1393  006766  051040  042110  030523
1394  006774     000
1395  006775     120  020103  020040  DH21:   .ASCII  /PC     TEST   CONT   CONT   CONT/<15><12>
1396  007002  020040  052040  051505
1397  007010  020124  020040  041440
1398  007016  047117  020124  020040
1399  007024  041440  047117  020124
1400  007032  020040  041440  047117
1401  007040  006524     012
1402  007043     040  020040  020040          .ASCIZ  /      NO     RHCS1  RHAS   RHDS1/
1403  007050  020040  047040  020117
1404  007056  020040  020040  051040
1405  007064  041510  030523  020040
1406  007072  051040  040510  020123
1407  007100  020040  051040  042110
1408  007106  030523     000
1409  007111     120  020103  020040  DH22:   .ASCII  /PC     TEST   RHAS   RHCS2/<15><12>
1410  007116  020040  052040  051505
1411  007124  020124  020040  051040
1412  007132  040510  020123  020040
1413  007140  051040  041510  031123
1414  007146  005015
1415  007150  020040  020040  020040          .ASCIZ  /      NO     UNIT   UNIT/
1416  007156  020040  047516  020040
1417  007164  020040  020040  047125
1418  007172  052111  020040  020040
1419  007200  047125  052111     000
1420  007205     120  020103  020040  DH24:   .ASCII  /PC     TEST   RHDST  BAD    GOOD   SECTOR SECTOR/<15><12>
1421  007212  020040  052040  051505
1422  007220  020124  020040  051040
1423  007226  042110  052123  020040
1424  007234  041040  042101  020040
1425  007242  020040  043440  047517
1426  007250  020104  020040  051440
1427  007256  041505  047524  020122
1428  007264  051440  041505  047524
1429  007272  006522     012
1430  007275     040  020040  020040          .ASCIZ  /      NO     CONT.  RHLA   RHLA   NO     CLOCK/
1431  007302  020040  047040  020117
1432  007310  020040  020040  041440
1433  007316  047117  027124  020040
1434  007324  051040  046110  020101
1435  007332  020040  051040  046110
1436  007340  020101  020040  047040
1437  007346  020117  020040  020040
1438  007354  041440  047514  045503
1439  007362     000
1440  007363     120  020103  020040  DH26:   .ASCII  /PC     TEST   PC OF  FAILING CONT.  CONT.  CONT.  CONT./<15><12>
1441  007370  020040  052040  051505
```

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1442  007376  020124  020040  050040
1443  007404  020103  043117  020040
1444  007412  043040  044501  044514
1445  007420  043516  041440  047117
1446  007426  027124  020040  041440
1447  007434  047117  027124  020040
1448  007442  041440  047117  027124
1449  007450  020040  041440  047117
1450  007456  027124  005015
1451  007462  020040  020040  020040          .ASCIZ  /       NO      JSR     REG ADD RHCS1   RHCS2   RHDS1   RHER1  /
1452  007470  020040  047516  020040
1453  007476  020040  020040  051512
1454  007504  020122  020040  020040
1455  007512  042522  020107  042101
1456  007520  020104  044122  051503
1457  007526  020061  020040  044122
1458  007534  051503  020062  020040
1459  007542  044122  051504  020061
1460  007550  020040  044122  051105
1461  007556  004461     000
1462  007561     120  020103  020040  DH27:   .ASCII  /PC      TEST    PC OF   FAILING GOOD    ACTUAL /<15><12>
1463  007566  020040  052040  051505
1464  007574  020124  020040  050040
1465  007602  020103  043117  020040
1466  007610  043040  044501  044514
1467  007616  043516  043440  047517
1468  007624  020104  020040  040440
1469  007632  052103  040525  004514
1470  007640  005015
1471  007642  020040  020040  020040          .ASCIZ  /       NO      JSR     REG.    DATA    DATA/
1472  007650  020040  047516  020040
1473  007656  020040  020040  051512
1474  007664  020122  020040  020040
1475  007672  042522  027107  020040
1476  007700  020040  040504  040524
1477  007706  020040  020040  040504
1478  007714  040524     000
1479  007717     120  020103  020040  DH30:   .ASCII  /PC      TEST    PC OF   REG.    GOOD    BAD/<15><12>
1480  007724  020040  052040  051505
1481  007732  020124  020040  050040
1482  007740  020103  043117  020040
1483  007746  051040  043505  020056
1484  007754  020040  043440  047517
1485  007762  020104  020040  041040
1486  007770  042101  005015
1487  007774  020040  020040  020040          .ASCIZ  /       NO      JSR     ADDR    DATA    DATA/
1488  010002  020040  047516  020040
1489  010010  020040  020040  051512
1490  010016  020122  020040  020040
1491  010024  042101  051104  020040
1492  010032  020040  040504  040524
1493  010040  020040  020040  040504
1494  010046  040524     000
1495  010051     120  020103  020040  DH31:   .ASCII  /PC      TEST    WORD    GOOD    BAD     CONT.   CONT.   CONT./<15><12>
```

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1496  010056  020040  052040  051505
1497  010064  020124  020040  053440
1498  010072  051117  020104  020040
1499  010100  043440  047517  020104
1500  010106  020040  041040  042101
1501  010114  020040  020040  041440
1502  010122  047117  027124  020040
1503  010130  041440  047117  027124
1504  010136  020040  041440  047117
1505  010144  027124  005015
1506  010150  020040  020040  020040          .ASCIZ  /       NO      NO      DATA    DATA    RHCS1   RHDS1   RHER1   /
1507  010156  020040  047516  020040
1508  010164  020040  020040  047516
1509  010172  020040  020040  020040
1510  010200  040504  040524  020040
1511  010206  020040  040504  040524
1512  010214  020040  020040  044122
1513  010222  051503  020061  020040
1514  010230  044122  051504  020061
1515  010236  020040  044122  051105
1516  010244  004461     000
1517  010247     120  020103  020040  DH32:   .ASCII  /PC     TEST    PC OF   WORD    GOOD    BAD     CONT.   CONT.   CONT./
1518  010254  020040  052040  051505
1519  010262  020124  020040  050040
1520  010270  020103  043117  020040
1521  010276  053440  051117  020104
1522  010304  020040  043440  047517
1523  010312  020104  020040  041040
1524  010320  042101  020040  020040
1525  010326  041440  047117  027124
1526  010334  020040  041440  047117
1527  010342  027124  020011  041440
1528  010350  047117  027124  005015
1529  010356  020040  020040  020040          .ASCIZ  /       NO      JSR     NO      DATA    DATA    RHCS1   RHDS1   RHER1/
1530  010364  020040  047516  020040
1531  010372  020040  020040  051512
1532  010400  020122  020040  020040
1533  010406  047516  020040  020040
1534  010414  020040  040504  040524
1535  010422  020040  020040  040504
1536  010430  040524  020040  020040
1537  010436  044122  051503  020061
1538  010444  020040  044122  051504
1539  010452  020061  020040  044122
1540  010460  051105  000061
1541  010464  041520  020040  020040  DH33:   .ASCII  /PC     TEST    PC OF   WORD    GOOD    CONT.   CONT.   CONT.   /<15><12
1542  010472  020040  042524  052123
1543  010500  020040  020040  041520
1544  010506  047440  020106  020040
1545  010514  047527  042122  020040
1546  010522  020040  047507  042117
1547  010530  020040  020040  047503
1548  010536  052116  020056  020040
1549  010544  047503  052116  020056
```

```
 1550  010552  020040  047503  052116
 1551  010560  004456  005015
 1552  010564  020040  020040  020040          .ASCIZ  /       NO      JSR     NO      DATA    RHCS1   RHDS1   RHER1   /
 1553  010572  020040  047516  020040
 1554  010600  020040  020040  051512
 1555  010606  020122  020040  020040
 1556  010614  047516  020040  020040
 1557  010622  020040  040504  040524
 1558  010630  020040  020040  044122
 1559  010636  051503  020061  020040
 1560  010644  044122  051504  020061
 1561  010652  020040  044122  051105
 1562  010660  004461     000
 1563  010663     120  020103  020040  DH34:   .ASCII  /PC     TEST    GOOD    GOOD    WRITTEN WRITTEN DATA/<15><12>
 1564  010670  020040  052040  051505
 1565  010676  020124  020040  043440
 1566  010704  047517  020104  020040
 1567  010712  043440  047517  020104
 1568  010720  020040  053440  044522
 1569  010726  052124  047105  053440
 1570  010734  044522  052124  047105
 1571  010742  042040  052101  006501
 1572  010750     012
 1573  010751     040  020040  020040          .ASCIZ  /       NO      ECC1    ECC2    ECC1    ECC2    USED/
 1574  010756  020040  047040  020117
 1575  010764  020040  020040  042440
 1576  010772  041503  020061  020040
 1577  011000  042440  041503  020062
 1578  011006  020040  042440  041503
 1579  011014  020061  020040  042440
 1580  011022  041503  020062  020040
 1581  011030  052440  042523  000104
 1582  011036  041520  020040  020040  DH35:   .ASCII  /PC     TEST    GOOD    GOOD    PATTERN POSITON GOOD    RHER1   /<15><12>
 1583  011044  020040  042524  052123
 1584  011052  020040  020040  047507
 1585  011060  042117  020040  020040
 1586  011066  047507  042117  020040
 1587  011074  020040  040520  052124
 1588  011102  051105  020116  047520
 1589  011110  044523  047524  020116
 1590  011116  047507  042117  020040
 1591  011124  020040  044122  051105
 1592  011132  004461  005015
 1593  011136  020040  020040  020040          .ASCIZ  /       NO      ECC1    ECC2    REG.    REG.    POSITON REG./
 1594  011144  020040  047516  020040
 1595  011152  020040  020040  041505
 1596  011160  030503  020040  020040
 1597  011166  041505  031103  020040
 1598  011174  020040  042522  027107
 1599  011202  020040  020040  042522
 1600  011210  027107  020040  020040
 1601  011216  047520  044523  047524
 1602  011224  020116  042522  027107
 1603  011232     000
```

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1604  011233    120   020103  020040  DH36:  .ASCII  /PC     TEST   PC OF  RHMR   POSITON PATTERN/<15><12>
1605  011240  020040  052040  051505
1606  011246  020124  020040  050040
1607  011254  020103  043117  020040
1608  011262  051040  046510  020122
1609  011270  020040  050040  051517
1610  011276  052111  047117  050040
1611  011304  052101  042524  047122
1612  011312  005015
1613  011314  020040  020040  020040         .ASCIZ  /      NO     JSR    CONT.  REG.   REG./
1614  011322  020040  047516  020040
1615  011330  020040  020040  051512
1616  011336  020122  020040  020040
1617  011344  047503  052116  020056
1618  011352  020040  042522  027107
1619  011360  020040  020040  042522
1620  011366  027107    000
1621  011371    120   020103  020040  DH37:  .ASCII  /PC     TEST   POSITON POSITON GOOD   GOOD   PATTERN DATA   N-CODE/
1622  011376  020040  052040  051505
1623  011404  020124  020040  050040
1624  011412  051517  052111  047117
1625  011420  050040  051517  052111
1626  011426  047117  043440  047517
1627  011434  020104  020040  043440
1628  011442  047517  020104  020040
1629  011450  050040  052101  042524
1630  011456  047122  042040  052101
1631  011464  020101  020040  047040
1632  011472  041455  042117  006505
1633  011500    012
1634  011501    040   020040  020040         .ASCIZ  /      NO     ECC    GOOD   ECC1   ECC2   ECC    ENVLOPE ZEROS
1635  011506  020040  047040  020117
1636  011514  020040  020040  042440
1637  011522  041503  020040  020040
1638  011530  043440  047517  020104
1639  011536  020040  042440  041503
1640  011544  020061  020040  042440
1641  011552  041503  020062  020040
1642  011560  042440  041503  020040
1643  011566  020040  042440  053116
1644  011574  047514  042520  055040
1645  011602  051105  051517  000011
1646
1647  011610  041520  020040  020040  DH40:  .ASCII  /PC     TEST   FAILING CONT.  CONT.  CONT.  CONT./<15><12>
1648  011616  020040  042524  052123
1649  011624  020040  020040  040506
1650  011632  046111  047111  020107
1651  011640  047503  052116  020056
1652  011646  020040  047503  052116
1653  011654  020056  020040  047503
1654  011662  052116  020056  020040
1655  011670  047503  052116  006456
1656  011676    012
1657  011677    040   020040  020040         .ASCIZ  /      NO     REG ADR RHCS1  RHCS2  RHDS1  RHER1/
```

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1658  011704  020040  047040  020117
1659  011712  020040  020040  051040
1660  011720  043505  040440  051104
1661  011726  051040  041510  030523
1662  011734  020040  051040  041510
1663  011742  031123  020040  051040
1664  011750  042110  030523  020040
1665  011756  051040  042510  030522
1666  011764     000
1667
1668          011766                  .EVEN
1669
1670  011766  001116  017330  045440  DT1:    .WORD   $ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT,0
1671  011774  001124  001126  000000
1672  012002  001116  017330  052460  DT2:    .WORD   $ERRPC,TSTNM,ERWORD,$GDDAT,0
1673  012010  001124  000000
1674  012014  001116  017330  052460  DT3:    .WORD   $ERRPC,TSTNM,ERWORD,$GDDAT,$BDDAT,0
1675  012022  001124  001126  000000
1676
1677  012030  001116  017330  001122  DT11:   .WORD   $ERRPC,TSTNM,$BDADR,CS1,CS2,DS1,ER1,0
1678  012036  015034  015032  015056
1679  012044  015036  000000
1680  012050  001116  017330  001122  DT14:   .WORD   $ERRPC,TSTNM,$BDADR,$BDDAT,CS1,CS2,DS1,ER1,0
1681  012056  001126  015034  015032
1682  012064  015056  015036  000000
1683  012072  001116  017330  001200  DT15:   .WORD   $ERRPC,TSTNM,$TMP1,0
1684  012100  000000
1685  012102  001116  017330  001204  DT16:   .WORD   $ERRPC,TSTNM,$TMP3,$TMP1,$TMP0,$BDDAT,0
1686  012110  001200  001176  001126
1687  012116  000000
1688  012120  001116  017330  015030  DT17:   .WORD   $ERRPC,TSTNM,BA,DB,WC,CS1,CS2,0
1689  012126  015024  015026  015034
1690  012134  015032  000000
1691
1692  012140  001116  017330  015036  DT20:   .WORD   $ERRPC,TSTNM,ER1,ER2,ER3,AS,DS1,0
1693  012146  015042  015050  015052
1694  012154  015056  000000
1695  012160  001116  017330  015034  DT21:   .WORD   $ERRPC,TSTNM,CS1,AS,DS1,0
1696  012166  015052  015056  000000
1697  012174  001116  017330  001124  DT22:   .WORD   $ERRPC,TSTNM,$GDDAT,$BDDAT,0
1698  012202  001126  000000
1699  012206  001116  017330  015040  DT24:   .WORD   $ERRPC,TSTNM,DST,$BDDAT,$TMP1,$TMP2,$TMP3,0
1700  012214  001126  001200  001202
1701  012222  001204  000000
1702  012226  001116  017330  015134  DT26:   .WORD   $ERRPC,TSTNM,PCJSR,$BDADR,CS1,CS2,DS1,ER1,0
1703  012234  001122  015034  015032
1704  012242  015056  015036  000000
1705  012250  001116  017330  015134  DT27:   .WORD   $ERRPC,TSTNM,PCJSR,REGADR,$GDDAT,$BDDAT,0
1706  012256  045440  001124  001126
1707  012264  000000
1708  012266  001116  017330  015134  DT30:   .WORD   $ERRPC,TSTNM,PCJSR,REGADR,$GDDAT,$BDDAT,0
1709  012274  045440  001124  001126
1710  012302  000000
1711
```

```
1712  012304  001116  017330  052460  DT31:   .WORD   $ERRPC,TSTNM,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1,0
1713  012312  001124  001126  015034
1714  012320  015056  015036  000000
1715  012326  001116  017330  015134  DT32:   .WORD   $ERRPC,TSTNM,PCJSR,ERWORD,$GDDAT,$BDDAT,CS1,DS1,ER1,0
1716  012334  052460  001124  001126
1717  012342  015034  015056  015036
1718  012350  000000
1719  012352  001116  017330  015134  DT33:   .WORD   $ERRPC,TSTNM,PCJSR,ERWORD,$GDDAT,CS1,DS1,ER1,0
1720  012360  052460  001124  015034
1721  012366  015056  015036  000000
1722  012374  001116  017330  050370  DT34:   .WORD   $ERRPC,TSTNM,GECC1,GECC2,WECC1,WECC2,DISK,0
1723  012402  050372  055256  055260
1724  012410  054256  000000
1725  012414  001116  017330  050370  DT35:   .WORD   $ERRPC,TSTNM,GECC1,GECC2,EC2,EC1,POSITI,ER1,0
1726  012422  050372  015066  015064
1727  012430  050402  015036  000000
1728  012436  001116  017330  015134  DT36:   .WORD   $ERRPC,TSTNM,PCJSR,MR,EC1,EC2,0
1729  012444  015054  015064  015066
1730  012452  000000
1731  012454  001116  017330  015064  DT37:   .WORD   $ERRPC,TSTNM,EC1,POSITI,GECC1,GECC2,EC2,DATENV,ZCODE,0
1732  012462  050402  050370  050372
1733  012470  015066  050406  050410
1734  012476  000000
1735  012500  001116  017330  001122  DT40:   .WORD   $ERRPC,TSTNM,$BDADR,CS1,CS2,DS1,ER1,0
1736  012506  015034  015032  015056
1737  012514  015036  000000
1738
1739
1740
1741
1742  012520  000     000     000   DF1:    .BYTE   0,0,0,0,0
1743  012523  000     000
1744  012525  000     000     001   DF2:    .BYTE   0,0,1,0
1745  012530  000
1746  012531  000     000     001   DF3:    .BYTE   0,0,1,0,0
1747  012534  000     000
1748
1749  012536  000     000     000   DF11:   .BYTE   0,0,0,0,0,0,0
1750  012541  000     000     000
1751  012544  000
1752  012545  000     000     000   DF14:   .BYTE   0,0,0,0,0,0,0,0
1753  012550  000     000     000
1754  012553  000     000
1755  012555  000     000     000   DF15:   .BYTE   0,0,0
1756  012560  000     000     000   DF16:   .BYTE   0,0,0,0,0
1757  012563  000     000
1758  012565  000     000     000   DF17:   .BYTE   0,0,0,0,0,0,0
1759  012570  000     000     000
1760  012573  000
1761  012574  000     000     000   DF20:   .BYTE   0,0,0,0,0,0,0
1762  012577  000     000     000
1763  012602  000
1764
1765  012603  000     000     000   DF21:   .BYTE   0,0,0,0,0
```

```
1766  012606  000  000
1767  012610  000  000  000  DF22:  .BYTE  0,0,0,0
1768  012613  000
1769  012614  000  000  000  DF24:  .BYTE  0,0,0,0,0,0,0
1770  012617  000  000  000
1771  012622  000
1772  012623  000  000  000  DF26:  .BYTE  0,0,0,0,0,0,0,0
1773  012626  000  000  000
1774  012631  000  000
1775  012633  000  000  000  DF27:  .BYTE  0,0,0,0,0,0
1776  012636  000  000  000
1777  012641  000  000  000  DF30:  .BYTE  0,0,0,0,0,0
1778  012644  000  000  000
1779
1780  012647  000  000  001  DF31:  .BYTE  0.0.1,0,0,0,0,0
1781  012652  000  000  000
1782  012655  000  000
1783  012657  000  000  000  DF32:  .BYTE  0,0,0,1,0,0.0,0,0
1784  012662  001  000  000
1785  012665  000  000  000
1786  012670  000  000  000  DF33:  .BYTE  0,0,0,1,0,0,0,0
1787  012673  001  000  000
1788  012676  000  000
1789  012700  000  000  000  DF34:  .BYTE  0,0,0,0,0,0,0
1790  012703  000  000  000
1791  012706  000
1792  012707  000  000  000  DF35:  .BYTE  0,0,0,0,0,0,0,0
1793  012712  000  000  000
1794  012715  000  000
1795  012717  000  000  000  DF36:  .BYTE  0,0,0,0,0,0
1796  012722  000  000  000
1797  012725  000  000  000  DF37:  .BYTE  0,0,0,0,0,0,0,0,0
1798  012730  000  000  000
1799  012733  000  000  000
1800  012736  000  000  000  DF40:  .BYTE  0,0,0,0,0,0,0
1801  012741  000  000  000
1802  012744  000
1803
1804          012746                      .EVEN
1805  012746  044122  030461  051040  EM42:  .ASCIZ  /RH11 REGISTER FAILED TO RESPOND TO A "TST" COMMAND/
1806  012754  043505  051511  042524
1807  012762  020122  040506  046111
1808  012770  042105  052040  020117
1809  012776  042522  050123  047117
1810  013004  020104  047524  040440
1811  013012  021040  051524  021124
1812  013020  041440  046517  040515
1813  013026  042116     000
1814
1815  013031     122  030510  020061  EM43:  .ASCIZ  /RH11 ILLEGAL REGISTER RESPONSE TEST/
1816  013036  046111  042514  040507
1817  013044  020114  042522  044507
1818  013052  052123  051105  051040
1819  013060  051505  047520  051516
```

```
1820  013066  020105  042524  052123
1821  013074     000
1822
1823  013075     115  053117  020105  EM44:   .ASCIZ  /MOVE BYTE TO WORD COUNT TEST/
1824  013102  054502  042524  052040
1825  013110  020117  047527  042122
1826  013116  041440  052517  052116
1827  013124  052040  051505  000124
1828
1829  013132  044502  020123  054502  EM45:   .ASCIZ  /BIS BYTE TO WORD COUNT/
1830  013140  042524  052040  020117
1831  013146  047527  042122  041440
1832  013154  052517  052116     000
1833
1834  013161     102  041511  041040  EM46:   .ASCIZ  /BIC BYTE TO WORD COUNT/
1835  013166  052131  020105  047524
1836  013174  053440  051117  020104
1837  013202  047503  047125  000124
1838
1839  013210  042522  044507  052123  EM47:   .ASCIZ  /REGISTER ADDRESS SELECT TEST/
1840  013216  051105  040440  042104
1841  013224  042522  051523  051440
1842  013232  046105  041505  020124
1843  013240  042524  052123     000
1844
1845  013245     116  047117  042440  EM50:   .ASCIZ  /NON EXISTANT DRIVE (NED) TEST/
1846  013252  044530  052123  047101
1847  013260  020124  051104  053111
1848  013266  020105  047050  042105
1849  013274  020051  042524  052123
1850  013302     000
1851
1852  013303     101  020123  042522  EM51:   .ASCIZ  /AS REGISTER TEST/
1853  013310  044507  052123  051105
1854  013316  052040  051505  000124
1855
1856  013324  052502  051523  040440  EM52:   .ASCIZ  /BUSS ADDRESS REGISTER DATA TEST/
1857  013332  042104  042522  051523
1858  013340  051040  043505  051511
1859  013346  042524  020122  040504
1860  013354  040524  052040  051505
1861  013362  000124
1862
1863  013364  052502  051523  040440  EM53:   .ASCIZ  /BUSS ADDRESS REGISTER MOVE BYTE/
1864  013372  042104  042522  051523
1865  013400  051040  043505  051511
1866  013406  042524  020122  047515
1867  013414  042526  041040  052131
1868  013422  000105
1869
1870  013424  044122  030461  044440  EM54:   .ASCIZ  /RH11 INTERRUPT FAILED TO OCCUR/
1871  013432  052116  051105  052522
1872  013440  052120  043040  044501
1873  013446  042514  020104  047524
```

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1874  013454  047440  041503  051125
1875  013462     000
1876
1877  013463     122  051505  052105  EM55:   .ASCIZ  /RESET TEST/
1878  013470  052040  051505  000124
1879
1880  013476  054115  020106  044502  EM56:   .ASCIZ  /MXF BIT TEST/
1881  013504  020124  042524  052123
1882  013512     000
1883
1884  013513     125  044516  052502  EM57:   .ASCIZ  /UNIBUS PARITY BIT TEST/
1885  013520  020123  040520  044522
1886  013526  054524  041040  052111
1887  013534  052040  051505  000124
1888
1889  013542  047504  051505  051440  EM60:   .ASCIZ  /DOES SELECTING THE RH11 CLEAR THE UNIT SELECT REGISTER/
1890  013550  046105  041505  044524
1891  013556  043516  052040  042510
1892  013564  051040  030510  020061
1893  013572  046103  040505  020122
1894  013600  044124  020105  047125
1895  013606  052111  051440  046105
1896  013614  041505  020124  042522
1897  013622  044507  052123  051105
1898  013630     000
1899
1900  013631     104  042517  020123  EM61:   .ASCIZ  /DOES TRE GET SET BY UNIBUS PARITY ERROR/
1901  013636  051124  020105  042507
1902  013644  020124  042523  020124
1903  013652  054502  052440  044516
1904  013660  052502  020123  040520
1905  013666  044522  054524  042440
1906  013674  051122  051117     000
1907
1908  013701     116  047117  042440  EM62:   .ASCIZ  /NON EXISTANT DRIVE (NED) FAILED TO SET (TRE)/
1909  013706  044530  052123  047101
1910  013714  020124  051104  053111
1911  013722  020105  047050  042105
1912  013730  020051  040506  046111
1913  013736  042105  052040  020117
1914  013744  042523  020124  052050
1915  013752  042522  000051
1916
1917  013756  047516  020116  054105  EM63:   .ASCIZ  /NON EXISTANT MEMORY (NEM) FAILED TO SET (TRE)/
1918  013764  051511  040524  052116
1919  013772  046440  046505  051117
1920  014000  020131  047050  046505
1921  014006  020051  040506  046111
1922  014014  042105  052040  020117
1923  014022  042523  020124  052050
1924  014030  042522  000051
1925
1926  014034  047520  052122  051440  EM64:   .ASCIZ  /PORT SELECT FAILED TO CLEAR/
1927  014042  046105  041505  020124
```

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1928  014050  040506  046111  042105
1929  014056  052040  020117  046103
1930  014064  040505  000122
1931
1932  014070  047503  052116  047522  EM65:   .ASCIZ  /CONTROLLER CLEAR FAILED TO CLEAR COMMAND REGISTER/
1933  014076  046114  051105  041440
1934  014104  042514  051101  043040
1935  014112  044501  042514  020104
1936  014120  047524  041440  042514
1937  014126  051101  041440  046517
1938  014134  040515  042116  051040
1939  014142  043505  051511  042524
1940  014150  000122
1941
1942  014152  042522  042523  042514  EM66:   .ASCIZ  /RESELECT FAILED TO CLEAR COMMAND REGISTER/
1943  014160  052103  043040  044501
1944  014166  042514  020104  047524
1945  014174  041440  042514  051101
1946  014202  041440  046517  040515
1947  014210  042116  051040  043505
1948  014216  051511  042524  000122
1949
1950  014224  047111  042524  051122  EM67:   .ASCIZ  /INTERRUPT CAUSED BY  RDY!IE BITS SET FAILED TO OCCUR/
1951  014232  050125  020124  040503
1952  014240  051525  042105  041040
1953  014246  020131  051040  054504
1954  014254  044441  020105  044502
1955  014262  051524  051440  052105
1956  014270  043040  044501  042514
1957  014276  020104  047524  047440
1958  014304  041503  051125     000
1959
1960  014311     111  020105  040506  EM70:   .ASCIZ  /IE FAILED TO CLEAR FOLLOWING AN INTERRUPT/
1961  014316  046111  042105  052040
1962  014324  020117  046103  040505
1963  014332  020122  047506  046114
1964  014340  053517  047111  020107
1965  014346  047101  044440  052116
1966  014354  051105  052522  052120
1967  014362     000
1968
1969  014363     101  020123  042522  EM71:   .ASCIZ  /AS REGISTER WRITE TEST/
1970  014370  044507  052123  051105
1971  014376  053440  044522  042524
1972  014404  052040  051505  000124
1973
1974
1975
1976  014412  041520  020040  020040  DH42:   .ASCII  /PC      TEST    ILLEGAL/<15><12>
1977  014420  020040  042524  052123
1978  014426  020040  020040  046111
1979  014434  042514  040507  006514
1980  014442     012
1981  014443     040  020040  020040          .ASCIZ  /       NO      ADDRESS/
```

```
 1982  014450  020040  047040  020117
 1983  014456  020040  020040  040440
 1984  014464  042104  042522  051523
 1985  014472     000
 1986  014473     120  020103  020040  DH44:   .ASCII  /PC      TEST    REGISTR CONT    CONT/<15><12>
 1987  014500  020040  052040  051505
 1988  014506  020124  020040  051040
 1989  014514  043505  051511  051124
 1990  014522  041440  047117  020124
 1991  014530  020040  041440  047117
 1992  014536  006524     012
 1993  014541     040  020040  020040          .ASCIZ  /       NO      ADDRESS GOOD    BAD/
 1994  014546  020040  047040  020117
 1995  014554  020040  020040  040440
 1996  014562  042104  042522  051523
 1997  014570  043440  047517  020104
 1998  014576  020040  041040  042101
 1999  014604     000
 2000  014605     120  020103  020040  DH54:   .ASCII  /PC      TEST    REGISTR CONT/<15><12>
 2001  014612  020040  052040  051505
 2002  014620  020124  020040  051040
 2003  014626  043505  051511  051124
 2004  014634  041440  047117  006524
 2005  014642     012
 2006  014643     040  020040  020040          .ASCIZ  /       NO      ADDRESS/
 2007  014650  020040  047040  020117
 2008  014656  020040  020040  040440
 2009  014664  042104  042522  051523
 2010  014672     000
 2011
 2012          014674                  .EVEN
 2013
 2014  014674  001116  017330  045440  DT42:   .WORD   $ERRPC,TSTNM,REGADR,0
 2015  014702  000000
 2016  014704  001116  017330  045440  DT44:   .WORD   $ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT,0
 2017  014712  001124  001126  000000
 2018  014720  001116  017330  045440  DT54:   .WORD   $ERRPC,TSTNM,REGADR,$GDDAT,0
 2019  014726  001124  000000
```

FLTINS.ERR ERROR POINTER TABLE

```
2020  014732  000  000  000  DF42:  .BYTE  0,0,0
2021  014735  000  000  000  DF44:  .BYTE  0,0,0,0,0
2022  014740  000  000
2023  014742  000  000  000  DF54:  .BYTE  0,0,0,0
2024  014745  000
```

```
                                .SBTTL  HWARDWARE 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)
```

```
2118            100000          DCK=    100000                  ;DATA CHECK ERROR (BIT 15)
2119
2120                            ;MAINTAINABILITY REGISTER (RHMR)(#03)
2121
2122            000001          DMD=    1                       ;DIAGINOSTIC MODE (BIT #0)
2123            000002          MCLK=   2                       ;MAINTAINABILITY CLOCK (BIT #1)
2124            000004          MINX=   4                       ;MAINTAINABILITY INDEX (BIT #2)
2125            000010          MSTCK=  10                      ;MAINTAINABILITY SECTOR CLOCK (BIT #3)
2126            000020          MRD=    20                      ;MAINTAINABILITY READ (BIT #4)
2127            000040          MWR=    40                      ;MAINTAINABILITY WRITE (BIT #5)
2128            000200          DENVL=  200                     ;DATA ENVELOPE (BIT #7)
2129            000400          ZER=    400                     ;ZERO DETECT (BIT #8)
2130            001000          DTSY=   1000                    ;MAINTAINABILITY SYNC DETECTED (BIT #9)
2131
2132                            ;ATTENTION SUMMARY PSEUDO-REGISTER (RHAS) (#04)
2133
2134            000001          AT0=    1                       ;DEVICE 0 (BIT #0)
2135            000002          AT1=    2                       ;DEVICE 1 (BIT #1)
2136            000004          AT2=    4                       ;DEVICE 2 (BIT #2)
2137            000010          AT3=    10                      ;DEVICE 3 (BIT #3)
2138            000020          AT4=    20                      ;DEVICE 4 (BIT #4)
2139            000040          AT5=    40                      ;DEVICE 5 (BIT #5)
2140            000100          AT6=    100                     ;DEVICE 6 (BIT #6)
2141            000200          AT7=    200                     ;DEVICE 7 (BIT #7)
2142
2143
2144
2145
2146
2147                            ;DESIRED SECTOR/TRACK ADDRESS REGISTER (RHDST) (#1)
2148                            ;EACH BIT IS CALLED BY BIT NUMBER
2149
2150
2151
2152
2153
2154                            ;DRIVE TYPE REGISTER (RHDT) (#06)
2155                            ;EACH BIT IS CALLED BY BIT NUMBER
2156
2157
2158
2159
2160
2161                            ;LOOK-AHEAD REGISTER (RHLA) (#07)
2162
2163            000001          EXT1=   1                       ;EXTENSION 1 (BIT #0)
2164            000002          EXT2=   2                       ;EXTENSION 2 (BIT #1)
2165            000004          EXT4=   4                       ;EXTENSION 3 (BIT #2)
2166            000010          EXT10=  10                      ;EXTENSION 4 (BIT #3)
2167            000020          EXT20=  20                      ;EXTENSION 5 (BIT #4)
2168            000040          EXT40=  40                      ;EXTENSION 6 (BIT #5)
2169            000100          SC1=    100                     ;SECTOR COUNT FIELD 0 (BIT #6)
2170            000200          SC2=    200                     ;SECTOR COUNT FIELD 1 (BIT #7)
2171            000400          SC4=    400                     ;SECTOR COUNT FIELD 2 (BIT #8)
```

```
                                SC10=   1000            ;SECTOR COUNT FIELD 3 (BIT #9)
                                SC20=   2000            ;SECTOR COUNT FIELD 4 (BIT #10)
                                TRK1=   4000            ;TRACK FIELD 1 (BIT #11)
                                TRK2=   10000           ;TRACK FIELD 2 (BIT #12)
                                TRK4=   20000           ;TRACK FIELD 3 (BIT #13)
                                TRK10=  40000           ;TRACK FIELD 4 (BIT #14)
                                TRK20=  100000          ;TRACK FIELD 5 (BIT #15)

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

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

                        ;OFFSET REGISTER (RHOF) (#11)

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

                                OFREV=  200             ;OFFSET NEGATIVE (REVERSE) (BIT #7)
                                HCI=    2000            ;HEADER COMPARE INHIBIT (BIT #10)
                                ECI=    4000            ;ERROR CORRECTION CODE INHIBIT (BIT #11)
                                FMT22=  10000           ;FORMAT BIT (BIT #12


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



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

```
2226
2227
2228
2229
2230                            ;SERIAL NUMBER REGISTER (RHSN) (#14)
2231                            ;EACH IS CALLED BY BIT NUMBER
2232
2233
2234
2235
2236
2237                            ;ERROR REGISTER #03 (RHER3) (#15)
2238
2239    000001                  PSU=    1               ;PACK SPEED UNSAFE (BIT #0)
2240    000002                  VUF=    2               ;VELOCITY UNSAFE (BIT #1)
2241    000010                  UWR=    10              ;ANY UNSAFE EXCEPT READ/WRITE (BIT #3)
2242    000020                  PRE=    20              ;DISK PACK ROTATION ERROR (BIT #4)
2243    000040                  ACL=    40              ;AC LOW (BIT #5)
2244    000100                  DCL=    100             ;DC LOW (BIT #6)
2245    040000                  SKI=    40000           ;SEEK INCOMPLETE (BIT #14)
2246    100000                  OCYL=   100000          ;OFF CYLINDER (BIT #15)
2247
2248                            ;ECC POSITION REGISTER (RHEC1) (#16)
2249                            ;EACH BIT IS CALLED BY BIT NUMBER
2250
2251
2252
2253
2254
2255                            ;ECC PATTERN REGISTER (RHEC2) (#17)
2256                            ;EACH BIT IS CALLED BY BIT NUMBER
2257
```

```
                                .SBTTL  REGISTER ADDRESSES

                                ;RP04/5/6 VECTOR ADDRESS

014746  000254                  RPVEC:  254                     ;RP04/5/6 VECTOR ADDRESS


                                ;RP04/5/6 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 TAGGED "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

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

                                ;ADDITIONAL REGISTERS LOCATED IN THE RH70 CONTROLLER

015020  176752                  RHCS3:  176752                  ;CONTROL AND STATUS REGISTER #3
015022  176750                  RHBAE:  176750                  ;BUS ADDRESS EXTENSION REGISTER
```

```
2310
2311                                    ;THE FOLLOWING LOCATIONS ARE RESERVED FOR REGISTER SAVES
2312                                    ;ANY TIME THERE IS AN ERROR ALL THESE WILL BE FILLED
2313                                    ;ONLY SOME MAY BE PRINTED BUT ALL WILL BE FILLED TRUE
2314                                    ;FOR THE TIME JUST AFTER THE "ERROR" ERROR COMMAND
2315
2316  015024  000000                    DB:     0                       ;DATA BUFFER
2317  015026  000000                    WC:     0                       ;WORD COUNT
2318  015030  000000                    BA:     0                       ;BUS ADDRESS
2319  015032  000000                    CS2:    0                       ;CONTROL AND STATUS 2
2320
2321
2322  015034  000000                    CS1:    0                       ;CONTROL AND STATUS 1
2323  015036  000000                    ER1:    0                       ;ERROR #1
2324  015040  000000                    DST:    0                       ;DESIRED SECTOR/TRACK ADDRESS
2325  015042  000000                    ER2:    0                       ;ERROR #2
2326  015044  000000                    OF:     0                       ;OFFSET
2327  015046  000000                    CA:     0                       ;DESIRED CYLINDER ADDRESS
2328  015050  000000                    ER3:    0                       ;ERROR #3
2329  015052  000000                    AS:     0                       ;ATTENTION SUMMARY
2330  015054  000000                    MR:     0                       ;MAINTAINABILITY
2331  015056  000000                    DS1:    0                       ;DRIVE STATUS
2332  015060  000000                    DT:     0                       ;DRIVE TYPE
2333  015062  000000                    SN:     0                       ;SERIAL NUMBER
2334  015064  000000                    EC1:    0                       ;ECC POSITION
2335  015066  000000                    EC2:    0                       ;ECC PATTERN
2336  015070  000000                    LA:     0                       ;LOOK-AHEAD
2337  015072  000000                    CC:     0                       ;CURRENT CYLINDER ADDRESS
2338
2339
```

```
2340                                    ;FLAGS AND INTERNAL PROGRAM CONTROL WORDS
2341
2342
2343
2344  015074  000010    UNITS:  .BLKW   8.          ;THIS IS FILLED WITH -1
2345  015114  000000    UNIT:   .WORD   0           ;UNIT UNDER TEST
2346  015116  000000    NOUNIT: .WORD   0           ;NUMBER OF UNITS PRESENT
2347                                                ;USED TO KEEP TRACK OF UNIT UNDER TEST
2348  015120  000000    NUNIT:  .WORD   0           ;USED TO DETERMIN IF THERE ARE MORE
2349                                                ;THAN ONE UNIT
2350  015122  000000    SELECT: .WORD   0           ;ALL ONES INDICATE UNIT TO BE SELECTED
2351  015124  000000    UNITSL: .WORD   0           ;UNIT NO. SELECTED
2352
2353  015126  000000    ERFLG$: 0                   ;ERROR FLAG
2354
2355  015130  000000    SAVDT:  0                   ;SAVE DRIVE TYPE REGISTER
2356                                                ;FOR COMPARISON IN DRIVE CLEAR TEST
2357                                                ;AND RH INIT TEST
2358  015132  000000    SAVSN:  0                   ;SAVE SERIAL NUMBER REGISTER
2359                                                ;FOR COMPARISON IN DRIVE CLEAR TEST
2360                                                ;AND RH INIT TEST
2361
2362  015134  000000    PCJSR:  0                   ;SAVE PC OF JSR WHICH GAVE THE ERROR
2363
2364  015136  000000    ATTENT: 0                   ;ATTENTION BIT FOR PRESENT UNIT
2365  015140  000000    TOTALAT:        0           ;TOTAL ATTENTION BITS
2366
2367  015142  000000    TMPILL: 0                   ;TEMPORARY ILLEGAL FUNCTION
2368
2369  015144  000000    TSECC:  0                   ;FLAG TO SAY IF ECC TEST OR NOT
2370                                                ;WHEN =177777 IT IS AN ECC TEST
2371                                                ;WHEN =0IT IS NOT AN ECC TEST
2372
2373  015146  000000    TESDTE: 0                   ;FLAG TO SAY IF DRIVE TIMING ERROR OR NOT
2374                                                ;WHEN = 177777 IT IS A DTE TEST
2375                                                ;WHEN = 0      IT IS NOT A DTE TEST
2376
2377  015150  000000    TAGDTE: 0                   ;TEMPORARY TAG USED IN DRIVE TIMING
2378                                                ;ERROR TEST
2379
```

```
2380
2381
2382                                    ;FUNCTION EQUATES
2383
2384                                    ;TABLE OF COMMAND FUNCTIONS FOR RHCS1
2385                                    ;THEN "GO" BIT HAS TO BE SET
2386
2387  015152                    FUTABL:
2388  015152  000000            NOPERA: 0                       ;NO OPERATION
2389  015154  000002            UNLOAD: 2                       ;UNLOAD (STAND BY)
2390  015156  000006            RECALI: 6                       ;RECALIBRATE
2391  015160  000010            DCLEAR: 10                      ;DRIVE CLEAR
2392  015162  000012            RELEAS: 12                      ;RELEASE (DUAL-PORT OPERATION)
2393  015164  000030            SERCH:  30                      ;SEARCH COMMAND
2394  015166  000050            WRCHEK: 50                      ;WRITE CHECK DATA
2395  015170  000052            WRCHDT: 52                      ;WRITE CHECK HEADER AND DATA
2396  015172  000060            WRIDAT: 60                      ;WRITE DATA
2397  015174  000062            WRIFOR: 62                      ;WRITE HEADER AND DATA (FORMAT)
2398  015176  000070            READAT: 70                      ;READ DATA
2399  015200  000072            REFOR:  72                      ;READ HEADER AND DATA
2400  015202  000004            SEECOM: 4                       ;SEEK COMMAND
2401  015204  000014            OFSETC: 14                      ;OFFSET COMMAND
2402  015206  000016            RETCL:  16                      ;RETURNTO CENTERLINE
2403  015210  000022            PKACK:  22                      ;PACK ACKNOWLEDGE
2404  015212  000020            READIN: 20                      ;READ IN
2405  015214  000000            ILLEGL: .WORD                   ;COMPUTED ILLEGAL FUNCTION
2406
2407
2408
2409                                    ;DATA BUFFER FOR READ WRITE
2410
2411
2412  015220  000422            WRFROM: .BLKW   274.            ;WRITE FROM THIS BUFFER
2413  016264  000422            REINTO: .BLKW   274.            ;READ INTO THIS BUFFER
2414
2415
2416  017330  000000            TSTNM:  0                       ;TEST NUMBER
2417  017332  000000            FIRST:  0                       ;IF ZERO WILL TYPE HEADER
2418                                                            ;IF ONES WILL NOT TYPE HEADER
2419
2420  017334  000000            RH70:   0                       ;FLAG = 1 FOR RH70 CONTROLLER
2421                                                            ;FLAG = 0 FOR RH11
2422
2423
2424
2425
2426                                    ;TABLE FOR ATTENTION BITS
2427                                    ;ATTENTION TABLE
2428
2429  017336    001   002   004 ATABLE: .BYTE   1,2,4,10,20,40,100,200
2430  017341    010   020   040
2431  017344    100   200
```

```
                                                .SBTTL
                                                .SBTTL  ***PROGRAM SETUP & SETUP TESTS***
                                                .SBTTL
017346  012737  177777  015122  BEGIN2: MOV     #-1,@#SELECT    ;SELECT UNIT
017354  000402                  BR      START
017356  005037  015122          BEGIN:  CLR     @#SELECT        ;DO NOT SELECT UNIT
                                                                ;NORMAL RUN

017362                          START:
017362  000005                          RESET
                                .SBTTL  INITIALIZE THE COMMON TAGS
                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
017364  012706  001100                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
017370  005026                          CLR     (R6)+           ;;CLEAR MEMORY LOCATION
017372  022706  001140                  CMP     #SWR,R6 ;;DONE?
017376  001374                          BNE     .-6             ;;LOOP BACK IF NO
017400  012706  001000                  MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                ;;INITIALIZE A FEW VECTORS
017404  012737  057060  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
017412  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
017420  012737  061276  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
017426  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
017434  012737  062046  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
017442  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
017450  012737  062122  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
017456  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
017464  005037  001212                  CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
017470  005037  001214                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
017474  112737  000001  001115          MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
017502  012737  017502  001106          MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
017510  012737  017510  001110          MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
                                ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
017516  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
017522  012737  017556  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
017530  012737  177570  001140          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
017536  012737  177570  001142          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
017544  022777  177777  161366          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
017552  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                ;;AND  THE HARDWARE SWR IS NOT = -1
017554  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
017556  012716  017564          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
017562  000002                          RTI
017564  012737  000176  001140  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
017572  012737  000174  001142          MOV     #DISPREG,DISPLAY
017600  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR


017604  012737  000000  177776  STARTA: MOV     #0,PS           ;SET PROCESSOR STATUS TO 0
017612  012777  056772  175126          MOV     #RPVECT,@RPVEC  ;THIS IS FOR UNTIMELY DRIVE INTERRUPTS
```

```
2486  017620  004737  060036          JSR     PC,@#$TKINT     ;INITIALIZE TTY KEYBOARD
2487  017624  005737  017332          TST     @#FIRST         ;IS THIS FIRST TIME ROUND ?
2488  017630  001001                  BNE     1$              ;DON'T TYPE HEADER IF NOT
2489  017632  000402                  BR      2$              ;TYPE HEADER IF SO
2490
2491  017634  000137  020662  1$:     JMP     @#SND1
2492
2493  017640                  2$:
2494  017640  104400  017646          TYPE    ,65$            ;;TYPE ASCIZ STRING
2495  017644  000435                  BR      64$             ;;GET OVER THE ASCIZ
2496                          ;;65$:  .ASCIZ  <15><12>?RP04/5/6 DISKLESS CONTROLLER TEST - PART II  - DZRJH-A?
2497  017740                  64$:
2498
2499  017740  104400  017746          TYPE    ,67$            ;;TYPE ASCIZ STRING
2500  017744  000417                  BR      66$             ;;GET OVER THE ASCIZ
2501                          ;;67$:  .ASCIZ  <15><12>/REVISION DATE: 21-MAR-76/<15><12>
2502  020004                  66$:
2503
2504  020004  104400  020012          TYPE    ,69$            ;;TYPE ASCIZ STRING
2505  020010  000433                  BR      68$             ;;GET OVER THE ASCIZ
2506                          ;;69$:  .ASCIZ  <15><12>/ALL DCL'S UNDER TEST MUST BE LOCKED ON CORRECT PORT/
2507  020100                  68$:
2508  020100  104400  020106          TYPE    ,71$            ;;TYPE ASCIZ STRING
2509  020104  000433                  BR      70$             ;;GET OVER THE ASCIZ
2510                          ;;71$:  .ASCIZ  <15><12>/IF CHANGES ARE REQUIRED ON PORT SWITCH, A CYCLE UP/
2511  020174                  70$:
2512  020174  104400  020202          TYPE    ,73$            ;;TYPE ASCIZ STRING
2513  020200  000436                  BR      72$             ;;GET OVER THE ASCIZ
2514                          ;;73$:  .ASCIZ  <15><12>/SEQUENCE IS REQUIRED FOR STROBING THE PORT SELECT FLOP/<15><12>
2515  020276                  72$:
2516  020276  104400  020304          TYPE    ,75$            ;;TYPE ASCIZ STRING
2517  020302  000431                  BR      74$             ;;GET OVER THE ASCIZ
2518                          ;;75$:  .ASCIZ  <15><12>/ALL DCL'S NOT UNDER TEST MUST BE SWITCHED OFF/<15><12>
2519  020366                  74$:
2520  020366  104400  020374          TYPE    ,77$            ;;TYPE ASCIZ STRING
2521  020372  000427                  BR      76$             ;;GET OVER THE ASCIZ
2522                          ;;77$:  .ASCIZ  <15><12>/*********************************************/
2523  020452                  76$:
2524  020452  104400  020460          TYPE    ,79$            ;;TYPE ASCIZ STRING
2525  020456  000427                  BR      78$             ;;GET OVER THE ASCIZ
2526                          ;;79$:  .ASCIZ  <15><12>/IF THIS IS NOT DONE, ERRORS WILL RESULT ON/
2527  020536                  78$:
2528  020536  104400  020544          TYPE    ,81$            ;;TYPE ASCIZ STRING
2529  020542  000415                  BR      80$             ;;GET OVER THE ASCIZ
2530                          ;;81$:  .ASCIZ  <15><12>/'NED' TESTS (T21 & T36)/
2531  020576                  80$:
2532  020576  104400  020604          TYPE    ,83$            ;;TYPE ASCIZ STRING
2533  020602  000427                  BR      82$             ;;GET OVER THE ASCIZ
2534                          ;;83$:  .ASCIZ  <15><12>/*********************************************/
2535  020662                  82$:
2536
2537  020662  012737  177777  017332  SND1:   MOV     #-1,@#FIRST             ;NEXT TIME DO NOT GIVE HEADER
2538
2539                          .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
```

```
2540  020670  005737  000042            TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
2541  020674  001006                    BNE     64$             ;;BRANCH IF YES
2542  020676  023727  001140  000176    CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
2543  020704  001005                    BNE     65$             ;;BRANCH IF NO
2544  020706  104405                    GTSWR                   ;;GET SOFT-SWR SETTINGS
2545  020710  000403                    BR      65$
2546  020712  112737  000001  001134  64$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
2547  020720                          65$:
2548
2549  020720  032777  010000  160212  RH70CK: BIT     #SW12,@SWR              ;LOOK TO SEE IF USING RH70
2550  020726  001403                    BEQ     3$                      ;IF SW12 = 0, SKIP NEXT
2551  020730  012737  177777  017334    MOV     #-1,@#RH70              ;IF SW12 = 1, CU IS AN RH70
2552
2553  020736  005737  015122          3$:     TST     @#SELECT                ;WAS IT A 200 START
2554  020742  001434                    BEQ     TST1            ;GO TO FIRST TEST IF STARTING FROM 200 ------)
2555  020744  104400  020752                  TYPE    ,65$            ;;TYPE ASCIZ STRING
2556  020750  000422                    BR      64$             ;;GET OVER THE ASCIZ
2557                                  ;;65$:  .ASCIZ  <15><12>/SELECT UNIT NUMBER TO BE TESTED ?/
2558  021016                          64$:
2559  021016  104411                    RDOCT
2560  021020  042716  177770          BIC     #177770,(SP)            ;ONLY KEEP LAST 3 BITS
2561  021024  011637  015114          MOV     (SP),@#UNIT             ;SAVE UNIT TO BE TESTED
2562  021030  012637  015124          MOV     (SP)+,@#UNITSL          ;SAVE UNIT TO BE TESTED
2563
2564
2565
```

```
                                ;;*****************************************************************
                                ;*TEST 1         REFERENCE EACH REGISTER
                                ;
                                ;*              REFERENCE EACH REGISTER BY A MOVE INSTRUCTION
                                ;
                                ;;*****************************************************************
021034  000004                  TST1:   SCOPE
021036  012737  000001  001212          MOV     #1,$TIMES       ;;DO 1 ITERATION
021044  012706  001000          MOV     #STACK, SP      ;SET UP STACK POINTER
021050  012737  000001  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
021056  012737  061306  000030          MOV     #REGSA1,@#EMTVEC;ERROR VECTOR SO THAT
                                                        ;NO REGISTERS ARE SAVED
021064  012737  021112  000004          MOV     #2$,@#ERRVEC    ;SET UP FOR BUS TIMEOUT
021072  012700  000024          MOV     #24,R0          ;THERE ARE 24 REG TO TEST
021076  012701  014750          MOV     #RHDB,R1        ;R1 NOW HAS ADDR OF ADDR OF FIRST REG.
021102  013102                  1$:     MOV     @(R1)+,R2       ;READ HARDWARE REG.
021104  005300          DEC     R0              ;COUNT DOWN
021106  001375          BNE     1$              ;BRANCH IF 24 NOT DONE
021110  000471          BR      3$              ;BRANCH IF 24 DONE
021112  012737  000006  000004  2$:     MOV     #ERRVEC+2,@#ERRVEC ;RESTORE TRAP CATCHER
021120  022626          CMP     (SP)+,(SP)+     ;CLEAN STACK
021122  016137  177776  001200          MOV     -2(R1), $TMP1   ;STORE FAILING REG ADDR
021130  104015          ERROR   15              ;REGISTER NON EXISTANT
021132  032777  020000  160000          BIT     #SW13,@SWR      ;INHIBIT ERROR PRINTOUT ?
021140  001053          BNE     4$              ;BRANCH IF YES
021142  104400  021150          TYPE    ,65$            ;;TYPE ASCIZ STRING
021146  000431          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12>/IF BASE ADDRESS IS TO BE CHANGED HALT PROGRAM /
021232                          64$:
021232  104400  021240          TYPE    ,67$            ;;TYPE ASCIZ STRING
021236  000411          BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  <15><12>/AND RESTART AT /
021262                          66$:
021262  012746  051320          MOV     #BASECH,-(SP)   ;GET READY TO TYPE STARTING ADDRESS
                                                        ;OF "CHANGE OF BASE ADDRESS" ROUTINE
021266  104401          TYPOC
021270  000137  044470          4$:     JMP     @#$EOP          ;GO TO END OF PROGRAM ---------------->

021274  012737  061276  000030  3$:     MOV     #$ERROR,@#EMTVEC;RESTORE ERROR VECTOR
                                                        ;SO THAT REGISTERS ARE SAVED
021302  012737  000006  000004          MOV     #ERRVEC+2,@#ERRVEC ;RESTORE TRAP CATCHER
```

```
                                        ;;*****************************************************************
                                        ;*TEST 2        RHCS2-CONTROL AND STATUS 2
                                        ;
                                        ;*      THIS PARTIALLY TESTS RHCS2 TO ENABLE DETERMINATION
                                        ;*      OF THE NUMBER OF DRIVES PRESENT
                                        ;
                                        ;;*****************************************************************
021310  000004                        TST2:   SCOPE
021312  012737  000001  001212                MOV     #1,$TIMES       ;;DO 1 ITERATION
021320  012706  001000                        MOV     #STACK,SP       ;RESET STACK
021324  012737  000002  017330                MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                        ;
                                        ;*CHECK TO SEE IF PROGRAM IS RUNNING WITH AN RH70
                                        ;
021332  005737  017334                        TST     @#RH70          ;TEST FOR RH70 CONTROLLER
021336  001402                        BEQ     30$             ;IF FLAG = 1, SKIP THIS TEST
021340  000137  021366                JMP     TST3            ;JUMP TO NEXT TEST ----------------------)
021344                                  30$:                            ;IF FLAG = 0, DO THIS TEST
                                        ;
021344  013737  014756  021360                MOV     @#RHCS2,@#UN+2
021352  004537  045442                        JSR     R5,@#BITST      ;TEST BITS IN REGISTER
021356  020017                          UN:   20017                   ;ONLY THESE BITS ARE TEST READ/WRITE
021360  000000                        .WORD   0                       ;ADDRESS OF REG. BEING TESTED
021362  104001                        ERROR   1                       ;IN CORRECT DATA RECEIVED
021364  000207                        RTS     PC              ;RETURN TO BLT3 ROUTINE
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;;*****************************************************************
                                        ;*TEST 3        PARTIAL TEST OF RHAS FOR UNIT NUMBERS PRESENT
                                        ;;*****************************************************************
021366  000004                        TST3:   SCOPE
021370  012737  000001  001212                MOV     #1,$TIMES       ;;DO 1 ITERATION
021376  012737  000003  017330                MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                        ;
021404  013701  014776                        MOV     @#RHAS,R1       ;R1 HAS ADDRESS OF RHAS
021410  012711  177777                        MOV     #-1,@R1         ;THIS CLEARS RHAS (SURPRISED!)
021414  011137  001126                        MOV     @R1,@#$BDDAT    ;TEST DATA
021420  105737  001126                        TSTB    @#$BDDAT
021424  001405                        BEQ     TST4            ;BRANCH IF GOOD
021426  005037  001124                        CLR     @#$GDDAT        ;GOOD DATA
021432  010137  045440                        MOV     R1,@#REGADR     ;FAILING REG. RHAS
021436  104001                        ERROR   1               ;RHAS DOES NOT CLEAR
                                                                ;WITH ONES MOVED INTO IT
```

```
                                        ;;*****************************************************************
                                        ;*TEST 4         TEST FOR DRIVES PRESENT USING RHAS AND RHCS2
                                        ;;*****************************************************************
021440  000004                  TST4:   SCOPE
021442  012737  000001  001212          MOV     #1,$TIMES       ;;DO 1 ITERATION
021450  000005                          RESET                   ;START WITH AN INIT
021452  004737  060036                  JSR     PC,@#$TKINT     ;INITILIZE TTY KEYBOARD
                                
021456  032777  020000  157454          BIT     #SW13,@SWR      ;INHIBIT ERROR TYPEOUT ?
021464  001026                          BNE     4$              ;SKIP NEXT IF SO
021466  104400  021474                  TYPE    ,65$            ;;TYPE ASCIZ STRING
021472  000423                          BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <15><12><15><12>/LOOKING AT RHAS - DRIVES PRESENT/
021542                          64$:
021542  013701  014776          4$:     MOV     @#RHAS,R1       ;R1 HAS ADDR. OF RHAS
021546  013702  014756                  MOV     @#RHCS2,R2      ;R2 HAS ADDR. OF RHCS2
021552  005012                          CLR     @R2             ;CLEAR RHCS2
021554  012700  000010                  MOV     #8.,R0          ;COUNT
021560  013704  014762                  MOV     @#RHER1,R4      ;R4 HAS ADDR. OF RHER1
                                
021564  012714  177777          1$:     MOV     #-1,@R4         ;MOVE ERRORS INTO RHER1
021570  005212                          INC     @R2             ;INCREMENT UNIT NO.
021572  005300                          DEC     R0              ;COUNT
021574  001373                          BNE     1$              ;BRANCH IF 8 NOT DONE
021576  111137  015140                  MOVB    @R1,@#TOTALAT   ;SAVE TOTAL ATTENTION
                                                                ;USED IN DRIVE CLEAR TEST
021602  105037  015141                  CLRB    @#TOTALAT+1     ;CLEAR UPPER BYTE
021606  105711                          TSTB    @R1             ;TEST FOR ANY DRIVES PRESENT
021610  001402                          BEQ     2$              ;NONE RESPONDING - TYPE THE MESSAGE
021612  000137  022202                  JMP     XE2             ;SOME THERE - GO FILL "UNITS" TABLE
                                
021616  032777  020000  157314  2$:     BIT     #SW13,@SWR      ;INHIBIT ERROR TYPE OUT?
021624  001402                          BEQ     3$              ;"NO DRIVES" MESSAGE IF NO
021626  000137  022540                  JMP     SELTST          ;CHECK FOR SELECTED UNIT START AND LOAD
                                                                ;"UNITS" TABLE WITH DESIRED DRIVE IF SO
                                
021632                          3$:
021632  104400  021640                  TYPE    ,67$            ;;TYPE ASCIZ STRING
021636  000412                          BR      66$             ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  <15><12>/NO DRIVES-RHAS=0/
021664                          66$:
021664  104400  021672                  TYPE    ,69$            ;;TYPE ASCIZ STRING
021670  000436                          BR      68$             ;;GET OVER THE ASCIZ
                                        ;;69$:  .ASCIZ  <15><12>/WRITING ONES INTO ERROR REGISTER #1 FOR ALL UNIT NUMBERS/
021766                          68$:
021766  104400  021774                  TYPE    ,71$            ;;TYPE ASCIZ STRING
021772  000441                          BR      70$             ;;GET OVER THE ASCIZ
                                        ;;71$:  .ASCIZ  <15><12>/DOES NOT SET ANY BIT IN THE ATTENTION REGISTER SO ABORT PROGRAM
022076                          70$:
022076  104400  022104                  TYPE    ,73$            ;;TYPE ASCIZ STRING
022102  000435                          BR      72$             ;;GET OVER THE ASCIZ
                                        ;;73$:  .ASCIZ  <15><12>/TO LOOP ON THIS TEST WO PRINTOUT SET SWITCHES 13, 8 & 2/
022176                          72$:
```

```
2714
2715  022176  000137  044470                  JMP     @#$EOP          ;GO OUT------------------------------>
2716
2717
2718                                          ;*SET UP UNITS TABLE
2719
2720  022202                          XE2:
2721  022202  012700  000010          2$:     MOV     #8.,R0          ;COUNTER
2722  022206  012703  015074                  MOV     #UNITS,R3       ;POINTER
2723  022212  012723  177777          3$:     MOV     #-1,(R3)+       ;PRESET BLOCK TO ALL ONES
2724  022216  005300                          DEC     R0              ;COUNT
2725  022220  001374                          BNE     3$              ;BRANCH IF 8 NOT DONE
2726  022222  012703  015074                  MOV     #UNITS,R3       ;POINTER
2727  022226  005005                          CLR     R5
2728  022230  005037  015116                  CLR     @#NOUNIT        ;NO. OF UNITS PRESENT
2729  022234  012700  000010                  MOV     #8.,R0          ;COUNTER
2730  022240  011137  001176                  MOV     @R1,@#$TMP0     ;TEMPORARY STORAGE
2731  022244  006037  001176          4$:     ROR     @#$TMP0         ;SET CARRY IF ONE IN  0 BIT
2732
2733  022250  103120                          BCC     5$
2734  022252  010577  172500                  MOV     R5,@RHCS2       ;INSERT UNIT NUMBER
2735  022256  022777  024020  172520          CMP     #24020,@RHDT    ;IS THIS A DUAL PORT RP04 ?
2736  022264  001503                          BEQ     6$              ;TYPE DRIVE NO. IF SO
2737  022266  022777  020020  172510          CMP     #20020,@RHDT    ;IS THIS A SINGLE PORT RP04 ?
2738  022274  001477                          BEQ     6$              ;TYPE DRIVE NO.IF YES
2739
2740
2741                                  ;;**********************************************************************
2742  022276  022777  024021  172500          CMP     #24021,@RHDT    ;IS THIS A DUAL PORT RP05 ?
2743  022304  001473                          BEQ     6$              ;TYPE UNIT NO. OUT
2744  022306  022777  020021  172470          CMP     #20021,@RHDT    ;IS THIS A SINGLE PORT RP05 ?
2745  022314  001467                          BEQ      6$             ;TYPE UNIT NO. IF SO
2746
2747  022316  022777  024022  172460          CMP     #24022,@RHDT    ;IS THIS A DUAL PORT RP06 ?
2748  022324  001463                          BEQ     6$              ;TYPE THE NO IF SO
2749  022326  022777  020022  172450          CMP     #20022,@RHDT    ;IS THIS A SINGLE PORT RP06 ?
2750  022334  001457                          BEQ     6$              ;TYPE THE NO IF SO
2751                                  ;;**********************************************************************
2752
2753
2754                                          ;*NO...IT'S NOT AN RP04/RP05/RP06 DEVICE
2755                                          ;*SO TYPE OUT THE DEVICE TYPE
2756
2757  022336  104400  022344                  TYPE    ,65$            ;;TYPE ASCIZ STRING
2758  022342  000410                          BR      64$             ;;GET OVER THE ASCIZ
2759                                  ;;65$:  .ASCIZ  <15><12>/UNIT NUMBER /
2760  022364                          64$:
2761  022364  010546                          MOV     R5,-(SP)        ;GET READY TO TYPE UNIT NUMBER
2762  022366  104404                          TYPOS
2763  022370  104400  022376                  TYPE    ,67$            ;;TYPE ASCIZ STRING
2764  022374  000406                          BR      66$             ;;GET OVER THE ASCIZ
2765                                  ;;67$:  .ASCIZ  /,  RHDT = /
2766  022412                          66$:
2767  022412  017746  172366                  MOV     @RHDT,-(SP)     ;GET READY TO TYPE RHDT
```

```
2768  022416  104401                          TYPOC
2769  022420  104400  022426                  TYPE    ,69$            ;;TYPE ASCIZ STRING
2770  022424  000422                          BR      68$             ;;GET OVER THE ASCIZ
2771                                ;;69$:    .ASCIZ  ? - NOT AN RP04/RP05/RP06 DEVICE !!?
2772  022472                        68$:
2773  022472  000407                          BR      5$              ;NO RP04/5/6 FOUND SO BRANCH
2774  022474  010523                6$:       MOV     R5,(R3)+
2775  022476  104400  001223                  TYPE    ,$CRLF
2776  022502  010546                          MOV     R5,-(SP)        ;PUT DRIVE NO. ON STACK
2777  022504  104404                          TYPDS                   ;TYPE DRIVE NO.
2778  022506  005237  015116                  INC     @#NOUNIT        ;INCR TOTAL NO. OF UNITS
2779
2780  022512  005205                5$:       INC     R5              ;'RHCS2' UNIT ADDRESS
2781  022514  005300                          DEC     R0              ;DRIVE COUNTER DOWN ONE
2782  022516  001252                          BNE     4$              ;TEST AND DO NEXT UNIT IF 8 NOT DONE
2783
2784  022520  013737  015074  015114          MOV     @#UNITS,@#UNIT  ;SET UNIT NO. TO FIRST ONE FOUND/OR 0
2785  022526  013737  015116  015120          MOV     @#NOUNIT,@#NUNIT  ;SAVE NO. OF UNITS
2786  022534  005337  015120                  DEC     @#NUNIT         ;IF NUNIT = 0 THEN ONLY ONE UNIT
2787                                                                  ;IF NUNIT > 0 THEN MORE THAN ONE UNIT
2788
2789  022540  005737  015122        SELTST:   TST     @#SELECT        ;STARTING ADDRESS 200 ?
2790  022544  001403                          BEQ     TST5            ;BRANCH IF STARTING FROM 200
2791  022546  013737  015124  015114          MOV     @#UNITSL,@#UNIT ;CHANGE UNIT NUMBER TO SELECTED ONE
2792
```

```
                                        ;;*****************************************************************
                                        ;*TEST 5         TYPE SERIAL NUMBER AND DRIVE TYPE
                                        ;
                                        ;*              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
                                        ;
                                        ;;*****************************************************************
022554  000004                  TST5:   SCOPE
022556  012737  000001  001212          MOV     #1,$TIMES       ;;DO 1 ITERATION
022564  012737  023234  001106          MOV     #1$,$LPADR      ;;SET SCOPE LOOP ADDRESS
                                        
022572  004737  045674                  JSR     PC,@#CLDISK     ;FILL UNIT NO.
022576  005037  015136                  CLR     @#ATTENT        ;CLEAR
                                        
                                        ;*TEST FOR UNIT #0
                                        
022602  005737  015114                  TST     @#UNIT          ;IS UNIT #0 NEXT IN THE UNITS TABLE ?
022606  001022                          BNE     10$             ;IF NOT, TEST THIS UNIT
022610  012700  000041                  MOV     #41,R0          ;IF SO, CHECK THE LOAD MEDIA LOCATION
022614  122710  000011                  CMPB    #11,(R0)        ;WAS IS AN RP04/5/6 ?
022620  001015                          BNE     10$             ;NO... GO AHEAD AND TEST UNIT #0
022622  005737  015122                  TST     @#SELECT        ;WAS UNIT #0 SELECTED ?
                                                                ;(IE. WAS IT A 210 START ?)
022626  001012                          BNE     10$             ;IF SO...TEST UNIT #0
                                        
                                        ;*INCREMENT THE UNITS TABLE TO NEXT DRIVE (IF ANY)
                                        ;* & DECREMENT THE "NOUNITS" PRESENT (TO BE TESTED)
                                        
022630  012700  015074                  MOV     #UNITS,R0       ;LOAD UNITS TABLE POINTER
022634  005720                          TST     (R0)+           ;SELECT THE NEXT UNIT IN THE TABLE
                                                                ;(DOUBLE INCREMENT THE POINTER)
022636  022710  177777                  CMP     #-1,(R0)        ;IS THERE ANOTHER TABLE ENTRY PRESENT ?
022642  001404                          BEQ     10$             ;IF NOT (LOC = -1) ...MUST USE UNIT #0
022644  011037  015114                  MOV     (R0),@#UNIT     ;SET UP TO BE THE UNIT UNDER TEST
022650  005337  015116                  DEC     @#NOUNITS       ;DECREMENT BECAUSE UNIT #0 WON'T BE TESTED
022654  013700  015114          10$:    MOV     @#UNIT,R0       ;R0 CONTAINS THE UNIT UNDER TEST
                                        
                                        
                                        ;;*****************************************************************
                                        ;       CLR     @#RP06          ;CLEAR RP06 DEVICE TYPE FLAG
                                        ;       CMP     #24022,@RHDT    ;DUAL PORT RP06 ?
                                        ;       BEQ     2$              ;YES...SET THE FLAG
                                        ;       CMP     #20022,@RHDT    ;SINGLE PORT RP06 ?
                                        ;       BEQ     2$              ;YES...SET FLAG
                                        ;       BR      3$              ;DON'T SET THE RP06 FLAG
                                        ;2$:    MOV     #-1,@#RP06      ;SET THE FLAG
                                        
                                        ;3$:                            ;ASSUME THE NEXT UNIT IS AN RP04
                                        ;;*****************************************************************
```

```
2847
2848  022660  116037  017336  015136          MOVB    ATABLE(R0),@#ATTENT  ;SET APPROPRIATE ATTENTION BIT
2849  022666  104400  022674                  TYPE    ,65$                 ;;TYPE ASCIZ STRING
2850  022672  000414                          BR      64$                  ;;GET OVER THE ASCIZ
2851                                  ;;65$:  .ASCIZ  <15><12>/TESTING DRIVE NUMBER/
2852  022724                          64$:
2853  022724  013746  015114                  MOV     @#UNIT,-(SP)         ;UNIT NO. TO STACK
2854  022730  104404                          TYPDS                        ;TYPE  DRIVE NO.
2855  022732  104400  022740                  TYPE    ,67$                 ;;TYPE ASCIZ STRING
2856  022736  000410                          BR      66$                  ;;GET OVER THE ASCIZ
2857                                  ;;67$:  .ASCIZ  <15><12>/SERIAL NO. = /
2858  022760                          66$:
2859  022760  017746  172022                  MOV     @RHSN,-(SP)          ;;SAVE @RHSN FOR TYPEOUT
2860  022764  104401                          TYPOC                        ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
2861  022766  104400  022774                  TYPE    ,69$                 ;;TYPE ASCIZ STRING
2862  022772  000410                          BR      68$                  ;;GET OVER THE ASCIZ
2863                                  ;;69$:  .ASCIZ  <15><12>/DRIVE TYPE = /
2864  023014                          68$:
2865  023014  017746  171764                  MOV     @RHDT,-(SP)          ;;SAVE @RHDT FOR TYPEOUT
2866  023020  104401                          TYPOC                        ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
2867
2868
2869
2870
2871
2872                                  ;;*****************************************************************
2873  023022  022777  024020  171754          CMP     #24020,@RHDT         ;DUAL PORT RP04 ?
2874  023030  001425                          BEQ     4$                   ;TYPE ASCII MSG OUT
2875  023032  022777  020020  171744          CMP     #20020,@RHDT         ;SINGLE PORT RP04 ?
2876  023040  001421                          BEQ     4$                   ;TYPE THE MESSAGE
2877
2878  023042  022777  024021  171734          CMP     #24021,@RHDT         ;DUAL PORT RP05 ?
2879  023050  001434                          BEQ     5$                   ;TYPE THE MESSAGE
2880  023052  022777  020021  171724          CMP     #20021,@RHDT         ;SINGLE PORT RP05 ?
2881  023060  001430                          BEQ     5$                   ;TYPE THE MESSAGE
2882
2883  023062  022777  024022  171714          CMP     #24022,@RHDT         ;DUAL PORT RP06 ?
2884  023070  001443                          BEQ     6$                   ;TYPE THE MESSAGE
2885  023072  022777  020022  171704          CMP     #20022,@RHDT         ;SINGLE PORT RP06 ?
2886  023100  001437                          BEQ     6$                   ;TYPE IT OUT
2887  023102  000454                          BR      1$                   ;DRIVE IS NOT RP04/5/6 - SO
2888                                                                       ;DO NOT TYPE ANY MESSAGE OUT
2889
2890                                                                       ;-SHOULD NEVER HAPPEN AT THIS POINT
2891                                                                       ;UNLESS DRIVE GOT SICK WHILE TESTING
2892                                                                       ;WAS IN PROGRESS
2893
2894  023104                          4$:
2895  023104  104400  023112                  TYPE    ,71$                 ;;TYPE ASCIZ STRING
2896  023110  000413                          BR      70$                  ;;GET OVER THE ASCIZ
2897                                  ;;71$:  .ASCIZ  <15><12>/DRIVE IS AN RP04/<15><12>
2898  023140                          70$:
2899  023140  000435                          BR      1$                   ;SKIP NEXT ONES
2900  023142                          5$:
```

```
 2901  023142  104400  023150                    TYPE    ,73$            ;;TYPE ASCIZ STRING
 2902  023146  000413                            BR      72$             ;;GET OVER THE ASCIZ
 2903                                    ;;73$:  .ASCIZ  <15><12>/DRIVE IS AN RP05/<15><12>
 2904  023176                                    72$:
 2905  023176  000416                            BR      1$              ;SKIP NEXT
 2906  023200                                    6$:
 2907  023200  104400  023206                    TYPE    ,75$            ;;TYPE ASCIZ STRING
 2908  023204  000413                            BR      74$             ;;GET OVER THE ASCIZ
 2909                                    ;;75$:  .ASCIZ  <15><12>/DRIVE IS AN RP06/<15><12>
 2910  023234                                    74$:
 2911                                    ;;*****************************************************************
 2912
 2913  023234  005777  171546            1$:     TST     @RHSN           ;READ SERIAL NO. AND DRIVE TYPE
 2914  023240  005777  171540                    TST     @RHDT           ;THESE TWO ARE TO HELP SCOPE LOOPS
 2915  023244  017737  171536  015132            MOV     @RHSN,@#SAVSN   ;SAVE TO CHECK IF CLR RHCS2 BIT 5 CLEARS ANY BITS
 2916  023252  017737  171526  015130            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
                                ;
                                ;;*****************************************************************
023260  000004                  TST6:   SCOPE
023262  012737  000006  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
023270  004737  045674          JSR     PC,@#CLDISK     ;GIVE INITILIZE
023274  032713  010000          BIT     #MOL,@R3        ;CHECK MOL IN RHDS1
023300  001550                  BEQ     TST7            ;BRANCH IF MOL LOW
                                
023302  104400  023310          TYPE    ,65$            ;;TYPE ASCIZ STRING
023306  000421                  BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12>/DRIVE IS ON LINE - MOL IS HIGH/
023352                          64$:
023352  104400  023360          TYPE    ,67$            ;;TYPE ASCIZ STRING
023356  000424                  BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  <15><12>/HIT STOP ON DRIVE TO GET IT OFF LINE/
023430                          66$:
023430  104400  023436          TYPE    ,69$            ;;TYPE ASCIZ STRING
023434  000430                  BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$:  .ASCIZ  <15><12>/PROGRAM WILL HANG TESTING MOL TILL MOL IS LOW/
023516                          68$:
                                
023516  032713  010000          1$:     BIT     #MOL,@R3        ;CHECK MOL IN RHDS1
023522  001375                  BNE     1$              ;BRANCH IF MOL IS HIGH
023524  104400  023532          TYPE    ,71$            ;;TYPE ASCIZ STRING
023530  000434                  BR      70$             ;;GET OVER THE ASCIZ
                                ;;71$:  .ASCIZ  <15><12>/GOOD - MOL IS NOW LOW . PROGRAM WILL NOW BE EXECUTED/
023622                          70$:
```

```
                                        ;;*****************************************************************
                                        ;*TEST 7         PACK ACKNOWLEDGE COMMAND TEST

                                        ;*      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

                                        ;;*****************************************************************
023622  000004                          TST7:   SCOPE
023624  012706  001000                          MOV     #STACK,SP       ;RESET STACK
023630  012737  000007  017330                  MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER

023636  004737  045674                  JSR     PC,@#CLDISK     ;INIT AND SET UP GENERAL REG.
                                                                ;AND UNIT NUMBER
023642  012777  000001  171130          MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE

023650  013777  015210  171102          MOV     @#PKACK,@RHCS1  ;LOAD PACK ACKNOWLEDGE COMMAND INTO RHCS1

                                        ;SAVE REGISTERS FOR COMPARISON AFTER GO
023656  004037  046366                  JSR     R0,@#SAVER      ;SAVE
023662  014752                          RHWC                    ;FROM
023664  016264                          REINTO                  ;TO
023666  000023                          19.                     ;NUMBER OF REGISTERS SAVED

                                        ;GIVE GO TO PACK ACKNOWLEDGE COMMAND
023670  052777  000001  171062          BIS     #GO,@RHCS1      ;GO TO PACK ACKNOWLEDGE COMMAND

                                        ;CHANGE SAVED REGISTERS TO EXPECTED VALUES
023676  052737  000100  016314          BIS     #VV,@#REINTO+30 ;SAVED RHDS1

                                        ;AFTER GO HAS BEEN GIVEN TO PACK ACKNOWLEDGE COMMAND
                                        ;SAVE REGISTERS AGAIN SO THAT COMPARISONS CAN
                                        ;BE DONE
023704  004037  046366                  JSR     R0,@#SAVER      ;SAVE
023710  014752                          RHWC                    ;FROM
023712  015220                          WRFROM
023714  000023                          19.                     ;NUMBER OF REGISTERS SAVED

                                        ;AS UPPER BYTE OF RHAS CAN BE CHANGING IN A DUAL PORT
                                        ;OPERATION THE UPPER BYTE OF RHAS WILL BE SAVED AS IS
                                        ;SO THAT THE COMPARES ARE ONLY VALID FOR THE LOWER BYTE
023716  113737  016311  015245          MOVB    @#REINTO+25,@#WRFROM+25;SAVE UPPER RHAS

                                        ;COMPARE REGISTERS BEFORE PACK ACKNOWLEDGE COMMAND
                                        ;WITH AFTER GO
023724  004037  046570                  JSR     R0,@#COMPAR     ;COMPARE
023730  016264                          REINTO                  ;GOOD BUFFER
023732  015220                          WRFROM                  ;TEST BUFFER
023734  000023                          19.                     ;NUMBER
023736  023744                          1$                      ;RETURN FOR ERROR
023740  023744                          1$                      ;SAME
```

```
3009  023742  023764                          2$                          ;RETURN FOR GOOD COMPARISON
3010  023744  013705  052460          1$:     MOV     @#ERWORD,R5         ;GETTING READY TO INDEX
3011  023750  060505                          ADD     R5,R5               ;DOUBLE ERROR WORD
3012  023752  016537  014750  045440          MOV     RHWC-2(R5),@#REGADR ;FAILING REGISTER ADDRESS
3013
3014  023760  104001                          ERROR   1                   ;IMPROPER REGISTER CHANGE
3015                                                                      ;AFTER PACK ACKNOWLEDGE COMMAND
3016                                                                      ;WITH GO IS GIVEN
3017  023762  000207                          RTS     PC                  ;RETURN TO COMPARISION
3018
3019  023764                          2$:
3020
3021                                  ;;*******************************************************************
3022                                  ;*TEST 10       MAKE CURRENT CYLINDER = 0
3023                                  ;;*******************************************************************
3024  023764  000004                  TST10:  SCOPE
3025  023766  012706  001000                  MOV     #STACK,SP           ;RESET STACK
3026  023772  012737  000010  017330          MOV     #TTNO,@#TSTNM       ;THIS SAVES TEST NUMBER
3027  024000  004737  045674                  JSR     PC,@#CLDISK         ;INIT DRIVE
3028  024004  012777  000001  170766          MOV     #DMD,@RHMR          ;SET DIAGNOSTIC MODE
3029  024012  004037  050246                  JSR     R0,@#MAKECYL        ;SUBROUTINE TO GIVE A SEEK
3030                                                                      ;COMMAND FOLOWED BY AN INIT
3031  024016  000000                          0                           ;THIS SHUOLD CHANGE RHCC TO 0
3032
3033
3034                                          .SBTTL
3035                                          .SBTTL  ***DIAGNOSTIC CODE***
3036                                          .SBTTL
```

```
3037            000004                  TIMOT=4
3038                                    .REM %
3039                                    THE FOLLOWING TESTS WILL ATTEMPT TO CATCH THOSE BUGS WHICH FAULT
3040                                    INSERTION HAS SHOWN US WE MISSED IN THE FIRST PART OF THIS TEST.
3041
3042                                     THIS TEST WILL ASCERTAIN THAT THE ALL RH11 REGISTERS WIIL
3043                                    RESPOND TO I.E. NOT CAUSE A NON-EXISTANT MEMORY ERROR WHEN ACCESSED
3044                                    BY A "TST" INSRUCTION.
3045                                    %
3046                                    ;;*****************************************************************
3047                                    ;*TEST 11        BCTA LEGAL REGISTER RESPONSE TEST
3048                                    ;;*****************************************************************
3049   024020   000004                  TST11:  SCOPE
3050   024022   012737   000001  001212          MOV     #1,$TIMES       ;;DO 1 ITERATION
3051   024030   012737   177777  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3052   024036   012777   000040  170712          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3053
3054   024044   012705   014760                  MOV     #RHCS1,R5       ;R5=LIST POINTER.
3055
3056   024050   013737   000004  001176          MOV     @#TIMOT,$TMP0   ;SAVE TIMEOUT VECTOR.
3057   024056   012737   024114  000004          MOV     #E00,@#TIMOT    ;SET VECTOR TO E00
3058
3059   024064   012706   001000          L00:    MOV     #STACK,SP       ;SET STACK POINTER.
3060
3061   024070   011502                  I00:    MOV     (R5),R2         ;R2=RH11 ADDRESS.
3062   024072   010237   045440                  MOV     R2,REGADR
3063   024076   005712                          TST     (R2)            ;DOES THE RH11 REGISTER RESPOND?
3064
3065   024100   062705   000002                  ADD     #2,R5           ;UPDATE ADDRESS
3066   024104   020527   015012                  CMP     R5,#RHEC2       ;AT THE END OF LEGAL RH11 REGISTERS?
3067   024110   101767                          BLOS    I00             ;NOPE
3068   024112   000401                          BR      000             ;YES! GOTO 000.
3069
3070   024114   104042                  E00:    ERROR   42
3071
3072   024116   013737   001176  000004  000:    MOV     $TMP0,@#TIMOT   ;RESTORE TIMEOUT VECTOR.
```

```
3073
```

```
3074                                    .REM %
3075                                    THE FOLLOWING 6 TESTS WILL TEST THE BYTE LOGIC FOR THE RH11 REGISTERS
3076                                    NO ATTEMPT IS MADE TO DETERMINE IF ALL POSSIBLE DATA PATTERNS CAN BE
3077                                    LOADED, ONLY THAT THE RH11 HARDWARE WILL ALLOW THE PROGRAM TO SELECTIVLY
3078                                    MANIPULATE BYTES USING THE FOLLOWING COMMANDS:
3079
3080                                            1). MOVE BYTE BOTH TO AND FROM THE WORD COUNT REGISTER
3081
3082                                            2). BIT SET INTO THE WORD COUNT REGISTER.
3083
3084                                            3). BIT CLEAR INTO THE WORD COUNT REGISTER.
3085
3086                                    %
3087
3088                                    ;;*****************************************************************
3089                                    ;*TEST 12        BCTA MOVB LO BYTE TO WC
3090                                    ;;*****************************************************************
3091  024124  000004                    TST12:  SCOPE
3092  024126  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3093  024134  012737  000012  017330            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3094  024142  012777  000040  170606            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3095
3096  024150  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3097
3098  024154  013702  014752                    MOV     RHWC,R2         ;R2=RH11 WC ADDRESS.
3099  024160  010237  045440                    MOV     R2,REGADR       ;REGISTER ADDRESS TO REGADR FOR TYPING.
3100  024164  012737  000377  001124            MOV     #377,$GDDAT     ;$GDDAT=S/B.
3101
3102  024172  005012                    LO2:    CLR     (R2)            ;CLEAR RH11 WC.
3103
3104  024174  112712  000377            IO2:    MOVB    #377,(R2)       ;SET WC TO LO BYTE.
3105  024200  011237  001126                    MOV     (R2),$BDDAT     ;$BDDAT=ACTUAL WAS
3106
3107  024204  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS
3108  024212  001401                            BEQ     TST13           ;NEXT TEST
3109  024214  104044                            ERROR   44
3110
```

```
3111
3112                                    ;;**********************************************************************
3113                                    ;*TEST 13        BCTA MOVB HI BYTE TO WC
3114                                    ;;**********************************************************************
3115  024216  000004                    TST13:  SCOPE
3116  024220  012737  000001  001212            MOV     #1,$TIMES           ;;DO 1 ITERATION
3117  024226  012737  000013  017330            MOV     #T†NO,@#TSTNM       ;†HIS SAVES TEST NUMBER
3118  024234  012777  000040  170514            MOV     #CLR,@RHCS2         ;CLEAR RH11 CONTROLLER
3119
3120  024242  012706  001000                    MOV     #STACK,SP           ;SET STACK POINTER.
3121
3122  024246  013702  014752                    MOV     RHWC,R2             ;R2=RH11 WC HI BYTE ADDRESS.
3123  024252  010237  045440                    MOV     R2,REGADR
3124  024256  012737  177400  001124            MOV     #177400,$GDDAT      ;$GDDAT=S/B.
3125
3126  024264  005012                    LO3:    CLR     (R2)                ;CLEAR RH11 WC.
3127
3128  024266  005202                            INC     R2                  ;R2=HI BYTE ADDRESS.
3129
3130  024270  112712  000377            IO3:    MOVB    #377,(R2)           ;SET WC HI BYTE.
3131
3132  024274  005302                            DEC     R2                  ;R2=FULL WORD ADDRESS.
3133
3134  024276  011237  001126                    MOV     (R2),$BDDAT         ;$BDDAT=ACTUAL.
3135
3136  024302  023737  001126  001124            CMP     $BDDAT,$GDDAT       ;COMPARE RESULTS.
3137  024310  001401                            BEQ     TST14               ;NEXT TEST
3138  024312  104044                            ERROR   44
3139
3140
```

```
3141
3142                                    ;;*****************************************************************
3143                                    ;*TEST 14        BCTA BISB LO BYTE TO WC
3144                                    ;;*****************************************************************
3145  024314  000004                    TST14:  SCOPE
3146  024316  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3147  024324  012737  000014  017330            MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
3148  024332  012777  000040  170416            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3149
3150  024340  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3151
3152  024344  013702  014752                    MOV     RHWC,R2         ;R2=RH11 WC ADDRESS
3153  024350  010237  045440                    MOV     R2,REGADR
3154  024354  012737  000377  001124            MOV     #377,$GDDAT     ;$GDDAT=S/B.
3155
3156  024362  005012                    LO4:    CLR     (R2)            ;CLEAR RH11 WC.
3157
3158  024364  012712  000252                    MOV     #252,(R2)       ;SET UP WC
3159  024370  152712  000125            IO4:    BISB    #125,(R2)       ;DO A BISB
3160
3161  024374  011237  001126                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3162
3163  024400  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS
3164  024406  001401                            BEQ     TST15           ;NEXT TEST
3165  024410  104045                            ERROR   45
3166
3167
```

```
3168
3169                                    ;;*******************************************************************
3170                                    ;*TEST 15        BCTA BISB HI-BYTE TO WC
3171                                    ;;*******************************************************************
3172  024412  000004                    TST15:  SCOPE
3173  024414  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3174  024422  012737  000015  017330            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3175  024430  012777  000040  170320            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3176
3177  024436  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3178
3179  024442  013702  014752                    MOV     RHWC,R2         ;R2=RH11 WC ADDRESS.
3180  024446  010237  045440                    MOV     R2,REGADR
3181  024452  012737  177400  001124            MOV     #177400,$GDDAT  ;$GDDAT=S/B.
3182
3183  024460  005012                    LO5:    CLR     (R2)            ;CLEAR RH11 WC.
3184
3185  024462  005202                            INC     R2              ;R2 =HI BYTE.
3186
3187  024464  112712  000125                    MOVB    #125,(R2)       ;SET UP RH11 WC.
3188  024470  152712  000252            IO5:    BISB    #252,(R2)       ;DO A BISB.
3189
3190  024474  005302                            DEC     R2              ;R2=FULL WORD ADDRESS.
3191
3192  024476  011237  001126                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3193
3194  024502  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3195  024510  001401                            BEQ     TST16           ;NEXT TEST
3196  024512  104045                            ERROR   45
3197
3198
```

```
3199
3200                                    ;;*********************************************************************
3201                                    ;*TEST 16        BCTA BICB LO-BYTE TO WC
3202                                    ;;*********************************************************************
3203  024514  000004                    TST16:  SCOPE
3204  024516  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3205  024524  012737  000016  017330            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3206  024532  012777  000040  170216            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3207
3208  024540  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3209
3210  024544  013702  014752                    MOV     RHWC,R2         ;R2=RH11 WC ADDRESS.
3211  024550  010237  045440                    MOV     R2,REGADR
3212  024554  012737  000252  001124            MOV     #252,$GDDAT     ;$GDDAT=S/B.
3213
3214  024562  005012                    LO6:    CLR     (R2)            ;CLEAR RH11 WC.
3215
3216  024564  012712  000377                    MOV     #377,(R2)       ;SET WC=0000377
3217
3218  024570  142712  000125            I06:    BICB    #125,(R2)       ;DO A BICB
3219
3220  024574  011237  001126                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3221
3222  024600  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3223  024606  001401                            BEQ     TST17           ;NEXT TEST
3224  024610  104046                            ERROR   46
3225
3226
```

```
3227
3228                                    ;;*****************************************************************
3229                                    ;*TEST 17        BCTA BICB HI- BYTE TO WC
3230                                    ;;*****************************************************************
3231  024612  000004                    TST17:  SCOPE
3232  024614  012737  000001  001212            MOV     #1,$TIMES           ;;DO 1 ITERATION
3233  024622  012737  000017  017330            MOV     #TTNO,@#TSTNM       ;THIS SAVES TEST NUMBER
3234  024630  012777  000040  170120            MOV     #CLR,@RHCS2         ;CLEAR RH11 CONTROLLER
3235
3236  024636  012706  001000                    MOV     #STACK,SP           ;SET STACK POINTER.
3237
3238  024642  013702  014752                    MOV     RHWC,R2             ;R2=RH11 WC ADDRESS.
3239  024646  010237  045440                    MOV     R2,REGADR
3240  024652  012737  125000  001124            MOV     #125000,$GDDAT      ;$GDDAT=S/B.
3241
3242  024660  005012                  LO7:      CLR     (R2)                ;CLEAR RH11 WC.
3243
3244  024662  005202                            INC     R2                  ;R2=HI BYTE.
3245
3246  024664  112712  000377                    MOVB    #377,(R2)           ;SET WC=177400
3247  024670  142712  000125          I07:      BICB    #125,(R2)           ;DO A BICB
3248
3249  024674  005302                            DEC     R2                  ;R2=FULL WORD.
3250
3251  024676  011237  001126                    MOV     (R2),$BDDAT         ;$BDDAT=WAS.
3252
3253  024702  023737  001126  001124            CMP     $BDDAT,$GDDAT       ;COMPARE RESULTS.
3254  024710  001401                            BEQ     TST20               ;NEXT TEST
3255  024712  104046                            ERROR   46
3256
3257
```

```
                                .REM    %
                                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
                                CONTIGUOUS 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.

                                FOR THE CASE OF THE RH70, THE CONFIGURATION ALLOWS 18 REGISTERS, SO
                                WE WILL ATTEMPT TO ADDRESS REGISTER 23(8) OR AS BEFORE THE LAST
                                REGISTER + 2.
                                        %

                                ;;*****************************************************************
                                ;*TEST 20        BCTA ILLEGAL REGISTER TEST
                                ;;*****************************************************************
024714  000004                  TST20:  SCOPE
024716  012737  000001  001212          MOV     #1,$TIMES       ;;DO 1 ITERATION
024724  012737  000020  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
024732  012777  000040  170016          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

024740  005737  017334                  TST     @#RH70          ;CHECK TO SEE IF RUNNING WITH RH70
024744  001403                          BEQ     1$              ;IF NOT...SKIP NEXT & DO FOLLOWING
024746  013702  015020                  MOV     RHCS3,R2        ;R2 = LAST LEGAL RH70 REG ADDRESS
024752  000402                          BR      2$              ;SKIP NEXT

024754  013702  015012          1$:     MOV     RHEC2,R2        ;R2 = LAST LEGAL RH11 REG ADDRESS.
024760  062702  000002          2$:     ADD     #2,R2           ;R2 = FIRST ILLEGAL ADDRESS.
024764  010237  045440                  MOV     R2,REGADR
024770  005037  001126                  CLR     $BDDAT          ;$BDDAT=WAS.
024774  005037  001124                  CLR     $GDDAT          ;$GDDAT=S/B.

025000  013737  000004  001176          MOV     @#TIMOT,$TMP0   ;SAVE TIMEOUT VECTOR.
025006  012737  025024  000004          MOV     #010,@#TIMOT    ;SET TIMEOUT VECTOR TO 010.

025014  012706  001000          L10:    MOV     #STACK,SP       ;SET THE STACK POINTER.

025020  005712                          TST     (R2)            ;TEST ADDRESS.

025022  104047                          ERROR   47

025024  013737  001176  000004  010:    MOV     $TMP0,@#TIMOT   ;RESTORE TIMEOUT VECTOR.
```

```
                                        ;
                                        ;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)
                                        ;;**************************************************************
025032  000004                  TST21:  SCOPE
025034  012737  000001  001212          MOV     #1,$TIMES       ;;DO 1 ITERATION
025042  012737  000021  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
025050  012777  000040  167700          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

025056  123727  015140  000377          CMPB    @#TOTALAT,#377          ;ARE ALL DRIVES ON LINE.
025064  001150                          BNE     U11             ;NO GO RUN THE TEST.

025066  023727  001100  000000          CMP     $PASS,#0        ;IF PASS #0 THEN TYPE MESSAGE
                                                                ;ADVISING OPERATOR
                                                                ;THAT THIS TEST WILL NOT BE RUN
025074  001002                          BNE     Y11
025076  000137  025510                  JMP     X11

025102                          Y11:
025102  104400  025110                  TYPE    ,65$            ;;TYPE ASCIZ STRING
025106  000426                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12>/ALL DRIVES APPEAR TO BE ON LINE THEREFORE/
025164                          64$:
025164  104400  025172                  TYPE    ,67$            ;;TYPE ASCIZ STRING
025170  000426                          BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  <15><12>/THE NED NON-EXISTANT DRIVE TEST CANNOT BE/
025246                          66$:
025246  104400  025254                  TYPE    ,69$            ;;TYPE ASCIZ STRING
025252  000425                          BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$:  .ASCIZ  <15><12>/RUN. TO RUN THIS TEST TAKE ONE OR MORE/
025326                          68$:
025326  104400  025334                  TYPE    ,71$            ;;TYPE ASCIZ STRING
025332  000425                          BR      70$             ;;GET OVER THE ASCIZ
                                ;;71$:  .ASCIZ  <15><12>/DRIVES OFF-LINE AND RESTART THE PROGRAM/
025406                          70$:

025406  012706  001000          U11:    MOV     #STACK,SP       ;SET STACK POINTER.

025412  013702  014756                  MOV     RHCS2,R2        ;R2=RH11 RHCS2 ADDRESS.
025416  010237  045440                  MOV     R2,REGADR

025422  013700  015140                  MOV     @#TOTALAT,R0
025426  005001                          CLR     R1
```

```
3355  025430  006000                  S11:    ROR     R0
3356  025432  103423                          BCS     N11
3357
3358  025434  010137  001124          R11:    MOV     R1,$GDDAT       ;$GDDAT=S/B.
3359  025440  052737  010000  001124          BIS     #NED,$GDDAT
3360
3361  025446  013705  014760                  MOV     RHCS1,R5        ;ADDRESS OF A DEVICE REGISTER.
3362
3363  025452  010112                  L11:    MOV     R1,(R2)         ;LOAD A NON-EXISTANT DRIVE.
3364
3365  025454  011537  001176                  MOV     (R5),$TMP0      ;ATTEMPT TO READ FROM DEVICE REGISTER.
3366
3367  025460  011237  001126                  MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3368  025464  042737  167770  001126          BIC     #^C<NED!US4!US2!US1>,$BDDAT;$BDDAT=SAVED DATA.
3369
3370  025472  023737  001126  001124          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3371  025500  001005                          BNE     E11
3372
3373  025502  005201                  N11:    INC     R1
3374  025504  020127  000010                  CMP     R1,#8.          ;TESTED ALL DRIVES YET.
3375  025510                          X11:
3376  025510  001402                          BEQ     TST22           ;NEXT TEST
3377  025512  000746                          BR      S11
3378
3379  025514  104050                  E11:    ERROR   50
3380
3381
```

```
3382
3383                                    ;;*****************************************************************
3384                                    ;*TEST 22       BCTB (NED) NON-EXISTANT DRIVE TEST. (CLEARED)
3385                                    ;;*****************************************************************
3386  025516  000004                    TST22:  SCOPE
3387  025520  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3388  025526  012737  000022  017330            MOV     #T†NO,@#TSTNM   ;THIS SAVES TEST NUMBER
3389  025534  012777  000040  167214            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3390
3391  025542  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3392
3393  025546  013702  014756                    MOV     RHCS2,R2        ;R2=RH11 RHCS2 ADDRESS.
3394  025552  010237  045440                    MOV     R2,REGADR
3395  025556  013700  015140                    MOV     @#†OTALAT,R0
3396  025562  005001                            CLR     R1
3397  025564  006000                    S12:    ROR     R0
3398  025566  103020                            BCC     N12
3399
3400  025570  010137  001124                    MOV     R1,$GDDAT
3401
3402  025574  013705  014760                    MOV     RHCS1,R5        ;ADDRESS OF A DEVICE REGISTER.
3403
3404  025600  010112                    L12:    MOV     R1,(R2)         ;SELECT UNIT.
3405
3406  025602  011537  001176                    MOV     (R5),$TMP0      ;ATTEMPT TO READ FROM DEVICE.
3407
3408  025606  011237  001126                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3409  025612  042737  167770  001126            BIC     #†C<NED!US4!US2!US1>,$BDDAT     ;$BDDAT=SAVED DATA.
3410
3411  025620  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3412  025626  001005                            BNE     E12
3413
3414  025630  005201                    N12:    INC     R1
3415  025632  020127  000010                    CMP     R1,#8.          ;TESTED ALL DRIVES.
3416  025636  001402                            BEQ     TST23           ;NEXT TEST
3417
3418  025640  000751                            BR      S12
3419  025642  104050                    E12:    ERROR   50
3420
3421
```

```
3422
3423                                    .REM    %
3424                                    TEST TO SEE IF WE CAN READ FROM THE "AS" REGISTER AND NOT CAUSE
3425                                    A NED NON-EXISTANT DRIVE ERROR
3426                                            %
3427                                    ;;*****************************************************************
3428                                    ;*TEST 23        BCTB AS REGISTER TEST
3429                                    ;;*****************************************************************
3430  025644  000004                    †ST23:  SCOPE
3431  025646  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3432  025654  012737  000023  017330            MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
3433  025662  012777  000040  167066            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3434
3435  025670  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3436
3437  025674  013702  014756                    MOV     RHCS2,R2        ;R2=RH11 CS2 ADDRESS.
3438  025700  012737  000007  001124            MOV     #US4!US2!US1,$GDDAT;$GDDAT=S/B.
3439
3440  025706  013705  014760                    MOV     RHCS1,R5        ;ADDRESS OF A DEVICE REGISTER.
3441
3442  025712  012712  000007          L13:      MOV     #US4!US2!US1,(R2);LOAD A NON-EXISTANT DEVICE.
3443
3444  025716  013702  014776                    MOV     RHAS,R2         ;R2= "AS".
3445
3446  025722  011237  001176                    MOV     (R2),$TMP0      ;ATTEMPT TO READ FROM DEVICE AS.
3447
3448  025726  005012                            CLR     (R2)            ;CLEAR AS REGISTER.
3449  025730  013702  014756                    MOV     RHCS2,R2        ;R2=RH11 CS2 ADDRESS.
3450  025734  010237  045440                    MOV     R2,REGADR
3451
3452  025740  011237  001126                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3453  025744  042737  167770  001126            BIC     #†C<NED!US4!US2!US1>,$BDDAT;SAVE NED AND DEVICE SELECTED.
3454
3455  025752  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3456  025760  001401                            BEQ     TST24           ;NEXT TEST
3457  025762  104051                            ERROR   51
3458
3459
```

```
                                        .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
                                        ;;*********************************************************************
025764  000004                        TST24:  SCOPE
025766  012737  000001  001212                MOV     #1,$TIMES       ;;DO 1 ITERATION
025774  012737  000024  017330                MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
026002  012777  000040  166746                MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

026010  012706  001000                        MOV     #STACK,SP       ;SET STACK POINTER.

026014  013702  014754                        MOV     RHBA,R2         ;R2=RH11 BA ADDRESS.
026020  010237  045440                        MOV     R2,REGADR
026024  012705  026064                        MOV     #LST14A,R5      ;R5=TEST LIST ADDRESS.

026030  012537  001124                L14:    MOV     (R5)+,$GDDAT    ;$GDDAT=S/B.

026034  013712  001124                I14:    MOV     $GDDAT,(R2)     ;SET BUS ADDRESS REGISTER.
026040  011237  001126                        MOV     (R2),$BDDAT     ;READ BUS ADDRESS REGISTER.

026044  023737  001126  001124                CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
026052  001401                                BEQ     N14             ;GET NEXT TEST DATA.
026054  104052                                ERROR   52

026056  005715                        N14:    TST     (R5)            ;AT END OF LIST
026060  001363                                BNE     L14             ;NO!
026062  000440                                BR      TST25           ;NEXT TEST
026064  000002                        LST14A: 2
026066  000004                                4
026070  000010                                10
026072  000020                                20
026074  000040                                40
026076  000100                                100
026100  000200                                200
026102  000400                                400
026104  001000                                1000
026106  002000                                2000
026110  004000                                4000
026112  010000                                10000
026114  020000                                20000
026116  040000                                40000
026120  100000                                100000
026122  177776                                177776
026124  177774                                177774
026126  177772                                177772
026130  177766                                177766
026132  177756                                177756
026134  177736                                177736
026136  177676                                177676
```

```
3514  026140  177576                          177576
3515  026142  177376                          177376
3516  026144  176776                          176776
3517  026146  175776                          175776
3518  026150  173776                          173776
3519  026152  167776                          167776
3520  026154  157776                          157776
3521  026156  137776                          137776
3522  026160  077776                          077776
3523  026162  000000                          0
3524
```

```
3525
3526                                    ;;*****************************************************************
3527                                    ;*TEST 25        BCTC BUS ADDRESS REGISTER LO-BYTE
3528                                    ;;*****************************************************************
3529  026164  000004                   TST25:  SCOPE
3530  026166  012737  000001  001212           MOV     #1,$TIMES       ;;DO 1 ITERATION
3531  026174  012737  000025  017330           MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3532  026202  012777  000040  166546           MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3533
3534  026210  012706  001000                   MOV     #STACK,SP       ;RESET STACK.
3535
3536  026214  013702  014754                   MOV     RHBA,R2         ;R2=RH11 BA ADDRESS.
3537  026220  010237  045440                   MOV     R2,REGADR
3538  026224  012705  026266                   MOV     #LST15A,R5      ;R5=TEST LIST ADDRESS.
3539
3540  026230  005012                   L15:    CLR     (R2)            ;CLEAR RH11 BA REGISTER.
3541
3542  026232  012537  001124                   MOV     (R5)+,$GDDAT    ;$GDDAT=S/B.
3543
3544  026236  113712  001124           I15:    MOVB    $GDDAT,(R2)     ;SET BUS ADDRESS REGISTER.
3545  026242  011237  001126                   MOV     (R2),$BDDAT     ;READ BUS ADDRESS REGISTER.
3546
3547  026246  023737  001126  001124           CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3548  026254  001401                           BEQ     R15
3549
3550  026256  104053                           ERROR   53
3551
3552  026260  005715                   R15:    TST     (R5)            ;AT END OF TEST LIST.
3553  026262  001362                           BNE     L15             ;NO!
3554  026264  000417                           BR      TST26           ;NEXT TEST
3555                                    ;THIS LIST WILL BE USED TO LOAD THE LOWER BYTE OF THE BA REGISTER.
3556                                    ;
3557  026266  000002                   LST15A: 2
3558  026270  000004                           4
3559  026272  000010                           10
3560  026274  000020                           20
3561  026276  000040                           40
3562  026300  000100                           100
3563  026302  000200                           200
3564  026304  000376                           376
3565  026306  000372                           372
3566  026310  000366                           366
3567  026312  000356                           356
3568  026314  000336                           336
3569  026316  000276                           276
3570  026320  000176                           176
3571  026322  000000                           0
```

```
3572
3573                                    ;;*****************************************************************
3574                                    ;*TEST 26       BCTC BUS ADDRESS REGISTER HI-BYTE
3575                                    ;;*****************************************************************
3576  026324  000004                    TST26:  SCOPE
3577  026326  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3578  026334  012737  000026  017330            MOV     #T%TNO,@#TSTNM  ;THIS SAVES TEST NUMBER
3579  026342  012777  000040  166406            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3580
3581  026350  012706  001000                    MOV     #STACK,SP       ;RESET STACK.
3582
3583  026354  013702  014754                    MOV     RHBA,R2         ;R2=RH11 BA ADDRESS.
3584  026360  010237  045440                    MOV     R2,REGADR
3585  026364  012705  026436                    MOV     #LST16A,R5      ;R5=TEST LIST ADDRESS.
3586
3587  026370  005012                  L16:      CLR     (R2)            ;CLEAR BA REGISTER.
3588
3589  026372  012537  001124                    MOV     (R5)+,$GDDAT    ;$GDDAT=5/8.
3590
3591  026376  005202                            INC     R2              ;R2=HI BYTE ADDRESS.
3592
3593  026400  113712  001124          I16:      MOVB    $GDDAT,(R2)     ;SET BUS ADDRESS REGISTER HI-BYTE.
3594
3595  026404  005302                            DEC     R2              ;R2=FULL WORD ADDRESS.
3596
3597  026406  011237  001126                    MOV     (R2),$BDDAT     ;READ BUS ADDRESS.
3598  026412  000337  001124                    SWAB    $GDDAT          ;ADJUST DATA FOR HI BYTE.
3599
3600  026416  023737  001126  001124          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3601  026424  001401                            BEQ     R16             ;OKAY
3602
3603  026426  104053                            ERROR   53
3604
3605  026430  005715                  R16:      TST     (R5)            ;AT END OF TEST LIST.
3606  026432  001356                            BNE     L16             ;NOPE
3607  026434  000420                            BR      TST27           ;NEXT TEST
3608                                  ;THIS LIST WILL BE USED TO LOAD THE UPPER BYTE OF THE BA REGISTER.
3609                                  ;
3610  026436  000002                  LST16A: 2
3611  026440  000004                          4
3612  026442  000010                          10
3613  026444  000020                          20
3614  026446  000040                          40
3615  026450  000100                          100
3616  026452  000200                          200
3617  026454  000376                          376
3618  026456  000374                          374
3619  026460  000376                          376
3620  026462  000366                          366
3621  026464  000356                          356
3622  026466  000336                          336
3623  026470  000276                          276
3624  026472  000176                          176
3625  026474  000000                          0
```

3626

```
                                        .REM    %
                                        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
                                        ;;**********************************************************************
026476  000004                  TST27:  SCOPE
026500  012737  000001  001212          MOV     #1,$TIMES       ;;DO 1 ITERATION
026506  012737  000027  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
026514  012777  000040  166234          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

026522  012706  001000                  MOV     #STACK,SP       ;SET STACK POINTER.

026526  013702  014760                  MOV     RHCS1,R2        ;R2=RH11 ADDRESS.
026532  010237  045440                  MOV     R2,REGADR
026536  005037  001126                  CLR     $BDDAT          ;$BDDAT=WAS.
026542  005037  001124                  CLR     $GDDAT          ;$GDDAT=S/B.

026546  017737  166174  001176          MOV     @RPVEC,$TMP0    ;SAVE RH11 INTERRUPT VECTOR.
026554  012777  026600  166164          MOV     #021,@RPVEC     ;SET RH11 INTERRUPT VECTOR TO 021.

026562  052712  000100          L21:    BIS     #IE,(R2)        ;CAUSE INTERRUPT.
026566  000240                          NOP                     ;WAIT FOR INTERRUPT.
026570  000240                          NOP
026572  011237  001124                  MOV     (R2),$GDDAT     ;SAVE CONTENTS OF REGISTER.

026576  104054                          ERROR   54

026600  013777  001176  166140  021:    MOV     $TMP0,@RPVEC    ;RESTORE RH11 INTERRUPT VECTOR.
```

```
3660
3661                                    ;TEST THAT RESET CAN GENERATE THE SIGNAL CLR L.
3662                                    .REM    %
3663                                            THE PROGRAM SETS THE PORT SELECT BIT .THEN DOES A RESET
3664                                            IF THE SIGNAL CLR L WAS GENERATED THE PORT SELECT BIT WILL CLEAR.
3665                                            %
3666                                    ;;*******************************************************************
3667                                    ;*TEST 30       BCTD CLR L TEST
3669                                    ;;*******************************************************************
3669  026606  000004                    TST30:  SCOPE
3670  026610  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3671  026616  012737  000030  017330            MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
3672  026624  012777  000040  166124            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3673
3674  026632  013702  014760                    MOV     RHCS1,R2        ;R2=RH11 CS1 ADDRESS
3675  026636  010237  045440                    MOV     R2,REGADR
3676  026642  005037  001124                    CLR     $GDDAT          ;$GDDAT=S/B
3677
3678  026646  012706  001000            L22:    MOV     #STACK,SP       ;SET STACK POINTER.
3679  026652  012712  002000                    MOV     #PSEL,(R2)      ;SET PORT SELECT FLOP.
3680  026656  000005                            RESET                   ;DO A BUSA INIT.
3681
3682  026660  011237  001126                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
3683  026664  042737  177677  001126            BIC     #†C<IE>,$BDDAT  ;SAVE ONLY I.E. BIT.
3684
3685  026672  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3686  026700  001401                            BEQ     TST31           ;NEXT TEST
3687  026702  104055                            ERROR   55
3688
3629
```

```
                                        .REM    %
                                        SET THE MXF FLOP AND READ IT BACK.
                                                %
                                        ;;*****************************************************************
                                        ;*TEST 31        MXF TEST
                                        ;;*****************************************************************
026704  000004                  TST31:  SCOPE
026706  012737  000001  001212          MOV     #1,$TIMES       ;;DO 1 ITERATION
026714  012737  000031  017330          MOV     #T1NO,@#TSTNM   ;THIS SAVES TEST NUMBER

                                        ;*CHECK TO SEE IF PROGRAM IS RUNNING WITH AN RH70

026722  005737  017334                  TST     @#RH70          ;TEST FOR RH70 CONTROLLER
026726  001402                          BEQ     30$             ;IF FLAG = 1, SKIP THIS TEST
026730  000137  027014                  JMP     TST32           ;JUMP TO NEXT TEST ----------------------)
026734                          30$:                            ;IF FLAG = 0, DO THIS TEST
026734  012777  000040  166014          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

026742  012706  001000                  MOV     #STACK,SP       ;SET STACK POINTER.
026746  013702  014756                  MOV     RHCS2,R2        ;R2=RH11 CS2 ADDRESS.
026752  010237  045440                  MOV     R2,REGADR
026756  012737  001000  001124          MOV     #MXF,$GDDAT     ;$GDDAT=S/B.

026764  012712  001000          I24:    MOV     #MXF,(R2)       ;LOAD MXF

026770  011237  001126                  MOV     (R2),$BDDAT     ;$BDDAT=WAS.

026774  042737  176777  001126          BIC     #^C<MXF>,$BDDAT ;SAVE ONLY MXF

027002  023737  001126  001124          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS
027010  001401                          BEQ     TST32           ;NEXT TEST
027012  104056                          ERROR   56
```

```
                                        .REM    %
                                        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
                                        ;;*****************************************************************
027014  000004                  TST32:  SCOPE
027016  012737  000001  001212          MOV     #1,$TIMES       ;;DO 1 ITERATION
027024  012737  000032  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER

                                        ;*CHECK TO SEE IF PROGRAM IS RUNNING WITH AN RH70

027032  005737  017334                  TST     @#RH70          ;TEST FOR RH70 CONTROLLER
027036  001402                          BEQ     30$             ;IF FLAG = 1, SKIP THIS TEST
027040  000137  027130                  JMP     TST33           ;JUMP TO NEXT TEST ----------------------)
027044                          30$:                            ;IF FLAG = 0, DO THIS TEST

027044  012777  000040  165704          MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

027052  012706  001000                  MOV     #STACK,SP       ;SET STACK POINTER.

027056  013702  014756                  MOV     RHCS2,R2        ;R2=RHCS2 ADDRESS.
027062  010237  045440                  MOV     R2,REGADR
027066  012737  020000  001124          MOV     #UPE,$GDDAT     ;$GDDAT=S/B.

027074  013712  001124          L30:    MOV     $GDDAT,(R2)     ;ATTEMPT TO SET UPE.
027100  000240                          NOP
027102  000240                          NOP

027104  011237  001126                  MOV     (R2),$BDDAT     ;$BDDAT=ACTUAL DATA.
027110  042737  157777  001126          BIC     #^C<UPE>,$BDDAT ;SAVE ONLY UPE.

027116  023737  001126  001124          CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
027124  001401                          BEQ     TST33           ;NEXT TEST
027126  104057                          ERROR   57
```

```
3762
3763                                    .REM    %
3764                                    SET THE UNIBUS PARITY ERROR FLOP AND ATTEMPT TO CLEAR IT WITH A
3765                                    CONTROLLER CLEAR.
3766                                            %
3767                                    ;;**********************************************************************
3768                                    ;*TEST 33        CSRB UNIBUS PARITY ERROR CLEAR TEST
3769                                    ;;**********************************************************************
3770  027130  000004                    TST33:  SCOPE
3771  027132  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3772  027140  012737  000033  017330            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3773  027146  012777  000040  165602            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3774
3775  027154  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3776
3777  027160  013702  014756                    MOV     RHCS2,R2        ;R2=RHCS2 ADDRESS.
3778  027164  010237  045440                    MOV     R2,REGADR
3779  027170  005037  001124                    CLR     $GDDAT          ;$GDDAT=S/B.
3780
3781  027174  012712  020000            L31:    MOV     #UPE,(R2)       ;SET UNIBUS PARITY ERROR SET.
3782  027200  000240                            NOP
3783  027202  000240                            NOP
3784
3785  027204  012712  000040                    MOV     #CLR,(R2)       ;CONTROLLER CLEAR.
3786
3787  027210  011237  001126                    MOV     (R2),$BDDAT     ;READ STATUS
3788  027214  042737  157777  001126            BIC     #^C<UPE>,$BDDAT ;SAVE ERROR.
3789
3790  027222  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3791  027230  001401                            BEQ     TST34           ;NEXT TEST
3792  027232  104057                            ERROR   57
3793
3794
```

```
3795
3796                                    .REM    %
3797                                    SET THE UNIT SELECT REGISTER TO DRIVE #7 ALL BITS SET, GENERATE A
3798                                    CONTROLLER CLEAR AND VERIFY THAT THE UNIT SELECT REGISTER IS CLEARED.
3799                                            %
3800                                    ;;**********************************************************************
3801                                    ;*TEST 34        CSRB UNIT SELECT CLEAR TEST
3802                                    ;;**********************************************************************
3803  027234  000004                    TST34:  SCOPE
3804  027236  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3805  027244  012737  000034  017330            MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
3806  027252  012777  000040  165476            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3807
3808  027260  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3809
3810  027264  013702  014756                    MOV     RHCS2,R2        ;R2=CS2 ADDRESS.
3811  027270  010237  045440                    MOV     R2,REGADR
3812  027274  005037  001124                    CLR     $GDDAT          ;$GDDAT=S/B.
3813
3814  027300  012712  000007            L34:    MOV     #US4!US2!US1,(R2)  ;LOAD RHCS2 DRIVE SELECT
3815  027304  000240                            NOP
3816  027306  000240                            NOP
3817
3818  027310  012712  000040                    MOV     #CLR,(R2)       ;GENERATE CLR.
3819
3820  027314  011237  001126                    MOV     (R2),$BDDAT     ;READ RHCS2
3821  027320  042737  177770  001126            BIC     #†C<US4!US2!US1>,$BDDAT;SAVE DRIVE SELECT BITS.
3822
3823  027326  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3824  027334  001401                            BEQ     TST35           ;NEXT TEST
3825  027336  104060                            ERROR   60
3826
3827
```

```
3828
3829                                    .REM    %
3830                                    SET THE UPE FLOP UNIBUS PARITY ERROR. VERIFY THAT THE SETTING OF (UPE)
3831                                    ALSO SETS THE TRANSFER ERROR (TRE) FLOP
3832                                            %
3833                                    ;;*******************************************************************
3834                                    ;*TEST 35        CSRB TRANSFER ERROR (TRE) - UPE
3835                                    ;;*******************************************************************
3836  027340  000004                    TST35:  SCOPE
3837  027342  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3838  027350  012737  000035  017330            MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
3839
3840                                            ;*CHECK TO SEE IF PROGRAM IS RUNNING WITH AN RH70
3841
3842  027356  005737  017334                    TST     @#RH70          ;TEST FOR RH70 CONTROLLER
3843  027362  001402                            BEQ     30$             ;IF FLAG = 1, SKIP THIS TEST
3844  027364  000137  027454                    JMP     TST36           ;JUMP TO NEXT TEST ----------------------)
3845  027370                            30$:                            ;IF FLAG = 0, DO THIS TEST
3846
3847  027370  012777  000040  165360            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3848
3849  027376  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3850
3851  027402  013702  014756                    MOV     RHCS2,R2        ;R2=RHCS2 ADDRESS.
3852  027406  012737  040000  001124            MOV     #TRE,$GDDAT     ;$GDDAT=S/B.
3853
3854  027414  012712  020000            L35:    MOV     #UPE,(R2)       ;SET UNIBUS PARITY ERROR.
3855
3856  027420  013702  014760                    MOV     RHCS1,R2        ;R2=RHCS1 ADDRESS.
3857  027424  010237  045440                    MOV     R2,REGADR
3858
3859  027430  011237  001126                    MOV     (R2),$BDDAT     ;READ REGISTER
3860  027434  042737  137777  001126            BIC     #†C<†RE>,$BDDAT ;SAVE TRANSFER ERROR.
3861
3862  027442  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS
3863  027450  001401                            BEQ     TST36           ;NEXT TEST
3864  027452  104061                            ERROR   61
3865
3866
```

```
3867
3868                                    .REM    %
3869                                    SET THE NED BIT NON EXISTANT DRIVE VERIFY THAT THIS SETS THE (TRE) BIT.
3870                                    %
3871                                    ;;*****************************************************************
3872                                    ;*TEST 36        CSRB TRANSFER ERROR (TRE) NED
3873                                    ;;*****************************************************************
3874  027454  000004                    TST36:  SCOPE
3875  027456  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3876  027464  012737  000036  017330            MOV     #T†NO,@#TSTNM   ;THIS SAVES TEST NUMBER
3877  027472  012777  000040  165256            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3878
3879  027500  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3880
3881  027504  013702  014756                    MOV     RHCS2,R2        ;R2=CS2 ADDRESS.
3882  027510  012737  040000  001124            MOV     #TRE,$GDDAT     ;$GDDAT=S/B.
3883
3884  027516  013700  015140                    MOV     @#TOTALAT,R0    ;GET ALL AVAILABLE DRIVES DATA
3885  027522  005001                            CLR     R1
3886  027524  006000                    S36:    ROR     R0
3887  027526  103420                            BCS     N36
3888  027530  010112                    L36:    MOV     R1,(R2)           ;SET NED.
3889
3890  027532  013702  014760                    MOV     RHCS1,R2        ;R2=RHCS1 ADDRESS.
3891  027536  010237  045440                    MOV     R2,REGADR
3892
3893  027542  011237  001126                    MOV     (R2),$BDDAT     ;READ REGISTER.
3894  027546  042737  137777  001126            BIC     #†C<†RE>,$BDDAT ;SAVE TRE.
3895
3896  027554  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3897  027562  001406                            BEQ     TST37           ;NEXT TEST
3898  027564  104062                            ERROR   62
3899  027566  000404                            BR      TST37           ;NEXT TEST
3900
3901  027570  005201                    N36:    INC     R1
3902  027572  020127  000010                    CMP     R1,#8.
3903  027576  001352                            BNE     S36
3904
3905
```

```
3906
3907                                    .REM    %
3908                                    SET THE PORT SELECT FLOP VERIFY THAT WE CAN READ IT BACK.
3909                                            %
3910                                    ;;*****************************************************************
3911                                    ;*TEST 37        CSRA PSEL CLEAR TEST
3912                                    ;;*****************************************************************
3913  027600  000004                    TST37:  SCOPE
3914  027602  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
3915  027610  012737  000037  017330            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3916  027616  012777  000040  165132            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3917
3918  027624  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
3919
3920  027630  013702  014760                    MOV     RHCS1,R2        ;R2=RHCS1 ADDRESS.
3921  027634  010237  045440                    MOV     R2,REGADR
3922  027640  005037  001124                    CLR     $GDDAT          ;$GDDAT=S/B.
3923
3924  027644  012712  002000            L40:    MOV     #PSEL,(R2)      ;SET P SELECT.
3925
3926  027650  012777  000040  165100            MOV     #CLR,@RHCS2     ;DO A CONTROLLER CLEAR.
3927
3928  027656  011237  001126                    MOV     (R2),$BDDAT     ;READ BACK P SELECT BIT.
3929  027662  042737  175777  001126            BIC     #^C<PSEL>,$BDDAT;SAVE ONLY PORT SELECT.
3930
3931  027670  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3932  027676  001401                            BEQ     TST40           ;NEXT TEST
3933  027700  104064                            ERROR   64
3934
```

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

                                        ;;*******************************************************************
                                        ;*TEST 40        CSRB COMMAND REGISTER CLEAR TEST
                                        ;;*******************************************************************
027702  000004                        TST40:  SCOPE
027704  012737  000001  001212                MOV     #1,$TIMES       ;;DO 1 ITERATION
027712  012737  000040  017330                MOV     #T†NO,@#TSTNM   ;THIS SAVES TEST NUMBER
027720  012777  000040  165030                MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

027726  012706  001000                        MOV     #STACK,SP       ;SET STACK POINTER.

027732  013702  014760                        MOV     RHCS1,R2        ;R2=RHCS1 ADDRESS.
027736  010237  045440                        MOV     R2,REGADR
027742  005037  001124                        CLR     $GDDAT          ;$GDDAT=S/B.

027746  012712  000011                L41:    MOV     #11,(R2)        ;ISSUE A DRIVE CLR AND GO.

027752  012777  000040  164776                MOV     #CLR,@RHCS2     ;CONTROLLER CLEAR.

027760  011237  001126                        MOV     (R2),$BDDAT     ;READ COMMAND REGISTER.
027764  042737  177770  001126                BIC     #†C<7>,$BDDAT   ;SAVE ONLY THE COMMAND BITS.

027772  023737  001126  001124                CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
030000  001401                                BEQ     TST41           ;NEXT TEST
030002  104065                                ERROR   65
```

```
3964
3965                                    .REM    %
3966                                    THE COMMAND REGISTER IS SUPPOSED TO BE SELF CLEARING THAT IS WHEN THE
3967                                    RH11 IS SELECTED WHEATHER OR NOT WE ADDRESS IT DIRECTLY THE LOGIC
3968                                    SHOULD CLEAR THE COMMAND REGISTER.
3969                                    THIS IS TESTED BY LOADING A COMMAND INTO IT READING ANOTHER REGISTER
3970                                    THAN RETURNING TO CHECK THE COMMAND REGISTER TO DETERMINE IF IT CLEARED.
3971                                            %
3972                                    ;;*******************************************************************
3973                                    ;*TEST 41        CSRB COMMAND REGISTER RESELECT CLEAR TEST
3974                                    ;;*******************************************************************
3975  030004  000004                   TST41:  SCOPE
3976  030006  012737  000001  001212           MOV     #1,$TIMES       ;;DO 1 ITERATION
3977  030014  012737  000041  017330           MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
3978  030022  012777  000040  164726           MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
3979
3980  030030  012706  001000                   MOV     #STACK,SP       ;SET STACK POINTER.
3981
3982  030034  013702  014760                   MOV     RHCS1,R2        ;R2=RHCS1 ADDRESS.
3983  030040  010237  045440                   MOV     R2,REGADR
3984  030044  005037  001124                   CLR     $GDDAT          ;$GDDAT=S/B.
3985
3986  030050  012737  000340  177776           MOV     #340,PS         ;SET PRIORITY TO #7.
3987
3988  030056  012712  000011           L42:    MOV     #11,(R2)        ;ISSUE A DRIVE CLR AND GO
3989
3990  030062  011237  001176                   MOV     (R2),$TMP0      ;DO A RESELECT OF THE REGISTER.
3991
3992  030066  011237  001126                   MOV     (R2),$BDDAT     ;READ THE COMMAND REGISTER.
3993  030072  042737  177770  001126           BIC     #^C<7>,$BDDAT   ;SAVE ONLY THE COMMAND BITS.
3994
3995  030100  023737  001126  001124           CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
3996  030106  001401                           BEQ     TST42           ;NEXT TEST
3997  030110  104066                           ERROR   66
3998
```

```
                                        .REM    %
                                        HERE WE TEST TO SEE IF SETTING (IE) AND (RDY) WILL CAUSE AN INTERRUPT.
                                                %
                                        ;;**************************************************************
                                        ;*TEST 42        CSRB READY AND IE INTERRUPT TEST
                                        ;;**************************************************************
030112  000004                        TST42:  SCOPE
030114  012737  000001  001212                MOV     #1,$TIMES       ;;DO 1 ITERATION
030122  012737  000042  017330                MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
030130  012777  000040  164620                MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

030136  013702  014760                       MOV     RHCS1,R2        ;R2=RPCS1 ADDRESS.
030142  010237  045440                       MOV     R2,REGADR
030146  005037  001126                       CLR     $BDDAT          ;$BDDAT=WAS.
030152  005037  001124                       CLR     $GDDAT          ;$GDDAT=S/B.

030156  017737  164564  001176               MOV     @RPVEC,$TMP0    ;SAVE RH11 INTERRUPT VECTOR.
030164  012777  030220  164554               MOV     #043,@RPVEC     ;SET RH11 INTERRUPT VECTOR 043

030172  012706  001000          L43:         MOV     #STACK,SP       ;SET STACK POINTER.
030176  005037  177776                       CLR     PS

030202  052712  000300                       BIS     #IE!RDY,(R2)    ;THIS WILL CAUSE AN INTERRUPT.
030206  000240                               NOP
030210  000240                               NOP

030212  011237  001124                       MOV     (R2),$GDDAT
030216  104067                               ERROR   67

030220  013777  001176  164520  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
                                        ;;*****************************************************************
030226  000004                TST43:  SCOPE
030230  012737  000001  001212        MOV     #1,$TIMES       ;;DO 1 ITERATION
030236  012737  000043  017330        MOV     #T†NO,@#TSTNM   ;THIS SAVES TEST NUMBER
030244  012777  000040  164504        MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER

030252  013702  014760                MOV     RHCS1,R2        ;R2=RPCS1 ADDRESS.
030256  010237  045440                MOV     R2,REGADR
030262  005037  001124                CLR     $GDDAT          ;$GDDAT=S/B.

030266  017737  164454  001176        MOV     @RPVEC,$TMPO    ;SAVE RH11 INTERRUPT VECTOR.
030274  012777  030324  164444        MOV     #044,@RPVEC     ;SET VECTOR TO 044.

030302  012706  001000        L44:    MOV     #STACK,SP       ;SET STACK POINTER.
030306  005037  177776                CLR     PS

030312  052712  000100                BIS     #IE,(R2)        ;THIS WILL CAUSE AN INTERRUPT
030316  000240                        NOP
030320  000240                        NOP

030322  000411                        BR      E44             ;NO INTERRUPT.

030324  011237  001126        044:    MOV     (R2),$BDDAT     ;READ RHCS1.
030330  042737  177677  001126        BIC     #†C<IE>,$BDDAT  ;SAVE ONLY THE "IE" BIT.

030336  023737  001126  001124        CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
030344  001401                        BEQ     R44             ;OK!

030346  104070                E44:    ERROR   70

030350  013777  001176  164370 R44:   MOV     $TMPO,@RPVEC    ;RESTORE RH11 INTERRUPT VECTOR.
```

```
4069
4070                                    .REM    %
4071                                    HERE WE VERIFY THAT WRITING INTO THE "AS" REGISTER OWILL NOT CAUSE
4072                                    AN (NED) ERROR.
4073                                            %
4074                                    ;;*******************************************************************
4075                                    ;*TEST 44        BCTB "AS" WRITE TEST
4076                                    ;;*******************************************************************
4077  030356  000004                    TST44:  SCOPE
4078  030360  012737  000001  001212            MOV     #1,$TIMES       ;;DO 1 ITERATION
4079  030366  012737  000044  017330            MOV     #T†NO,@#TSTNM   ;†HIS SAVES TEST NUMBER
4080  030374  012777  000040  164354            MOV     #CLR,@RHCS2     ;CLEAR RH11 CONTROLLER
4081
4082  030402  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER.
4083
4084  030406  013702  014756                    MOV     RHCS2,R2        ;R2=RH11 CS2 ADDRESS.
4085  030412  012737  000007  001124            MOV     #US4!US2!US1,$GDDAT;$GDDAT=5/8.
4086
4087  030420  013705  014760                    MOV     RHCS1,R5        ;ADDRESS OF A DEVICE REGISTER.
4088
4089  030424  012712  000007            L45:    MOV     #US4!US2!US1,(R2);LOAD A NON EXISTANT DEVICE.
4090
4091  030430  013702  014776                    MOV     RHAS,R2         ;R2="AS" ADDRESS.
4092
4093  030434  012712  000377                    MOV     #377,(R2)       ;ATTEMPT TO LOAD "AS".
4094
4095  030440  005012                            CLR     (R2)            ;CLEAR  "AS".
4096
4097  030442  013702  014756                    MOV     RHCS2,R2        ;R2=RH11 CS2 ADDRESS.
4098  030446  010237  045440                    MOV     R2,REGADR
4099
4100  030452  011237  001126                    MOV     (R2),$BDDAT     ;$BDDAT=WAS.
4101  030456  042737  167770  001126            BIC     #†C<NED!US4!US2!US1>,$BDDAT;SAVE NED AND DEVICE SELECTED.
4102
4103  030464  023737  001126  001124            CMP     $BDDAT,$GDDAT   ;COMPARE RESULTS.
4104  030472  001401                            BEQ     TST45           ;NEXT TEST
4105  030474  104071                            ERROR   71
4106
```

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

                                ;;*****************************************************************
                                ;*TEST 45       MAKE CURRENT CYLINDER = 0
                                ;;*****************************************************************
030476  000004                TST45:  SCOPE
030500  012706  001000                MOV     #STACK,SP       ;RESET STACK
030504  012737  000045  017330        MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
030512  004737  045674                JSR     PC,@#CLDISK     ;INIT DRIVE
030516  012777  000001  164254        MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE
030524  004037  050246                JSR     R0,@#MAKECYL    ;SUBROUTINE TO GIVE A SEEK
                                                            ;COMMAND FOLOWED BY AN INIT
030530  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

                                ;;*****************************************************************
030532  000004                TST46:  SCOPE

030534  012706  001000                MOV     #STACK,SP       ;RESET STACK
030540  012737  000046  017330        MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER

                                ;*CHECK TO SEE IF PROGRAM IS RUNNING WITH AN RH70

030546  005737  017334                TST     @#RH70          ;TEST FOR RH70 CONTROLLER
030552  001402                        BEQ     30$             ;IF FLAG = 1, SKIP THIS TEST
030554  000137  031064                JMP     TST47           ;JUMP TO NEXT TEST ----------------------)
030560                          30$:                            ;IF FLAG = 0, DO THIS TEST

030560  004037  045612                JSR     R0,@#CLAREA     ;CLEAR SIMULATED DISK
030564  054256                        .WORD   DISK            ;FROM
030566  055302                        .WORD   TOLGAP+16       ;TO
030570  000000                        .WORD   0               ;DATA

                                ;THESE ARE SETUP FOR DISKLESS USE ONLY

030572  012737  010000  052340        MOV     #FMT22,@#CYL;CYLINDER 0
                                                            ;16 BITS PER WORD
030600  005037  052342                CLR     @#SECOTR        ;SECTOR 0 TRACK 0
030604  005037  052344                CLR     @#KEY1          ;KEY1 0
030610  005037  052346                CLR     @#KEY2          ;KEY2 0
```

```
 4161  030614  012737  000400  052406          MOV     #256.,@#NOWORD  ;NO OF DATA WORDS
 4162  030622  012737  000001  052350          MOV     #1,@#X          ;WRITE DATA
 4163  030630  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
 4164  030634  052340                          CYL
 4165  030636  054240                          WCRC
 4166
 4167                                  ;THESE ARE REGULAR SETUPS
 4168
 4169
 4170  030640  004737  045674                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
 4171  030644  012777  177400  164100          MOV     #-256.,@RHWC    ;256 DATA WORDS
 4172  030652  013777  001144  164074          MOV     @#$TKS,@RHBA    ;STARTING ADDRESS OF WRITE BUFFER
 4173  030660  017737  150260  015142          MOV     @$TKS,@#TMPILL  ;TEMPORARY STORAGE OF DATA
 4174  030666  005077  164072                  CLR     @RHDS           ;SECTOR 0 TRACK 0
 4175  030672  012777  010000  164070          MOV     #FMT22,@RHOF    ;16 BITS PER WORD FORMAT
 4176  030700  005077  164066                  CLR     @RHCA           ;CYLINDER 0
 4177  030704  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
 4178  030710  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
 4179                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
 4180  030714  000000                          HALT                    ;STOP THE TEST
 4181  030716  013746  015172                  MOV     @#WRIDAT,-(SP)  ;WRITE DATA=60
 4182  030722  052716  001400                  BIS     #A16!A17,(SP)   ;SET HIGH ORDER UNIBUS BITS
 4183  030726  012611                          MOV     (SP)+,@R1       ;FILL RHCS1
 4184  030730  052777  000010  164020          BIS     #BAI,@RHCS2     ;SET BUS ADDRESS INHIBIT
 4185  030736  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
 4186  030742  004737  052200                  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.

030746  004737  045374          JSR     PC,@#PUTREG     ;SAVE REGISTERS
030752  005737  015126          TST     @#ERFLG$        ;HAVE ANY ERRORS OCCURED?
030756  001042                  BNE     TST47           ;       BRANCH OUT IF YES
030760  013700  015142          MOV     @#TMPILL,R0     ;GOOD DATA
030764  012701  054256          MOV     #DISK,R1        ;DATA WRITTEN INTO "DISK"
030770  012702  000400          MOV     #256.,R2        ;COUNTER
030774  012737  000401  052460  1$:     MOV     #257.,@#ERWORD  ;FOR ERROR WORD
031002  020021                  CMP     R0,(R1)+        ;COMPARE GOOD DATA WITH DATA ON DISK
031004  001425                  BEQ     3$              ;BRANCH IF GOOD
031006  013737  015142  001124  MOV     @#TMPILL,@#$GDDAT;GOOD DATA
031014  014137  001126          MOV     -(R1),@#$BDDAT  ;BAD DATA
031020  160237  052460          SUB     R2,@#ERWORD     ;ERROR WORD NO
031024  005737  015126          TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE?
031030  001002                  BNE     2$              ;BRANCH IF YES
031032  104037                  ERROR   37              ;ERROR ON WRITE DATA COMMAND
                                                        ;SEE NEXT ERROR COMMENTS
031034  000401                  BR      64$             ;BRANCH TO AVOID PRINTING NEXT ERROR
031036  104040          2$:     ERROR   40              ;WORD NO GIVES WORD IN ERROR
                                                        ;ERROR OCCURED WHILE WRITING
                                                        ;WITH A16 A17 OF RHCS1 SET
031040  005721          64$:    TST     (R1)+           ;UNDO -(R1) FOR BAD DATA
031042  017746  150072          MOV     @SWR,-(SP)      ;GET SWITCH SETTING
031046  042716  177177          BIC     #177177,(SP)    ;KEEP ONLY SWITCH 7 AND 8
031052  022726  000200          CMP     #SW07,(SP)+     ;IS 7 SET AND 8 RESET
031056  001402                  BEQ     TST47           ;       BRANCH OUT IF YES
031060  005302          3$:     DEC     R2              ;IF NOT COUNT 256 WORDS
031062  001344                  BNE     1$              ;BRANCH IF 256 NOT DONE
```

```
                                        ;;*****************************************************************
                                        ;*TEST 47        DRIVE TIMING ERROR
                                        ;
                                        ;*      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'
                                        ;;*****************************************************************
031064, 000004                          TST47:  SCOPE
031066  012706  001000                          MOV     #STACK,SP       ;RESET STACK
031072  012737  000047  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER

                                        ;*THESE ARE TO SETUP FOR DISKLESS USE

031100  012737  010000  052340          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
                                                                ;CYLINDER 0
031106  005037  052342                  CLR     @#SECOTR        ;SECTOR 0
                                                                ;TRACK 0
031112  005037  052344                  CLR     @#KEY1          ;KEY1 = 0
031116  005037  052346                  CLR     @#KEY2          ;KEY2 = 0
031122  005037  052350                  CLR     @#X             ;THIS IS A READ COMMAND
031126  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
031132  052340                          CYL
031134  054240                          WCRC

                                        ;* THESE         ARE REGULAR SETUPS

031136  004737  045674                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
031142  012777  177374  163602          MOV     #-260.,@RHWC    ;256 DATA WORDS, 4 HEADER WORDS
031150  012777  016264  163576          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF BUFFER
031156  005077  163602                  CLR     @RHDST          ;TRACK = 0
                                                                ;SECTOR = 0
031162  012777  014000  163600          MOV     #FMT22!ECI,@RHOF ;16 BITS PER WORD
                                                                ;ECC CORRECTION INHIBITED
031170  005077  163576                  CLR     @RHCA           ;CYLINDER = 0
031174  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
031200  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
031204  000000                          HALT                    ;STOP THE TEST
031206  013711  015200                  MOV     @#REFCR,@R1     ;READ HEADER AND DATA = 72

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

031212  004037  046366                  JSR     R0,@#SAVER      ;READ IN SEQUENCE
031216  014752                          RHWC                    ;FROM HARDWARE REGISTER
031220  015026                          WC                      ;INTO CORE AT LOCATION
031222  000023                          19.                     ;NUMBER OF REGISTERS TO READ
```

```
                                        ;*NOW 'GO' WILL BE GIVEN, EVERYTHING WILL BE TREATED
                                        ;*NORMALLY FOR THE HEADER, BUT WHEN IT IS TIME TO READ
                                        ;*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.

031224  012737  177777  015146          MOV     #-1,@#TESDTE    ;SET DTE TEST
031232  012737  177777  015126          MOV     #-1,@#ERFLG$    ;THIS WILL BRING THE READ HEADER
                                                                ;AND DATA PROCESS OUT AFTER THE
                                                                ;HEADER HAS BEEN CORRECTLY READ

031240  004737  052200                  JSR     PC,@#COMHD      ;ISSUE 'GO', SEARCH FOR THE SECTOR
                                                                ;AND READ THE HEADER

031244  017737  163510  001176  SETCK1: MOV     @RHCS1,@#$TMPO  ;READ CS1 TO CHECK FOR ANY READ ERRORS
031252  032737  100000  001176          BIT     #SC,@#$TMPO     ;TEST FOR "SPECIAL CONDITION" - 'SC'
031260  001405                          BEQ     8$              ;CONTINUE WITH TEST IF 'SC' = 0 (NO ERRORS)
031262  004737  045374                  JSR     PC,@#PUTREG     ;READ & SAVE ALL REGISTERS AGAIN IF AN
                                                                ;UNDEFINED DATA TRANSFER ERROR OCCURRED
031266  104040                          ERROR   40              ;READ/WRITE HEADER & DATA ERROR DURING
031270  000137  031556                  JMP     TST50           ;       'DTE' TEST - ABORT THE TEST

031274                          8$:     ;NOW THE HEADER HAS BEEN READ OK
                                        ;*NOW 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
                                        ;*WHICH EQUALS 3 BYTES OF DATA

031274  012701  000030                  MOV     #24.,R1         ;LOAD COUNTER
031300  013700  015000                  MOV     @#RHMR,R0       ;GET RHMR ADDRESS
031304  012710  000001                  MOV     #DMD,@R0        ;SET DIAGNOSTIC MODE
031310  052710  000012          1$:     BIS     #MSTCK!MCLK,@R0 ;SET SECTOR CLOCK AND DATA CLOCK
031314  042710  000012                  BIC     #MSTCK!MCLK,@R0 ;CLEAR SECTOR CLOCK AND DATA CLOCK
031320  012702  000007                  MOV     #7,R2           ;LOAD COUNTER FOR DIAGNOSTIC CLOCKS
031324  052710  000002          4$:     BIS     #MCLK,@R0       ;SET CLOCK
031330  042710  000002                  BIC     #MCLK,@R0       ;CLEAR CLOCK
031334  005302                          DEC     R2              ;COUNT TO 7
031336  001372                          BNE     4$              ;BRANCH IF 7 NOT DONE
031340  005301                          DEC     R1              ;COUNT TO 24
031342  001362                          BNE     1$              ;BRANCH IF 24 NOT DONE

                                        ;*THIS GIVES 536 SECTOR CLOCKS WITHOUT DIAGNOSTIC DATA CLOCKS

031344  012701  001030                  MOV     #536.,R1        ;LOAD SECTOR CLOCK COUNTER
031350  052710  000010          5$:     BIS     #MSTCK,@R0      ;SET SECTOR CLOCK
031354  042710  000010                  BIC     #MSTCK,@R0      ;CLEAR SECTOR CLOCK
```

```
4330  031360  005301                    DEC     R1              ;COUNT
4331  031362  001372                    BNE     5$              ;BRANCH IF 536 NOT DONE
4332
4333
4334                                    ;*NOW 'DTE' SHOULD BE SET
4335                                    ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES
4336
4337  031364  012737  177400  015026    MOV     #-256.,@#WC     ;SAVED RHWC
4338  031372  012737  016274  015030    MOV     #REINTO+<4.*2>,@#BA ;SAVED RHBA
4339  031400  052737  140000  015034    BIS     #SC!TRE,@#CS1   ;SAVED RHCS1
4340  031406  052737  010000  015036    BIS     #DTE,@#ER1      ;SAVED RHER1
4341  031414  012737  000401  015054    MOV     #401,@#MR       ;SAVED RHMR
4342  031422  052737  140000  015056    BIS     #ATA!ERR,@#DS1  ;SAVED RHDS1
4343  031430  012737  000100  015070    MOV     #100,@#LA       ;SAVED RHLA
4344  031436  012737  000001  015040    MOV     #1,@#DST        ;SAVED RHDST
4345  031444  013737  015136  015052    MOV     @#ATTENT,@#AS   ;SAVED RHAS
4346
4347
4348                                    ;*NOW READ & SAVE REGISTERS AGAIN SO THAT COMPARISONS
4349                                    ;*CAN BE DONE (USE THE 'WRFROM' SAVE BUFFER THIS TIME)
4350
4351  031452  004037  046366            JSR     R0,@#SAVER      ;READ IN SEQUENCE
4352  031456  014752                    RHWC                    ;FROM HARDWARE REGISTER
4353  031460  015220                    WRFROM                  ;INTO CORE BUFFER
4354  031462  000023                    19.                     ;NUMBER OF REGISTERS TO READ
4355
4356                                    ;*FOR RHAS UPPER BYTE
4357  031464  113737  015053  015245    MOVB    @#AS+1,@#WRFROM+25 ;UPPER RHAS
4358
4359                                    ;*COMPARE THE HEADER READ
4360
4361  031472  004037  046570            JSR     R0,@#COMPAR     ;COMPARE
4362  031476  052340                    CYL                     ;GOOD BUFFER
4363  031500  016264                    REINTO                  ;TEST BUFFER
4364  031502  000004                    4.                      ;NUMBER
4365  031504  031512                    6$                      ;RETURN FOR ERROR
4366  031506  031512                    6$                      ;SAME
4367  031510  031516                    7$                      ;RETURN FOR GOOD COMPARISON
4368  031512  104010            6$:     ERROR   10              ;HEADER READ IN DURING THIS TEST IS
4369                                                            ;IN ERROR
4370
4371  031514  000207                    RTS     PC              ;RETURN
4372
4373  031516                    7$:                             ;GOOD COMPARISON, CONTINUE
4374
4375
4376                                    ;*COMPARE REGISTERS BEFORE COMMAND WITH REGISTERS AFTER COMMAND
4377
4378  031516  004037  046570            JSR     R0,@#COMPAR     ;COMPARE
4379  031522  015026                    WC                      ;INITIAL SNAPSHOT BUFFER (CHANGED)
4380  031524  015220                    WRFROM                  ;TEST SNAPSHOT BUFFER
4381  031526  000022                    18.                     ;NUMBER OF REGISTERS
4382  031530  031536                    2$                      ;RETURN FOR ERROR
4383  031532  031536                    2$                      ;SAME
```

```
 4384  031534  031556                          3$                      ;RETURN FOR GOOD COMPARISON
 4385
 4386  031536  013705  052460          2$:     MOV     @#ERWORD,R5     ;GETTING READY TO INDEX
 4387  031542  060505                          ADD     R5,R5           ;DOUBLE ERROR WORD
 4388  031544  016537  014750  045440          MOV     RHWC-2(R5),@#REGADR ;FAILING REGISTER
 4389  031552  104001                          ERROR   1               ;IMPROPER REGISTER
 4390                                                                  ;CHANGE AFTER FORCING
 4391                                                                  ;'DTE' ERROR
 4392  031554  000207                          RTS     PC              ;RETURN
 4393
 4394  031556                          3$:                             ;GOOD - REGISTERS OK, GO ON TO NEXT TEST
 4395
 4396
```

```
                                ;;*****************************************************************
                                ;*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'
                                ;;*****************************************************************
031556  000004                TST50:  SCOPE
031560  012706  001000                MOV     #STACK,SP       ;RESET STACK
031564  012737  000050  017330        MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                      ;*THESE ARE TO SETUP FOR DISKLESS USE
031572  012737  010000  052340        MOV     #FMT22,@#CYL    ;16 BITS PER WORD
                                                              ;CYLINDER 0
031600  005037  052342                CLR     @#SECOTR        ;SECTOR 0
                                                              ;TRACK 0
031604  005037  052344                CLR     @#KEY1          ;KEY1 = 0
031610  005037  052346                CLR     @#KEY2          ;KEY2 = 0
031614  012737  177777  052350        MOV     #-1,@#X         ;THIS IS FOR WRITE DATA COMMAND
031622  004537  047102                JSR     R5,@#CRC        ;GO TO CALCULATE CRC
031626  052340                        CYL
031630  054240                        WCRC

                                      ;* THESE        ARE REGULAR SETUPS & CHECKS

031632  004737  045674                JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
031636  012777  177400  163106        MOV     #-256.,@RHWC    ;256 DATA WORDS
031644  012777  015220  163102        MOV     #WRFROM,@RHBA   ;STARTING ADDRESS OF BUFFER
031652  005077  163106                CLR     @RHDST          ;TRACK = 0
                                                              ;SECTOR = 0
031656  012777  010000  163104        MOV     #FMT22,@RHOF    ;16 BITS PER WORD
                                                              ;ECC CORRECTION INHIBITED
031664  005077  163102                CLR     @RHCA           ;CYLINDER = 0
031670  004737  045730                JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
031674  104400  005124                TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                              ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
031700  000000                        HALT                    ;STOP THE TEST
031702  013711  015172                MOV     @#WRIDAT,@R1    ;WRITE DATA = 60

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

031706  004037  046366                JSR     R0,@#SAVER      ;READ REGISTERS IN SEQUENCE
031712  014752                        RHWC                    ;FROM HARDWARE REGISTER
031714  015026                        WC                      ;INTO CORE BUFFER LOCATION
```

```
 4451  031716  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.

031720  012737  177777  015146           MOV     #-1,@#TESDTE    ;SET DTE TEST
031726  012737  177777  015126           MOV     #-1,@#ERFLG$    ;THIS WILL BRING THE READ HEADER
                                                                ;AND DATA PROCESS OUT AFTER THE
                                                                ;HEADER HAS BEEN CORRECTLY READ

031734  004737  052200                   JSR     PC,@#COMHD      ;ISSUE 'GO', SEARCH FOR SECTOR,
                                                                ;READ HEADER AND DATA.

031740  017737  163014  001176  SETCK2:  MOV     @RHCS1,@#$TMP0  ;READ CS1 TO CHECK FOR READ ERRORS
031746  032737  100000  001176           BIT     #SC,@#$TMP0     ;TEST FOR "SPECIAL CONDITION" - 'SC'
031754  001405                           BEQ     6$              ;CONTINUE TESTING IF NO ERROR
031756  004737  045374                   JSR     PC,@#PUTREG     ;READ & SAVE REGISTERS AGAIN IF UNDE-
                                                                ;FINED ERROR HAS OCCURRED
031762  104040                           ERROR   40              ;THERE WAS A READ/WRITE HEADER ERROR
                                                                ;DURING 'DTE' TEST SETUP
031764  000137  032302                   JMP     TST51           ;       ABORT THE TEST

031770                           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

031770  012701  000030                   MOV     #24.,R1         ;LOAD SECTOR CLOCK COUNTER
031774  013700  015000                   MOV     @#RHMR,R0       ;GET RHMR ADDRESS
032000  012710  000001                   MOV     #DMD,@R0        ;SET DIAGNOSTIC MODE
032004  052710  000012           1$:     BIS     #MSTCK!MCLK,@R0 ;SET SECTOR CLOCK AND DATA CLOCK
032010  042710  000012                   BIC     #MSTCK!MCLK,@R0 ;CLEAR SECTOR CLOCK AND DATA CLOCK
032014  012702  000007                   MOV     #7,R2           ;LOAD COUNTER FOR DIAGNOSTIC DATA CLOCKS
032020  052710  000002           4$:     BIS     #MCLK,@R0       ;SET CLOCK (DATA)
032024  042710  000002                   BIC     #MCLK,@R0       ;CLEAR CLOCK (DATA)
032030  005302                           DEC     R2              ;COUNT
032032  001372                           BNE     4$              ;BRANCH IF 7 NOT DONE
032034  005301                           DEC     R1              ;COUNT
032036  001362                           BNE     1$              ;BRANCH IF 24 NOT DONE

                                        ;*THIS GIVES 536 SECTOR CLOCKS WITHOUT DIAGNOSTIC DATA CLOCKS

032040  012701  001030                   MOV     #536.,R1        ;LOAD SECTOR CLOCK COUNTER
032044  052710  000010           5$:     BIS     #MSTCK,@R0      ;SET SECTOR CLOCK
032050  042710  000010                   BIC     #MSTCK,@R0      ;CLEAR SECTOR CLOCK
```

```
4506  032054  005301                          DEC     R1              ;COUNT
4507  032056  001372                          BNE     5$              ;BRANCH IF 536 NOT DONE
4508
4509
4510
4511                                          ;*ECC PATTERN REGISTER IS NOT CHECKED
4512  032060  017737  162726  015066          MOV     @RHEC2,@#EC2    ;RHEC2 IS NOT CHECKED
4513
4514
4515                                          ;*NOW 'DTE' SHOULD BE SET, CHANGE SAVED REGISTERS TO EXPECTED VALUES
4516
4517  032066  005737  017334                  TST     @#RH70          ;CHECK FOR RH70 CONTROLLER
4518  032072  001412                          BEQ     7$              ;SKIP RH70 CODE AND DO RH11 IF NOT
4519
4520  032074  012737  177416  015026          MOV     #-242.,@#WC     ;SAVED RHWC
4521  032102  012737  015254  015030          MOV     #WRFROM+<14.*2>,@#BA ;SAVED RHBA
4522  032110  052737  000300  015032          BIS     #IR!OR,@#CS2    ;SAVED RHCS2
4523  032116  000414                          BR      8$              ;SKIP NEXT RH11 CODE
4524
4525  032120  012737  177511  015026  7$:     MOV     #-183.,@#WC     ;SAVED RHWC
4526  032126  012737  015442  015030          MOV     #WRFROM+<73.*2>,@#BA ;SAVED RHBA
4527  032134  042737  000100  015032          BIC     #IR,@#CS2       ;SAVED RHCS2
4528  032142  052737  000200  015032          BIS     #OR,@#CS2       ;SAVED RHCS2
4529
4530  032150  052737  140000  015034  8$:     BIS     #SC!TRE,@#CS1   ;SAVED RHCS1
4531  032156  052737  010000  015036          BIS     #DTE,@#ER1      ;SAVED RHER1
4532  032164  012737  000201  015054          MOV     #DENVL!DMD,@#MR ;SAVED RHMR
4533  032172  052737  140000  015056          BIS     #ATA!ERR,@#DS1  ;SAVED RHDS1
4534  032200  012737  000100  015070          MOV     #100,@#LA       ;SAVED RHLA
4535  032206  012737  000001  015040          MOV     #1,@#DST        ;SAVED RHDST
4536  032214  013737  015136  015052          MOV     @#ATTENT,@#AS   ;SAVED RHAS
4537
4538                                          ;*NOW READ & SAVE REGISTERS AGAIN SO THAT COMPARISONS
4539                                          ;CAN BE DONE (USING 'WRFROM' BUFFER THIS TIME)
4540
4541  032222  004037  046366                  JSR     R0,@#SAVER      ;READ IN SEQUENCE
4542  032226  014752                          RHWC                    ;FROM HARDWARE REGISTER
4543  032230  016264                          REINTO                  ;INTO CORE BUFFER LOCATION
4544  032232  000023                          19.                     ;NUMBER OF REGISTERS TO READ
4545
4546                                          ;*FOR RHAS UPPER BYTE
4547  032234  113737  015053  016311          MOVB    @#AS+1,@#REINTO+25 ;UPPER RHAS
4548
4549
4550                                          ;*COMPARE CHANGED REGISTER SNAPSHOT BEFORE COMMAND WITH
4551                                          ;*SNAPSHOT AFTER COMMAND
4552
4553  032242  004037  046570                  JSR     R0,@#COMPAR     ;COMPARE
4554  032246  015026                          WC                      ;CHANGED INITIAL SNAPSHOT BUFFER
4555  032250  016264                          REINTO                  ;SNAPSHORT BUFFER AFTER COMMAND
4556  032252  000022                          18.                     ;NUMBER OF REGISTERS TO COMPARE
4557  032254  032262                          2$                      ;RETURN FOR ERROR
4558  032256  032262                          2$                      ;SAME
4559  032260  032302                          3$                      ;RETURN FOR GOOD COMPARISON
```

```
4560
4561  032262  013705  052460          2$:   MOV     @#ERWORD,R5      ;GETTING READY TO INDEX
4562  032266  060505                        ADD     R5,R5            ;DOUBLE ERROR WORD
4563  032270  016537  014750  045440        MOV     RHWC-2(R5),@#REGADR ;FAILING REGISTER
4564  032276  104001                        ERROR   1                ;IMPROPER REGISTER
4565                                                                 ;CHANGE AFTER FORCING
4566                                                                 ;'DTE' ERROR
4567  032300  000207                        RTS     PC               ;RETURN
4568
4569  032302                          3$:                            ;GOOD, REGISTERS OK - GO ON TO NEXT TEST
4570
4571
```

```
                                ;;*****************************************************************
                                ;*TEST 51        DRIVE TIMING ERROR
                                ;
                                ;*      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'
                                ;;*****************************************************************
032302  000004                  TST51:  SCOPE
032304  012706  001000                  MOV     #STACK,SP       ;RESET STACK
032310  012737  000051  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER

                                        ;*THESE ARE TO SET UP FOR DISKLESS USE ONLY

032316  012737  010000  055476          MOV     #FMT22,@#WCYL   ;FORMAT 22=16 BITWORDS AND
                                                                ;CYLINDER 0
032324  005037  055500                  CLR     @#WSECTR        ;TRACK=0, SECTOR=0
032330  005037  055502                  CLR     @#WKEY1         ;KEY1=0
032334  005037  055504                  CLR     @#WKEY2         ;KEY2=0
032340  012737  000400  055536          MOV     #256.,@#FNWORD  ;256 DATAWORDS
032346  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
032352  055476                          WCYL
032354  055506                          GCRC

                                        ;* THESE         ARE REGULAR SETUPS & CHECKS

032356  004737  045674                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
032362  012777  177374  162362          MOV     #-260.,@RHWC    ;256 DATA WORDS & 4 HEADER WORDS
032370  012777  015220  162356          MOV     #WRFROM,@RHBA   ;STARTING ADDRESS OF BUFFER
032376  005077  162362                  CLR     @RHDST          ;TRACK = 0
                                                                ;SECTOR = 0
032402  012777  014000  162360          MOV     #FMT22!ECI,@RHOF ;16 BITS PER WORD
                                                                ;ECC CORRECTION INHIBITED
032410  005077  162356                  CLR     @RHCA           ;CYLINDER = 0
032414  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
032420  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
032424  000000                          HALT                    ;STOP THE TEST
032426  013711  015174                  MOV     @#WRIFOR,@R1    ;WRITE HEADER AND DATA = 62

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

032432  004037  046366                  JSR     R0,@#SAVER      ;READ IN SEQUENCE
032436  014752                          RHWC                    ;FROM HARDWARE REGISTER
032440  015026                          WC                      ;INTO CORE BUFFER LOCATION
032442  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.

032444  012737  177777  015146        MOV     #-1,@#TESDTE    ;SET DTE TEST
032452  012737  177777  015126        MOV     #-1,@#ERFLG$    ;THIS WILL BRING THE READ HEADER
                                                                ;AND DATA PROCESS OUT AFTER THE
                                                                ;HEADER HAS BEEN CORRECTLY READ

032460  004737  055322                JSR     PC,@#COMWHD     ;ISSUE 'GO', SEARCH FOR SECTOR,
                                                                ;WRITE HEADER AND DATA.

032464  017737  162270  001176  SETCK3: MOV     @RHCS1,@#$TMPO  ;READ CS1 TO CHECK FOR ERRORS DURING WRITE
032472  032737  100000  001176        BIT     #SC,@#$TMPO     ;TEST FOR "SPECIAL CONDITION" - 'SC'
032500  001405                        BEQ     4$              ;CONTINUE TEST IF NO ERROR ('SC' = 0)
032502  004737  045374                JSR     PC,@#PUTREG     ;READ & SAVE REGISTERS AGAIN IF ERROR
032506  104040                        ERROR   40              ;THERE WAS A READ/WRITE HEADER ERROR
                                                                ;DURING 'DTE' TEST SETUP
032510  000137  032742                JMP     TST52           ;       ABORT THE TEST AT THAT POINT

032514                          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

032514  012701  001141          5$:     MOV     #609.,R1        ;LOAD SECTOR CLOCK COUNTER
032520  052710  000010                  BIS     #MSTCK,@R0      ;SET SECTOR CLOCK
032524  042710  000010                  BIC     #MSTCK,@R0      ;CLEAR SECTOR CLOCK
032530  005301                          DEC     R1              ;COUNT
032532  001372                          BNE     5$              ;BRANCH IF 536 NOT DONE

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

032534  005737  017334                TST     @#RH70          ;CHECK FOR RH70 CONTROLLER
032540  001407                        BEQ     6$              ;SKIP RH70 CODE AND DO RH11 IF NOT

032542  012737  177404  015026        MOV     #-252.,@#WC     ;SAVED RHWC
032550  012737  015240  015030        MOV     #WRFROM+<8.*2>,@#BA ;SAVED RHBA
032556  000406                        BR      7$              ;SKIP NEXT RH11 CODE

032560  012737  177477  015026  6$:     MOV     #-193.,@#WC     ;SAVED RHWC
032566  012737  015426  015030          MOV     #WRFROM+<67.*2>,@#BA ;SAVED RHBA
```

```
4676  032574  052737  140000  015034  7$:   BIS     #SC!TRE,@#CS1   ;SAVED RHCS1
4677  032602  042737  000100  015032        BIC     #IR,@#CS2       ;SAVED RHCS2
4678  032610  052737  000200  015032        BIS     #OR,@#CS2       ;SAVED RHCS2
4679  032616  052737  010000  015036        BIS     #DTE,@#ER1      ;SAVED RHER1
4680  032624  012737  000401  015054        MOV     #401,@#MR       ;SAVED RHMR
4681  032632  052737  140000  015056        BIS     #ATA!ERR,@#DS1  ;SAVED RHDS1
4682  032640  012737  000100  015070        MOV     #100,@#LA       ;SAVED RHLA
4683  032646  012737  000001  015040        MOV     #1,@#DST        ;SAVED RHDST
4684  032654  013737  015136  015052        MOV     @#ATTENT,@#AS   ;SAVED RHAS
4685
4686                                        ;*NOW READ & SAVE REGISTERS AGAIN SO THAT COMPARISONS CAN BE DONE
4687
4688  032662  004037  046366                JSR     R0,@#SAVER      ;READ IN SEQUENCE
4689  032666  014752                        RHWC                    ;FROM HARDWARE REGISTER
4690  032670  016264                        REINTO                  ;INTO CORE BUFFER LOCATION
4691  032672  000023                        19.                     ;NUMBER OF REGISTERS TO READ
4692
4693                                        ;*FOR RHAS UPPER BYTE
4694  032674  113737  015053  016311        MOVB    @#AS+1,@#REINTO+25 ;UPPER RHAS
4695
4696                                        ;*COMPARE CHANGED REGISTER SNAPSHOT BEFORE COMMAND
4697                                        ;*WITH REGISTER SNAPSHOT AFTER COMMAND
4698
4699  032702  004037  046570                JSR     R0,@#COMPAR     ;COMPARE
4700  032706  015026                        WC                      ;CHANGED REGISTER SNAPSHOT
4701  032710  016264                        REINTO                  ;SNAPSHOT AFTER COMMAND
4702  032712  000022                        18.                     ;NUMBER OF REGISTERS TO COMPARE
4703  032714  032722                        2$                      ;RETURN FOR ERROR
4704  032716  032722                        2$                      ;SAME
4705  032720  032742                        3$                      ;RETURN FOR GOOD COMPARISON
4706
4707  032722  013705  052460        2$:     MOV     @#ERWORD,R5     ;GETTING READY TO INDEX
4708  032726  060505                        ADD     R5,R5           ;DOUBLE ERROR WORD
4709  032730  016537  014750  045440        MOV     RHWC-2(R5),@#REGADR ;FAILING REGISTER
4710  032736  104001                        ERROR   1               ;IMPROPER REGISTER
4711                                                                ;CHANGE AFTER FORCING
4712                                                                ;'DTE' ERROR
4713  032740  000207                        RTS     PC              ;RETURN
4714
4715  032742                        3$:                             ;GOOD, REGISTERS COMPARE OK
4716                                                                ;GO ON TO THE NEXT TEST
4717
```

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

                        ;;*****************************************************************
032742  000004         TST52:  SCOPE
032744  012706  001000          MOV     #STACK,SP       ;RESET STACK
032750  012737  000052  017330  MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
032756  004737  045674          JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS & CLEAR
                                                        ;THE DRIVE
032762  012737  000026  015150  MOV     #22.,@#TAGDTE   ;22 SECTORS
                                                        ;THIS TEST REPEATS
                                                        ;ITSELF 22 TIMES

                                ;*THE FOLLOWING INITIALIZES FOR SECTOR 0

032770  005037  033074          CLR     @#SS3+2         ;HEADER (SECTOR)
032774  012737  000025  033100  MOV     #21.,@#SS4+2    ;HEADER (KEY1)
033002  012737  000025  033104  MOV     #21.,@#SS5+2    ;HEADER (KEY2)
033010  005037  033132          CLR     @#SS7+2         ;DATA (SECTOR)
033014  005037  033214          CLR     @#SS10+2        ;DATA
033020  005037  033244          CLR     @#SS12+2        ;SECTOR (SIMULATED DISK)
033024  012737  000025  033252  MOV     #21.,@#SS13+2   ;KEY1 (SIMULATED DISK)
033032  012737  000025  033260  MOV     #21.,@#SS14+2   ;KEY2 (SIMULATED DISK)
033040  005037  033320          CLR     @#SS15+2        ;SECTOR (RHDST)

                                ;*CLEAR SIMULATED DISK AREA
033044                  SS1:
033044  012700  054160  1$:     MOV     #SECGAP,R0      ;POINTER
033050  012701  000460          MOV     #304.,R1        ;COUNTER
033054  005020          2$:     CLR     (R0)+           ;CLEAR SIMULATED DISK AREA
033056  005301                  DEC     R1              ;COUNT
033060  001375                  BNE     2$

                                ;*SETUP WRITE FROM BUFFER
033062  012700  015220          MOV     #WRFROM,R0

                                ;*HEADER
033066  012720  010000          MOV     #FMT22,(R0)+    ;FORMAT 16 BITS PER WORD
                                                        ;CYLINDER 0
033072  012720  000000  SS3:    MOV     #0,(R0)+        ;SECTOR TO VARY
033076  012720  000025  SS4:    MOV     #21.,(R0)+      ;KEY1 TO VARY
033102  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

033106  012705  000023          MOV     #19.,R5         ;COUNTER
033112  005020          6$:     CLR     (R0)+           ;19 ZEROS
033114  005305                  DEC     R5              ;COUNT
033116  001375                  BNE     6$              ;19 DONE?
033120  013720  052442          MOV     @#RSYNC,(R0)+   ;SYNC = 14400
033124  012720  010000          MOV     #FMT22,(R0)+    ;CYLINDER 0
033130  012720  000000  SS7:     MOV     #0,(R0)+        ;SECTOR TO VARY
033134  005020                  CLR     (R0)+
033136  005020                  CLR     (R0)+
033140  004537  047102          JSR     R5,@#CRC        ;CALCULATE CRC FOR ABOVE 4 WORDS
033144  015270                  WRFROM+50               ;4 WORDS START FROM HERE
033146  015300                  WRFROM+60               ;PUT CRC HERE

033150  005720                  TST     (R0)+           ;INCREMENT R0

033152  012705  000005          MOV     #5.,R5
033156  005020          8$:     CLR     (R0)+           ;5 WORDS OF ZEROS
033160  005305                  DEC     R5              ;COUNT
033162  001375                  BNE     8$              ;BRANCH IF 5 NOT DONE

033164  013720  052442          MOV     @#RSYNC,(R0)+   ;SYNC = 14400

033170  012705  000144          MOV     #100.,R5
033174  005020          9$:     CLR     (R0)+           ;100 WORDS OF ZEROS
033176  005305                  DEC     R5
033200  001375                  BNE     9$

033202  013720  052442          MOV     @#RSYNC,(R0)+   ;SYNC = 14400
033206  012705  000106          MOV     #70.,R5
033212  012720  000000  SS10:    MOV     #0,(R0)+        ;SECTOR TO VARY
033216  005305                  DEC     R5
033220  001374                  BNE     SS10

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

033222  012705  000066          MOV     #54.,R5
033226  005020          11$:    CLR     (R0)+
033230  005305                  DEC     R5
033232  001375                  BNE     11$

                                        ;*THESE ARE TO BE SET UP FOR DISKLESS USE ONLY

033234  012737  010000  055476  MOV     #FMT22,@#WCYL   ;FORMAT = 16 BIT WORDS
                                                        ;CYLINDER = 0
033242  012737  000000  055500  SS12:   MOV     #0,@#WSECTR     ;SECTOR TO VARY
033250  012737  000025  055502  SS13:   MOV     #21.,@#WKEY1    ;KEY1 TO VARY
033256  012737  000025  055504  SS14:   MOV     #21.,@#WKEY2    ;KEY2 TO VARY
033264  012737  000312  055536          MOV     #202.,@#FNWORD  ;202 DATA WORDS
```

```
4826  033272  004537  047102                  JSR     R5,@#CRC        ;CALCULATE CRC
4827  033276  055476                          WCYL                    ;FIRST WORD
4828  033300  055506                          GCRC                    ;PUT HERE
4829
4830                                          ;*THESE ARE REGULAR SETUPS
4831
4832  033302  012777  177400  161442          MOV     #-256.,@RHWC    ;202 DATA, 4 HEADER
4833  033310  012777  015220  161436          MOV     #WRFROM,@RHBA   ;FILL BUS ADDRESS
4834  033316  012777  000000  161440  SS15:   MOV     #0,@RHDST       ;SECTOR TO VARY
4835  033324  013777  015174  161426          MOV     @#WRIFOR,@RHCS1 ;GET READY TO DO
4836                                                                  ;WRITE HEADER AND DATA
4837                                                                  ;WITH 62 FUNCTION CODE IN RHCS1
4838  033332  012777  010000  161430          MOV     #FMT22,@RHOF    ;16 BITS PER WORD FORMAT
4839  033340  005077  161426                  CLR     @RHCA           ;CYLINDER = 0
4840
4841  033344  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
4842
4843  033350  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
4844  033354  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
4845                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
4846  033360  000000                          HALT                    ;STOP THE TEST
4847
4848  033362  004737  055322                  JSR     PC,@#COMWHD     ;ISSUE 'GO', COUNT SECTOR CLOCKS,
4849                                                                  ;WRITE HEADER AND DATA
4850  033366  005737  015126                  TST     @#ERFLG$        ;HAVE ANY ERRORS OCCURRED ?
4851  033372  001051                          BNE     TST53           ;       EXIT IF YES----------------------)
4852
4853  033374  004737  046120                  JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
4854  033400  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
4855  033404  000000                          HALT                    ;STOP THE TEST AND RESTART PROGRAM
4856
4857                                          ;*NOW COMPARE "DISK" BUFFER WITH "REINTO" BUFFER
4858  033406  004037  046570                  JSR     R0,@#COMPAR     ;CHECK
4859  033412  015230                          WRFROM+8.               ;GOOD BUFFER
4860  033414  054256                          DISK                    ;TEST BUFFER
4861  033416  000400                          256.                    ;NUMBER OF WORDS
4862  033420  033426                          16$                     ;RETURN POINT FOR ERROR  HEADER
4863  033422  033432                          17$                     ;RETURN POINT FOR ERROR DATA
4864  033424  033436                          18$                     ;RETURN FOR GOOD COMPARISON
4865  033426  104007                  16$:    ERROR   7
4866  033430  000207                          RTS     PC
4867  033432  104010                  17$:    ERROR   10
4868  033434  000207                          RTS     PC
4869
4870                                          ;*THE FOLLOWING INCREMENTS ARE TO CHANGE THE ABOVE SET UP
4871                                          ;*TO WRITE ON THE NEXT SECTOR
4872
4873  033436  005237  033074          18$:    INC     @#SS3+2         ;HEADER (SECTOR)
4874  033442  005337  033100                  DEC     @#SS4+2         ;HEADER (KEY1)
4875  033446  005337  033104                  DEC     @#SS5+2         ;HEADER (KEY2)
4876  033452  005237  033132                  INC     @#SS7+2         ;DATA (SECTOR)
4877  033456  005237  033214                  INC     @#SS10+2        ;DATA
4878  033462  005237  033244                  INC     @#SS12+2        ;SECTOR (SIMULATED DISK)
4879  033466  005337  033252                  DEC     @#SS13+2        ;KEY1 (SIMULATED DISK)
```

```
 4880  033472  005337  033260                DEC     @#SS14+2        ;KEY2 (SIMULATED DISK)
 4881  033476  005237  033320                INC     @#SS15+2        ;SECTOR (RHDST)
 4882
 4883  033502  005337  015150        SS2:    DEC     @#TAGDTE        ;COUNT DOWN FOR 22 SECTORS
 4884  033506  001001                        BNE     1$              ;BRANCH IF 22 SECTORS NOT DONE
 4885  033510  000402                        BR      TST53           ;ALL DONE - GO TO NEXT TEST
 4886  033512  000137  033044        1$:     JMP     @#SS1           ;GO BACK TO NEXT SECTOR
 4887
 4888
 4889
```

```
                                        .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.

                                ;;*****************************************************************
033516  000004                  TST53:  SCOPE
033520  012706  001000                  MOV     #STACK,SP       ;RESET STACK

033524  012737  000053  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
033532  012700  054160                  MOV     #SECGAP,R0      ;POINTER
033536  012701  000402                  MOV     #258.,R1        ;COUNTER
033542  012720  177777          1$:     MOV     #-1,(R0)+       ;FILL SIMULATER DISK WITH ONES
033546  005301                  1$:     DEC     R1
033550  001374                          BNE     1$
033552  004737  045674                  JSR     PC,@#CLDISK     ;THIS IS USED TO SET GENERAL REGISTERS

                                        ;*THESE ARE FOR ECC TEST ONLY

033556  012737  177777  015144          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
033564  005037  050402                  CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
033570  013737  050376  050400          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
033576  013737  050404  050412          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
033604  005037  050370                  CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
033610  005037  050372                  CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
033614  005037  050406                  CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
033620  005037  050410                  CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT


                                        ;*THESE ARE TO BE SETUP FOR DISKLESS USE ONLY

033624  012737  010000  055476          MOV     #FMT22,@#WCYL   ;FORMAT22=16BIT WORDS AND
                                                                ;CYLINDER 0
033632  012737  000001  055500          MOV     #1,@#WSECTR     ;TRACK=0, SECTOR=1
033640  005037  055502                  CLR     @#WKEY1         ;KEY1=0
033644  005037  055504                  CLR     @#WKEY2         ;KEY2=0
033650  012737  000400  055536          MOV     #256.,@#FNWORD  ;256 DATA WORDS
033656  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
033662  055476                          WCYL
033664  055506                          GCRC

                                        ;*THESE ARE REGULAR SETUPS

033666  012777  177374  161056          MOV     #-260.,@RHWC    ;256 DATA WORDS 4 HEADER WORDS
033674  012700  015220                  MOV     #WRFROM,R0      ;THESE TWO INSTRUCTIONS GETS
```

```
4944  033700  010077  161050                    MOV     R0,@RHBA        ;ADDR. OF WRFROM INTO R0 AND
4945                                                                      ;BUS ADDRESS REGISTER
4946  033704  012720  010000                    MOV     #FMT22,(R0)+    ;FORMAT=16 BIT WORDS
4947                                                                      ;CYLINDER=0
4948  033710  012720  000001          2$:       MOV     #1,(R0)+        ;TRACK=0, SECTOR=1, KEYS=0
4949  033714  005020                            CLR     (R0)+           ;KEY1=0
4950  033716  005020                            CLR     (R0)+           ;KEY2=0
4951  033720  012705  000400                    MOV     #256.,R5        ;COUNTER
4952  033724  012720  000000          3$:       MOV     #0,(R0)+        ;MOVE ALL ZEROS FOR DATA
4953  033730  005305                            DEC     R5
4954  033732  001374                            BNE     3$              ;BRANCH IF DATA NOT COMPLETE
4955  033734  012777  000001  161022            MOV     #1,@RHDST       ;TRACK=0 SECTOR=1
4956
4957  033742  004737  045730                    JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
4958  033746  104400  005124                    TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
4959                                                                      ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
4960  033752  000000                            HALT                    ;STOP THE TEST
4961
4962  033754  013711  015174                    MOV     @#WRIFOR,@R1    ;GET READY FOR WRITE HEADER AND
4963                                                                      ;DATA WITH 62 IN RHCS1
4964  033760  005037  015126                    CLR     @#ERFLG$        ;CLEAR ERROR FLAG
4965  033764  012777  010000  160776            MOV     #FMT22,@RHOF    ;FORMAT BIT=1 (16 BIT WORDS)
4966  033772  005077  160774                    CLR     @RHCA           ;CYLINDER =0
4967  033776  004737  055322                    JSR     PC,@#COMWHD     ;WRITE HEADER AND DATA
4968
4969                                            ;*IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
4970                                            ;*FROM THE "COMWHD" ROUTINE THAT MEANS ALL HEADER ON DISK
4971                                            ;*IS GOOD IE. ONLY DATA IS TO BE CHECKED TO SEE IF THEY ARE
4972                                            ;*ALL ZEROS AND WRITE DATA GAP AND TOLERANCE GAP TO SEE IF
4973                                            ;*THEY ARE ALL ZEROS
4974
4975  034002  005737  015126                    TST     @#ERFLG$        ;HAS ANY ERRORS OCCURED?
4976                                                                      ;IF WRITE ERROR OCCURS ECC IS NOT CHECKED
4977  034006  001056                            BNE     TST54           ;;BRANCH IF YES
4978
4979
4980                                            ;*COMPARE SOFTWARE GENERATED ECC WITH THAT GENERATED BY HARDWARE
4981
4982  034010  023737  050370  055256            CMP     @#GECC1,@#WECC1;COMPARE SOFTWARE ECC WITH HARDWARE ECC
4983  034016  001402                            BEQ     6$              ;BRANCH IF GOOD
4984  034020  104031                            ERROR   31              ;LOW ORDER ECC IN ERROR
4985  034022  000405                            BR      7$              ;BRANCH TO CONTINUE
4986  034024  023737  050372  055260  6$:       CMP     @#GECC2,@#WECC2;COMPARE SOFTWARE ECC WITH HARDWARE ECC
4987  034032  001401                            BEQ     7$              ;BRANCH IF GOOD
4988  034034  104031                            ERROR   31              ;HIGH ORDER ECC IN ERROR
4989
4990
4991  034036                          7$:
4992  034036  004737  046120                    JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
4993  034042  104400  005124                    TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
4994  034046  000000                            HALT                    ;STOP THE TEST AND RESTART PROGRAM
4995
4996
4997
```

```
                                        ;*FILL "REINTO" BUFFER WITH EXPECTED DATA
                                        ;
034050  004037  045612                  JSR     R0,@#CLAREA     ;FILL REINTO BUFFER
034054  016264                          REINTO                  ;FROM
034056  017262                          REINTO+<255.*2>         ;TO
034060  000000                          .WORD   0               ;DATA
                                        ;
034062  013737  050370  017264          MOV     @#GECC1,@#REINTO+<256.*2>;FILL ECC1
034070  013737  050372  017266          MOV     @#GECC2,@#REINTO+<257.*2>;FILL ECC2
034076  004037  045612                  JSR     R0,@#CLAREA     ;FILL REST
034102  017270                          REINTO+<258.*2>         ;FROM
034104  017324                          REINTO+<272.*2>         ;TO
034106  000000                          0                       ;DATA
                                        ;
                                        ;
034110  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
                                        ;
                                        ;
                                        ;*NOW COMPARE "DISK" BUFFER WITH "REINTO"
                                        ;
034114  004037  046570                  JSR     R0,@#COMPAR     ;CHECK
034120  016264                          REINTO                  ;GOOD BUFFER
034122  054256                          DISK                    ;TEST BUFFER
034124  000402                          258.                    ;NUMBER OF WORDS CHECKED
034126  034134                          4$                      ;RETURN POINT FOR ERROR HEADER
034130  034140                          5$                      ;RETURN POINT FOR ERROR DATA
                                        ;
034132  034144                          TST54                   ;RETURN FOR GOOD COMPARISON
                                        ;
034134  104007          4$:             ERROR   7               ;READ ERROR 10 NEXT
034136  000207                          RTS     PC              ;RETURN TO COMPARE
034140  104010          5$:             ERROR   10              ;WORD NOS 1 TO 256 ARE
                                        ;                       ;DATA WORDS
                                        ;                       ;WORD NOS 257 AND 258
                                        ;                       ;ARE ECC WHICH ARE CHECKED
                                        ;                       ;WORD NOS 259
                                        ;                       ;IS DATA GAP
                                        ;                       ;WORD NOS 260 TO 273
                                        ;                       ;ARE TOLERANCE GAP
034142  000207                          RTS     PC              ;RETURN TO COMPARE
```

```
5043
5044                                    ;;*****************************************************************
5045                                    ;*TEST 54        READ ECC ENABLED 1A
5046
5047                                    ;*      THIS IS AN ECC READ DATA TEST
5048                                    ;*      ERROR CORRECTION IS ENABLED
5049                                    ;*      NO ERROR IS INSERTED
5050                                    ;*      GOOD DATA USED IS 256 WORDS OF 0
5051                                    ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
5052                                    ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
5053
5054                                    ;;*****************************************************************
5055  034144  000004                    TST54:  SCOPE
5056  034146  012706  001000                    MOV     #STACK,SP       ;RESET STACK
5057
5058  034152  012737  000054  017330            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
5059
5060
5061                                    ;       SETUP FOR WHAT IS TO BE READ
5062                                    ;       HEADER CRC IS RESTORED FROM A SUBROUTINE
5063
5064  034160  012746  000000                    MOV     #0,-(SP)        ;DATA TO BE READ
5065  034164  012705  000400                    MOV     #256.,R5        ;COUNTER
5066  034170  012700  054256                    MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
5067  034174  011620                    1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
5068  034176  005305                            DEC     R5              ;COUNT
5069  034200  001375                            BNE     1$              ;BRANCH IF 256 NOT COMPLETE
5070  034202  005726                            TST     (SP)+           ;UNDO -(SP)
5071  034204  022020                            CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
5072  034206  012705  000017                    MOV     #15.,R5         ;1 DATA GAP
5073                                                                    ;14 TOLERANCE GAP
5074  034212  005020                    2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
5075  034214  005305                            DEC     R5              ;TOLERANCE GAP
5076  034216  001375                            BNE     2$              ;BRANCH IF NOT COMPLETE
5077
5078
5079  034220  004737  051164                    JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
5080                                                                    ;IN THE CORRECT PLACE
5081
5082                                    ;*THESE ARE FOR ECC TEST ONLY
5083
5084  034224  012737  177777  015144            MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
5085  034232  005037  050402                    CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
5086  034236  013737  050376  050400            MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
5087  034244  013737  050404  050412            MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
5088  034252  005037  050370                    CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
5089  034256  005037  050372                    CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
5090  034262  005037  050406                    CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
5091  034266  005037  050410                    CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
5092
5093
5094                                    ;*THESE ARE TO SETUP FOR DISKLESS USE ONLY
5095
5096  034272  012737  010000  052340            MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
                                                        ;CYLINDER 0, FORMAT 16 BITS
034300  112737  000000  052343    MOVB    #0,@#SECOTR+1   ;TRACK 0
034306  112737  000000  052342    MOVB    #0,@#SECOTR     ;SECTOR 0
034314  012737  000000  052344    MOV     #0,@#KEY1       ;KEY1=0
034322  012737  000000  052346    MOV     #0,@#KEY2       ;KEY2=0
034330  012737  000400  052420    MOV     #256.,  @#DAWORD ;NO. OF DATA WORDS
034336  005037  052350            CLR     @#X             ;THIS IS A READ COMMAND
034342  004537  047102            JSR     R5,@#CRC        ;GO TO CALCULATE CRC
034346  052340                    CYL
034350  054240                    WCRC



                                ;*THESE ARE REGULAR SETUPS
034352  004737  045674            JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
034356  012777  177374  160366    MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
034364  012777  016264  160362    MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
034372  112746  000000            MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
034376  112766  000000  000001    MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
034404  012677  160354            MOV     (SP)+,  @RHDST  ;TRACK/SECTOR IN RHDST
034410  012777  010000  160352    MOV     #FMT22,@RHOF    ;16 BITS PER WORD
                                                        ;ECC CORRECTION NOT INHIBIT
                                                        ;BECAUSE ECC IS NOT GOING
                                                        ;TO BE CHECKED
034416  005077  160350            CLR     @RHCA           ;CYLINDER 0

034422  004737  045730            JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
034426  104400  005124            TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                        ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
034432  000000                    HALT                    ;STOP THE TEST

034434  013711  015200            MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
034440  005037  015126            CLR     @#ERFLG$        ;CLEAR ERROR FLAG
034444  004737  052200            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

034450  005737  015126            TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
034454  001102                    BNE     TST55           ;BRANCH IF YES
034456  004737  045374            JSR     PC,@#PUTREG     ;SAVE REGISTERS
034462  005737  015036            TST     @#ER1           ;NO ERRORS SHOULD BE SET
```

```
5151  034466  001401                        BEQ     6$              ;BRANCH IF NO ERRORS SET
5152  034470  104032                        ERROR   32              ;32 BIT ECC REGISTER SHOULD BE ZERO
5153                                                                ;ONLY 11 OF THE 32 BITS CAN BE SEEN
5154                                                                ;IN THE PATERN REGISTER
5155                                                                ;DCK SHOULD BE SET IN RHER1
5156  034472  013746  050370          6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
5157  034476  042716  174000                  BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
5158  034502  022637  015066                  CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
5159  034506  001401                        BEQ     7$              ;BRANCH IF GOOD
5160  034510  104032                        ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT
5161
5162
5163
5164
5165                                        ;*ADD 16 MAINTENANCE CLOCKS TO
5166                                        ;*BRING EBL DOWN
5167
5168  034512  012700  000020          7$:     MOV     #16.,R0         ;COUNTER
5169  034516  052777  000002  160254  8$:     BIS     #MCLK,@RHMR     ;SET CLOCK
5170  034524  042777  000002  160246          BIC     #MCLK,@RHMR     ;CLEAR CLOCK
5171  034532  005300                        DEC     R0              ;COUNT
5172  034534  001370                        BNE     8$              ;BRANCH IF 16 CLOCKS NOT DONE
5173  034536  004737  046120                JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
5174  034542  104400  005124                TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
5175  034546  000000                        HALT                    ;STOP THE TEST AND RESTART PROGRAM
5176  034550  012700  015220                MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
5177  034554  012720  010000                MOV     #0!FMT22,(R0)+  ;CYLINDER 0
5178  034560  112746  000000                MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
5179  034564  112766  000000  000001        MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
5180  034572  012620                        MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
5181  034574  012720  000000                MOV     #0,(R0)+        ;KEY1 IN BUFFER
5182  034600  012720  000000                MOV     #0,(R0)+        ;KEY2 IN BUFFER
5183  034604  012701  000400                MOV     #256.,R1        ;DATA WORD COUNTER
5184  034610  012702  000000                MOV     #0,R2           ;DATA
5185  034614  010220                3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
5186  034616  005301                        DEC     R1              ;COUNT
5187  034620  001375                        BNE     3$              ;BRANCH IF 256 NOT DONE
5188
5189
5190  034622  005037  015126                CLR     @#ERFLG$        ;CLEAR ERROR FLAG
5191  034626  004737  045374                JSR     PC,@#PUTREG     ;SAVE REGISTERS
5192
5193
5194
5195                                        ;*NOW READ DATA BUFFER WILL BE CHECKED
5196
5197  034632  004037  046570                JSR     R0,@#COMPAR     ;CHECK
5198  034636  015220                        WRFROM                  ;GOOD BUFFER
5199  034640  016264                        REINTO                  ;TEST BUFFER
5200  034642  000404                        4+256.                  ;NUMBER OF WORDS CHECKED
5201  034644  034652                        4$                      ;RETURN POINT FOR ERROR HEADER
5202  034646  034656                        5$                      ;RETURN POINT FOR ERROR DATA
5203
5204  034650  034662                        TST55                   ;RETURN FOR GOOD COMPARISON
```

```
5205
5206  034652  104004                  4$:     ERROR   4               ;READ NEXT ERROR
5207  034654  000207                          RTS     PC              ;RETURN TO "COMPAR"
5208  034656  104005                  5$:     ERROR   5               ;WORD NOS 1 TO 4 ARE
5209                                                                  ;HEADER WORDS
5210                                                                  ;5 TO 260 ARE DATA WORDS
5211  034660  000207                          RTS     PC              ;RETURN TO "COMPAR"
5212
5213
5214
5215
```

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

                                ;;*****************************************************************
034662  000004                  TST55:  SCOPE
034664  012706  001000                  MOV     #STACK,SP       ;RESET STACK

034670  012737  000055  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER


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

034676  012746  000000                  MOV     #0,-(SP)        ;DATA TO BE READ
034702  012705  000400                  MOV     #256.,R5        ;COUNTER
034706  012700  054256                  MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
034712  011620                  1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
034714  005305                          DEC     R5              ;COUNT
034716  001375                          BNE     1$              ;BRANCH IF 256 NOT COMPLETE
034720  005726                          TST     (SP)+           ;UNDO -(SP)
034722  022020                          CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
034724  012705  000017                  MOV     #15.,   R5      ;1 DATA GAP
                                                                ;14 TOLERANCE GAP
034730  005020                  2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
034732  005305                          DEC     R5              ;TOLERANCE GAP
034734  001375                          BNE     2$              ;BRANCH IF NOT COMPLETE


034736  004737  051164                  JSR     PC,@#FILLEC     ;INSERT ECC IN PROPER PLACE ON DISK


                                        ;*THESE ARE FOR ECC TEST ONLY

034742  012737  177777  015144          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
034750  005037  050402                  CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
034754  013737  050376  050400          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
034762  013737  050404  050412          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
034770  005037  050370                  CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
034774  005037  050372                  CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
035000  005037  050406                  CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
035004  005037  050410                  CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT


                                        ;*THESE ARE TO SETUP FOR DISKLESS USE ONLY
```

```
5270  035010  012737  010000  052340          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
5271                                                                  ;CYLINDER 0, FORMAT 16 BITS
5272  035016  112737  000000  052343          MOVB    #0,@#SECOTR+1   ;TRACK 0
5273  035024  112737  000000  052342          MOVB    #0,@#SECOTR     ;SECTOR 0
5274  035032  012737  000000  052344          MOV     #0,@#KEY1       ;KEY1=0
5275  035040  012737  000000  052346          MOV     #0,@#KEY2       ;KEY2=0
5276  035046  012737  000400  052420          MOV     #256.,  @#DAWORD ;NO. OF DATA WORDS
5277  035054  005037  052350                  CLR     @#X             ;THIS IS A READ COMMAND
5278  035060  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
5279  035064  052340                          CYL
5280  035066  054240                          WCRC
5281
5282
5283                                          ;*THIS IS TO INSERT ERROR
5284                                          ;*THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
5285                                          ;*THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
5286                                          ;*THIS MOVE
5287
5288  035070  012737  100000  054260          MOV     #100000,@#DISK+2 ;FORCE ERROR ON BIT NUMBER 32
5289                                                                  ;SO ERROR POSITION REGISTER WILL SHOW
5290                                                                  ;22
5291  035076  012737  000026  035252          MOV     #22.,@#8$       ;INSERT POSITION REG.
5292
5293
5294                                          ;*THESE ARE REGULAR SETUPS
5295
5296  035104  004737  045674                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
5297  035110  012777  177374  157634          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
5298  035116  012777  016264  157630          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
5299  035124  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
5300  035130  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
5301  035136  012677  157622                  MOV     (SP)+,  @RHDST  ;TRACK/SECTOR IN RHDST
5302  035142  012777  010000  157620          MOV     #FMT22,@RHOF    ;16 BITS PER WORD
5303                                                                  ;ECC CORRECTION NOT INHIBIT
5304                                                                  ;BECAUSE ECC IS NOT GOING
5305                                                                  ;TO BE CHECKED
5306  035150  005077  157616                  CLR     @RHCA           ;CYLINDER 0
5307
5308  035154  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
5309  035160  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
5310                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
5311  035164  000000                          HALT                    ;STOP THE TEST
5312
5313  035166  013711  015200                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
5314  035172  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
5315  035176  004737  052200                  JSR     PC,@#COMHD      ;READ HEADER AND DATA
5316                                                                  ;IF THERE ARE READ ERRORS THEN
5317                                                                  ;ECC WILL NOT BE CHECKED
5318
5319
5320                                          ;*IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
5321                                          ;*FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
5322                                          ;*FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
5323                                          ;*SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
```

```
5324                                            ;*DETECTED
5325                                            ;*HEADER AND DATA ARE TO BE CHECKED.
5326                                            ;*IN CHECKING READ DATA THE WRITE FROM BUFFER
5327                                            ;*"WRFROM" IS FILLED WITH EXPECTED DATA AND
5328                                            ;*COMPARISONS ARE MADE
5329
5330  035202  005737  015126                    TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE -
5331  035206  001077                            BNE     TST56           ;BRANCH IF YES
5332  035210  004737  045374                    JSR     PC,@#PUTREG     ;SAVE REGISTERS
5333  035214  022737  100000  015036            CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
5334  035222  001401                            BEQ     6$              ;BRANCH IF YES
5335  035224  104032                            ERROR   32              ;32 BIT ECC REGISTER SHOULD BE NON
5336                                                                    ;ZERO
5337                                                                    ;ONLY 11 OF THE 32 BITS CAN BE SEEN
5338                                                                    ;IN THE PATERN REGISTER
5339                                                                    ;DCK SHOULD BE SET IN RHER1
5340  035226  013746  050370            6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
5341  035232  042716  174000                    BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
5342  035236  022637  015066                    CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
5343  035242  001401                            BEQ     7$              ;BRANCH IF GOOD
5344  035244  104032                            ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT
5345
5346  035246  004037  051012            7$:     JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
5347  035252  000026                    8$:     22.                     ;EXPECTED POSITION REG. WHEN CORRECTION
5348                                                                    ;IS COMPLETE
5349
5350
5351
5352  035254  004737  046120                    JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
5353  035260  104400  005124                    TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
5354  035264  000000                            HALT                    ;STOP THE TEST AND RESTART PROGRAM
5355  035266  012700  015220                    MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
5356  035272  012720  010000                    MOV     #0!FMT22,(R0)+  ;CYLINDER 0
5357  035276  112746  000000                    MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
5358  035302  112766  000000  000001            MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
5359  035310  012620                            MOV     (SP)+,  (R0)+   ;GET TRACK/SECTOR IN BUFFER
5360  035312  012720  000000                    MOV     #0,(R0)+        ;KEY1 IN BUFFER
5361  035316  012720  000000                    MOV     #0,(R0)+        ;KEY2 IN BUFFER
5362  035322  012701  000400                    MOV     #256.,  R1      ;DATA WORD COUNTER
5363  035326  012702  000000                    MOV     #0,R2           ;DATA
5364  035332  010220                    3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
5365  035334  005301                            DEC     R1              ;COUNT
5366  035336  001375                            BNE     3$              ;BRANCH IF 256 NOT DONE
5367
5368                                            ;*ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
5369                                            ;*NOW THE INSERTED ERROR WILL BE PUT IN
5370  035340  012737  100000  015232            MOV     #100000,@#WRFROM+<5*2>  ;INSERTED ERROR
5371
5372
5373
5374  035346  005037  015126                    CLR     @#ERFLG$        ;CLEAR ERROR FLAG
5375  035352  004737  045374                    JSR     PC,@#PUTREG     ;SAVE REGISTERS
5376
5377
```

```
                                        ;*NOW READ DATA BUFFER WILL BE CHECKED
                                        
035356  004037  046570                  JSR     R0,@#COMPAR     ;CHECK
035362  015220                          WRFROM                  ;GOOD BUFFER
035364  016264                          REINTO                  ;TEST BUFFER
035366  000404                          4+256.                  ;NUMBER OF WORDS CHECKED
035370  035376                          4$                      ;RETURN POINT FOR ERROR HEADER
035372  035402                          5$                      ;RETURN POINT FOR ERROR DATA
                                        
035374  035406                          TST56                   ;RETURN FOR GOOD COMPARISON
                                        
035376  104004                  4$:     ERROR   4               ;READ NEXT ERROR
035400  000207                          RTS     PC              ;RETURN TO "COMPAR"
035402  104005                  5$:     ERROR   5               ;WORD NOS 1 TO 4 ARE
                                                                ;HEADER WORDS
                                                                ;5 TO 260 ARE DATA WORDS
035404  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
                                ;
                                ;;*****************************************************************
035406  000004                  TST56:  SCOPE
035410  012706  001000                  MOV     #STACK,SP       ;RESET STACK
                                ;
035414  012737  000056  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                ;
                                ;       SETUP FOR WHAT IS TO BE READ
                                ;       HEADER CRC IS RESTORED FROM A SUBROUTINE
                                ;
035422  012746  000000                  MOV     #0,-(SP)        ;DATA TO BE READ
035426  012705  000400                  MOV     #256.,R5        ;COUNTER
035432  012700  054256                  MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
035436  011620                  1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
035440  005305                          DEC     R5              ;COUNT
035442  001375                          BNE     1$              ;BRANCH IF 256 NOT COMPLETE
035444  005726                          TST     (SP)+           ;UNDO -(SP)
035446  022020                          CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
035450  012705  000017                  MOV     #15.,R5         ;1 DATA GAP
                                                                ;14 TOLERANCE GAP
035454  005020                  2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
035456  005305                          DEC     R5              ;TOLERANCE GAP
035460  001375                          BNE     2$              ;BRANCH IF NOT COMPLETE
                                ;
035462  004737  051164                  JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
                                                                ;IN THE CORRECT PLACE
                                ;
                                ;*THESE ARE FOR ECC TEST ONLY
                                ;
035466  012737  177777  015144          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
035474  005037  050402                  CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
035500  013737  050376  050400          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
035506  013737  050404  050412          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
035514  005037  050370                  CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
035520  005037  050372                  CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
035524  005037  050406                  CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
035530  005037  050410                  CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
                                ;
                                ;*THESE ARE TO SETUP FOR DISKLESS USE ONLY
                                ;
035534  012737  010000  052340          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
                                                                ;CYLINDER 0, FORMAT 16 BITS
035542  112737  000000  052343          MOVB    #0,@#SECOTR+1   ;TRACK 0
035550  112737  000000  052342          MOVB    #0,@#SECOTR     ;SECTOR 0
035556  012737  000000  052344          MOV     #0,@#KEY1       ;KEY1=0
035564  012737  000000  052346          MOV     #0,@#KEY2       ;KEY2=0
035572  012737  000400  052420          MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
035600  005037  052350                  CLR     @#X             ;THIS IS A READ COMMAND
035604  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
035610  052340                          CYL
035612  054240                          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
035614  012737  177760  054260          MOV     #177760,@#DISK+2  ;FORCE ERROR ON BIT NUMBER 21 THRU 32
                                                                ;SO ERROR POSITION REGISTER WILL SHOW
                                                                ;22
035622  012737  010040  035776          MOV     #4128.,@#8$     ;INSERT POSITION REG.


                                        ;*THESE ARE REGULAR SETUPS

035630  004737  045674                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
035634  012777  177374  157110          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
035642  012777  016264  157104          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
035650  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
035654  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
035662  012677  157076                  MOV     (SP)+,  @RHDST  ;TRACK/SECTOR IN RHDST
035666  012777  010000  157074          MOV     #FMT22,@RHOF    ;16 BITS PER WORD
                                                                ;ECC CORRECTION NOT INHIBIT
                                                                ;BECAUSE ECC IS NOT GOING
                                                                ;TO BE CHECKED
035674  005077  157072                  CLR     @RHCA           ;CYLINDER 0
035700  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
035704  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
035710  000000                          HALT                    ;STOP THE TEST
035712  013711  015200                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
035716  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
035722  004737  052200                  JSR     PC,     @#COMHD ;READ HEADER AND DATA
                                                                ;IF THERE ARE READ ERRORS THEN
                                                                ;ECC WILL NOT BE CHECKED
```

```
5495
5496                                        ;*IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
5497                                        ;*FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
5498                                        ;*FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
5499                                        ;*SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
5500                                        ;*DETECTED
5501                                        ;*HEADER AND DATA ARE TO BE CHECKED.
5502                                        ;*IN CHECKING READ DATA THE WRITE FROM BUFFER
5503                                        ;*"WRFROM" IS FILLED WITH EXPECTED DATA AND
5504                                        ;*COMPARISONS ARE MADE
5505
5506  035726  005737  015126          TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
5507  035732  001106                  BNE     TST57           ;BRANCH IF YES
5508  035734  004737  045374          JSR     PC,@#PUTREG     ;SAVE REGISTERS
5509  035740  022737  100000  015036  CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
5510  035746  001401                  BEQ     6$              ;BRANCH IF YES
5511  035750  104032                  ERROR   32              ;32 BIT ECC REGISTER SHOULD BE NON
5512                                                          ;ZERO
5513                                                          ;ONLY 11 OF THE 32 BITS CAN BE SEEN
5514                                                          ;IN THE PATERN REGISTER
5515                                                          ;DCK SHOULD BE SET IN RHER1
5516  035752  013746  050370    6$:   MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
5517  035756  042716  174000          BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
5518  035762  022637  015066          CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER-
5519  035766  001401                  BEQ     7$              ;BRANCH IF GOOD
5520  035770  104032                  ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT
5521
5522  035772  004037  051012    7$:   JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
5523  035776  000000    8$:   .WORD                           ;EXPECTED POSITION REG. WHEN CORRECTION
5524                                                          ;IS COMPLETE
5525
5526
5527
5528  036000  004737  045374          JSR     PC,@#PUTREG     ;SAVE REGISTERS
5529  036004  022737  100100  015036  CMP     #DCK!ECH,@#ER1  ;WITH ERRORS INSERTED IN BIT POSITION 21
5530                                                          ;THRU 32 HARD ERROR BIT SHOULD SET
5531  036012  001401                  BEQ     9$              ;BRANCH IF GOOD
5532  036014  104036                  ERROR   36              ;WITH ERROR INSERTED IN BIT POSITION 21 THRU
5533                                                          ;32 ECH SHOULD SET
5534
5535
5536
5537  036016            9$:
5538  036016  004737  046120          JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
5539  036022  104400  005124          TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
5540  036026  000000                  HALT                    ;STOP THE TEST AND RESTART PROGRAM
5541  036030  012700  015220          MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
5542  036034  012720  010000          MOV     #0!FMT22,(R0)+  ;CYLINDER 0
5543  036040  112746  000000          MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
5544  036044  112766  000000  000001  MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
5545  036052  012620                  MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
5546  036054  012720  000000          MOV     #0,(R0)+        ;KEY1 IN BUFFER
5547  036060  012720  000000          MOV     #0,(R0)+        ;KEY2 IN BUFFER
5548  036064  012701  000400          MOV     #256.,R1        ;DATA WORD COUNTER
```

```
 5549  036070  012702  000000            MOV     #0,R2           ;DATA
 5550  036074  010220            3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
 5551  036076  005301                    DEC     R1              ;COUNT
 5552  036100  001375                    BNE     3$              ;BRANCH IF 256 NOT DONE
 5553
```

```
5554                                            ;ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
5555                                            ;*NOW THE INSERTED ERROR WILL BE PUT IN
5556
5557  036102  012737  177760  015232            MOV     #177760,@#WRFROM+<5*2>  ;INSERTED ERROR
5558
5559
5560
5561  036110  005037  015126                    CLR     @#ERFLG$                ;CLEAR ERROR FLAG
5562  036114  004737  045374                    JSR     PC,@#PUTREG     ;SAVE REGISTERS
5563
5564
5565                                            ;*NOW READ DATA BUFFER WILL BE CHECKED
5566
5567  036120  004037  046570                    JSR     R0,@#COMPAR     ;CHECK
5568  036124  015220                            WRFROM                  ;GOOD BUFFER
5569  036126  016264                            REINTO                  ;TEST BUFFER
5570  036130  000404                            4+256.                  ;NUMBER OF WORDS CHECKED
5571  036132  036140                            4$                      ;RETURN POINT FOR ERROR HEADER
5572  036134  036144                            5$                      ;RETURN POINT FOR ERROR DATA
5573
5574  036136  036150                            TST57                   ;RETURN FOR GOOD COMPARISON
5575
5576  036140  104004                    4$:     ERROR   4               ;READ NEXT ERROR
5577  036142  000207                            RTS     PC              ;RETURN TO "COMPAR"
5578  036144  104005                    5$:     ERROR   5               ;WORD NOS 1 TO 4 ARE
5579                                            ;HEADER WORDS
5580                                            ;5 TO 260 ARE DATA WORDS
5581  036146  000207                            RTS     PC              ;RETURN TO "COMPAR"
5582
5583
5584
5585
5586
5587
```

```
5588
5589                                    ;;*****************************************************************
5590                                    ;*TEST 57        WRITE ECC TEST 2
5591
5592                                    ;*      THIS IS A WRITE ECC TEST
5593                                    ;*      WRITE CYLINDER 0, FORMAT 16 BITS PER WORD
5594                                    ;*      TRACK 0, SECTOR 1, KEYS 0, NUMBER OF WORDS 256
5595                                    ;*      OF ALL ONES.
5596
5597                                    ;;*****************************************************************
5598  036150  000004                    TST57:  SCOPE
5599  036152  012706  001000                    MOV     #STACK,SP       ;RESET STACK
5600
5601  036156  012737  000057  017330            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
5602  036164  012700  054160                    MOV     #SECGAP,R0      ;POINTER
5603  036170  012701  000460                    MOV     #304.,R1        ;COUNTER
5604  036174  005020                    1$:     CLR     (R0)+           ;CLEAR SIMULATED DISK AREA
5605  036176  005301                            DEC     R1
5606  036200  001375                            BNE     1$
5607  036202  004737  045674                    JSR     PC,CLDISK       ;THIS IS USED TO SET GENERAL REGISTERS
5608
5609                                            ;*THESE ARE FOR ECC TEST ONLY
5610
5611  036206  012737  177777  015144            MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
5612  036214  005037  050402                    CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
5613  036220  013737  050376  050400            MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
5614  036226  013737  050404  050412            MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
5615  036234  005037  050370                    CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
5616  036240  005037  050372                    CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
5617  036244  005037  050406                    CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
5618  036250  005037  050410                    CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
5619
5620
5621
5622
5623                                            ;*THESE ARE TO BE SETUP FOR DISKLESS USE ONLY
5624
5625  036254  012737  010000  055476            MOV     #FMT22,@#WCYL   ;FORMAT22=16BIT WORDS AND
5626                                                                    ;CYLINDER 0
5627  036262  012737  000001  055500            MOV     #1,@#WSECTR     ;TRACK=0, SECTOR=1
5628  036270  005037  055502                    CLR     @#WKEY1         ;KEY1=0
5629  036274  005037  055504                    CLR     @#WKEY2         ;KEY2=0
5630  036300  012737  000400  055536            MOV     #256.,@#FNWORD  ;256 DATA WORDS
5631  036306  004537  047102                    JSR     R5,@#CRC        ;GO TO CALCULATE CRC
5632  036312  055476                            WCYL
5633  036314  055506                            GCRC
5634
5635                                            ;*THESE ARE REGULAR SETUPS
5636
5637  036316  012777  177374  156426            MOV     #-260.,@RHWC    ;256 DATA WORDS 4 HEADER WORDS
5638  036324  012700  015220                    MOV     #WRFROM,R0      ;THESE TWO INSTRUCTIONS GETS
5639  036330  010077  156420                    MOV     R0,@RHBA        ;ADDR. OF WRFROM INTO R0 AND
5640                                                                    ;BUS ADDRESS REGISTER
5641  036334  012720  010000                    MOV     #FMT22,(R0)+    ;FORMAT=16 BIT WORDS
```

```
5642
5643  036340  012720  000001          2$:   MOV   #1,(R0)+       ;CYLINDER=0
5644  036344  005020                        CLR   (R0)+           ;TRACK=0, SECTOR=1, KEYS=0
5645  036346  005020                        CLR   (R0)+           ;KEY1=0
5646  036350  012705  000400              MOV   #256.,R5          ;KEY2=0
5647  036354  012720  177777          3$:   MOV   #-1,(R0)+       ;COUNTER
5648  036360  005305                        DEC   R5              ;MOVE ALL ONES FOR DATA
5649  036362  001374                        BNE   3$              ;BRANCH IF DATA NOT COMPLETE
5650  036364  012777  000001  156372        MOV   #1,@RHDST       ;TRACK=0 SECTOR=1
5651
5652  036372  004737  045730              JSR   PC,@#CHECKT       ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
5653  036376  104400  005124              TYPE  ,CPHALT           ;CANNOT CONTINUE TESTING IF ANY OF THE
5654                                                              ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
5655  036402  000000                      HALT                    ;STOP THE TEST
5656
5657  036404  013711  015174              MOV   @#WRIFOR,@R1      ;GET READY FOR WRITE HEADER AND
5658                                                              ;DATA WITH 62 IN RHCS1
5659  036410  005037  015126              CLR   @#ERFLG$          ;CLEAR ERROR FLAG
5660  036414  012777  010000  156346      MOV   #FMT22,@RHOF      ;FORMAT BIT=1 (16 BIT WORDS)
5661  036422  005077  156344              CLR   @RHCA             ;CYLINDER =0
5662  036426  004737  055322              JSR   PC,@#COMWHD       ;WRITE HEADER AND DATA
5663
5664                                      ;*IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
5665                                      ;*FROM THE "COMWHD" ROUTINE THAT MEANS ALL HEADER ON DISK
5666                                      ;*IS GOOD IE. ONLY DATA IS TO BE CHECKED TO SEE IF THEY ARE
5667                                      ;*ALL ONES AND WRITE DATA GAP AND TOLERANCE GAP TO SEE IF
5668                                      ;*THEY ARE ALL ZEROS
5669
5670  036432  005737  015126              TST   @#ERFLG$          ;HAS ANY ERRORS OCCURED?
5671                                                              ;IF WRITE ERROR OCCURS ECC IS NOT CHECKED
5672  036436  001056                      BNE   TST60             ;;BRANCH IF YES
5673
5674
5675                                      ;*COMPARE SOFTWARE GENERATED ECC WITH THAT GENERATED BY HARDWARE
5676
5677  036440  023737  050370  055255      CMP   @#GECC1,@#WECC1;COMPARE SOFTWARE ECC WITH HARDWARE ECC
5678  036446  001402                      BEQ   6$                ;BRANCH IF GOOD
5679  036450  104031                      ERROR 31                ;LOW ORDER ECC IN ERROR
5680  036452  000405                      BR    7$                ;BRANCH TO CONTINUE
5681  036454  023737  050372  055260  6$: CMP   @#GECC2,@#WECC2;COMPARE SOFTWARE ECC WITH HARDWARE ECC
5682  036462  001401                      BEQ   7$                ;BRANCH IF GOOD
5683  036464  104031                      ERROR 31                ;HIGH ORDER ECC IN ERROR
5684
5685
5686  036466                          7$:
5687  036466  004737  046120              JSR   PC,@#CHECKE       ;CHECK THAT DVA,RDY,DPR,DRY = 1
5688  036472  104400  005124              TYPE  ,CPHALT           ;CANNOT CONTINUE IF THEY DON'T
5689  036476  000000                      HALT                    ;STOP THE TEST AND RESTART PROGRAM
5690
5691
5692
5693
5694                                      ;*FILL "REINTO" BUFFER WITH EXPECTED DATA
5695
```

```
5696  036500  004037  045612          JSR     R0,@#CLAREA     ;FILL REINTO BUFFER
5697  036504  016264                  REINTO                  ;FROM
5698  036506  017262                  REINTO+<255.*2>         ;TO
5699  036510  177777                  .WORD   -1              ;DATA
5700
5701  036512  013737  050370  017264  MOV     @#GECC1,@#REINTO+<256.*2>;FILL ECC1
5702  036520  013737  050372  017266  MOV     @#GECC2,@#REINTO+<257.*2>;FILL ECC2
5703  036526  004037  045612          JSR     R0,@#CLAREA     ;FILL REST
5704  036532  017270                  REINTO+<258.*2>         ;FROM
5705  036534  017324                  REINTO+<272.*2>         ;TO
5706  036536  000000                  0                       ;DATA
5707
5708
5709  036540  005037  015126          CLR     @#ERFLG$        ;CLEAR ERROR FLAG
5710
5711
5712                                  ;*NOW COMPARE "DISK" BUFFER WITH "REINTO"
5713
5714  036544  004037  046570          JSR     R0,@#COMPAR     ;CHECK
5715  036550  016264                  REINTO                  ;GOOD BUFFER
5716  036552  054256                  DISK                    ;TEST BUFFER
5717  036554  000402                  258.                    ;NUMBER OF WORDS CHECKED
5718  036556  036564                  4$                      ;RETURN POINT FOR ERROR HEADER
5719  036560  036570                  5$                      ;RETURN POINT FOR ERROR DATA
5720
5721  036562  036574                  TST60                   ;RETURN FOR GOOD COMPARISON
5722
5723  036564  104007          4$:     ERROR   7               ;READ ERROR 10 NEXT
5724  036566  000207                  RTS     PC              ;RETURN TO COMPARE
5725  036570  104010          5$:     ERROR   10              ;WORD NOS 1 TO 256 ARE
5726                                                          ;DATA WORDS
5727                                                          ;WORD NOS 257 AND 258
5728                                                          ;ARE ECC WHICH ARE CHECKED
5729                                                          ;WORD NOS 259
5730                                                          ;IS DATA GAP
5731                                                          ;WORD NOS 260 TO 273
5732                                                          ;ARE TOLERANCE GAP
5733  036572  000207                  RTS     PC              ;RETURN TO COMPARE
5734
5735
5736
5737
5738
```

```
                                ;;*****************************************************************
                                ;*TEST 60        READ ECC ENABLED 2A
                                ;
                                ;*       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
                                ;
                                ;;*****************************************************************
036574  000004                  TST60:  SCOPE
036576  012706  001000                  MOV     #STACK,SP       ;RESET STACK
                                ;
036602  012737  000060  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                ;
                                ;
                                ;       SETUP FOR WHAT IS TO BE READ
                                ;       HEADER CRC IS RESTORED FROM A SUBROUTINE
                                ;
036610  012746  177777                  MOV     #-1,-(SP)       ;DATA TO BE READ
036614  012705  000400                  MOV     #256.,R5        ;COUNTER
036620  012700  054256                  MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
036624  011620                  1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
036626  005305                          DEC     R5              ;COUNT
036630  001375                          BNE     1$              ;BRANCH IF 256 NOT COMPLETE
036632  005726                          TST     (SP)+           ;UNDO -(SP)
036634  022020                          CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
036636  012705  000017                  MOV     #15.,R5         ;1 DATA GAP
                                                                ;14 TOLERANCE GAP
036642  005020                  2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
036644  005305                          DEC     R5              ;TOLERANCE GAP
036646  001375                          BNE     2$              ;BRANCH IF NOT COMPLETE
                                ;
                                ;
036650  004737  051164                  JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
                                                                ;IN THE CORRECT PLACE
                                ;
                                ;*THESE ARE FOR ECC TEST ONLY
                                ;
036654  012737  177777  015144          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
036662  005037  050402                  CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
036666  013737  050376  050400          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
036674  013737  050404  050412          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
036702  005037  050370                  CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
036706  005037  050372                  CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
036712  005037  050406                  CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
036716  005037  050410                  CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
                                ;
                                ;
                                ;*THESE ARE TO SETUP FOR DISKLESS USE ONLY
                                ;
036722  012737  010000  052340          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
5793                                                    ;CYLINDER 0, FORMAT 16 BITS
5794  036730  112737  000000  052343    MOVB    #0,@#SECOTR+1   ;TRACK 0
5795  036736  112737  000000  052342    MOVB    #0,@#SECOTR     ;SECTOR 0
5796  036744  012737  000000  052344    MOV     #0,@#KEY1       ;KEY1=0
5797  036752  012737  000000  052346    MOV     #0,@#KEY2       ;KEY2=0
5798  036760  012737  000400  052420    MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
5799  036766  005037  052350            CLR     @#X             ;THIS IS A READ COMMAND
5800  036772  004537  047102            JSR     R5,@#CRC        ;GO TO CALCULATE CRC
5801  036776  052340                    CYL
5802  037000  054240                    WCRC
5803
5804
5805
5806
5807                                    ;*THESE ARE REGULAR SETUPS
5808
5809  037002  004737  045674            JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
5810  037006  012777  177374  155736    MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
5811  037014  012777  016264  155732    MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
5812  037022  112746  000000            MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
5813  037026  112766  000000  000001    MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
5814  037034  012677  155724            MOV     (SP)+,@RHDST    ;TRACK/SECTOR IN RHDST
5815  037040  012777  010000  155722    MOV     #FMT22,@RHOF    ;16 BITS PER WORD
5816                                                            ;ECC CORRECTION NOT INHIBIT
5817                                                            ;BECAUSE ECC IS NOT GOING
5818                                                            ;TO BE CHECKED
5819  037046  005077  155720            CLR     @RHCA           ;CYLINDER 0
5820
5821  037052  004737  045730            JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
5822  037056  104400  005124            TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
5823                                                            ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
5824  037062  000000                    HALT                    ;STOP THE TEST
5825
5826  037064  013711  015200            MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
5827  037070  005037  015126            CLR     @#ERFLG$        ;CLEAR ERROR FLAG
5828  037074  004737  052200            JSR     PC,@#COMHD      ;READ HEADER AND DATA
5829                                                            ;IF THERE ARE READ ERRORS THEN
5830                                                            ;ECC WILL NOT BE CHECKED
5831
5832
5833                                    ;*IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
5834                                    ;*FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
5835                                    ;*FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
5836                                    ;*SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
5837                                    ;*DETECTED
5838                                    ;*HEADER AND DATA ARE TO BE CHECKED.
5839                                    ;*IN CHECKING READ DATA THE WRITE FROM BUFFER
5840                                    ;*"WRFROM" IS FILLED WITH EXPECTED DATA AND
5841                                    ;*COMPARISONS ARE MADE
5842
5843  037100  005737  015126            TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
5844  037104  001102                    BNE     TST61           ;BRANCH IF YES
5845  037106  004737  045374            JSR     PC,@#PUTREG     ;SAVE REGISTERS
5846  037112  005737  015036            TST     @#ER1           ;NO ERRORS SHOULD BE SET
```

```
5847  037116  001401                          BEQ     6$              ;BRANCH IF NO ERRORS SET
5848  037120  104032                          ERROR   32              ;32 BIT ECC REGISTER SHOULD BE ZERO
5849                                                                  ;ONLY 11 OF THE 32 BITS CAN BE SEEN
5850                                                                  ;IN THE PATERN REGISTER
5851                                                                  ;DCK SHOULD BE SET IN RHER;
5852  037122  013746  050370          6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
5853  037126  042716  174000                  BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
5854  037132  022637  015066                  CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
5855  037136  001401                          BEQ     7$              ;BRANCH IF GOOD
5856  037140  104032                          ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT
5857
5858
5859
5860
5861                                          ;*ADD 16 MAINTENANCE CLOCKS TO
5862                                          ;*BRING EBL DOWN
5863
5864  037142  012700  000020          7$:     MOV     #16.,R0         ;COUNTER
5865  037146  052777  000002  155624  8$:     BIS     #MCLK,@RHMR     ;SET CLOCK
5866  037154  042777  000002  155616          BIC     #MCLK,@RHMR     ;CLEAR CLOCK
5867  037162  005300                          DEC     R0              ;COUNT
5868  037164  001370                          BNE     8$              ;BRANCH IF 16 CLOCKS NOT DONE
5869  037166  004737  046120                  JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
5870  037172  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
5871  037176  000000                          HALT                    ;STOP THE TEST AND RESTART PROGRAM
5872  037200  012700  015220                  MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
5873  037204  012720  010000                  MOV     #0!FMT22,(R0)+  ;CYLINDER 0
5874  037210  112746  000000                  MOVB    #0,     -(SP)   ;IN LOWER BYTE GET SECTOR
5875  037214  112766  000000  000001          MOVB    #0,     1(SP)   ;GET TRACK IN HIGHER BYTE
5876  037222  012620                          MOV     (SP)+,  (R0)+   ;GET TRACK/SECTOR IN BUFFER
5877  037224  012720  000000                  MOV     #0,     (R0)+   ;KEY1 IN BUFFER
5878  037230  012720  000000                  MOV     #0,     (R0)+   ;KEY2 IN BUFFER
5879  037234  012701  000400                  MOV     #256.,  R1      ;DATA WORD COUNTER
5880  037240  012702  177777                  MOV     #-1,    R2      ;DATA
5881
5882  037244  010220                  3$:     MOV     R2,     (R0)+   ;DATA INTO BUFFER
5883  037246  005301                          DEC     R1              ;COUNT
5884  037250  001375                          BNE     3$              ;BRANCH IF 256 NOT DONE
5885  037252  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
5886  037256  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
5887
5888                                          ;NOW READ DATA BUFFER WILL BE CHECKED
5889
5890  037262  004037  046570                  JSR     R0,@#COMPAR     ;CHECK
5891  037266  015220                          WRFROM                  ;GOOD BUFFER
5892  037270  016264                          REINTO                  ;TEST BUFFER
5893  037272  000404                          4+256.                  ;NUMBER OF WORDS CHECKED
5894  037274  037302                          4$                      ;RETURN POINT FOR ERROR HEADER
5895  037276  037306                          5$                      ;RETURN POINT FOR ERROR DATA
5896
5897  037300  037312                          TST61                   ;RETURN FOR GOOD COMPARISON
5898
5899  037302  104004                  4$:     ERROR   4               ;READ NEXT ERROR
5900  037304  000207                          RTS     PC              ;RETURN TO "COMPAR"
```

```
5901  037306  104005                  5$:     ERROR   5               ;WORD NOS 1 TO 4 ARE
5902                                                                  ;HEADER WORDS
5903                                                                  ;5 TO 260 ARE DATA WORDS
5904  037310  000207                          RTS     PC              ;RETURN TO "COMPAR"
5905
5906
5907
5908
```

```
5909
5910                                    ;;*****************************************************************
5911                                    ;*TEST 61        READ ECC ENABLED 2B
5912
5913                                    ;*      THIS IS AN ECC READ DATA TEST
5914                                    ;*      ERROR CORRECTION IS ENABLED
5915                                    ;*      A CORRECTABLE ERROR IS INSERTED IN BIT POSITION 32
5916                                    ;*      GOOD DATA USED IS 256 WORDS OF 177777
5917                                    ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
5918                                    ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
5919
5920                                    ;;*****************************************************************
5921  037312  000004                    TST61:  SCOPE
5922  037314  012706  001000                    MOV     #STACK,SP       ;RESET STACK
5923
5924  037320  012737  000061  017330            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
5925
5926
5927                                    ;*SETUP FOR WHAT IS TO BE READ
5928                                    ;*HEADER CRC IS RESTORED FROM A SUBROUTINE
5929
5930  037326  012746  177777                    MOV     #-1,-(SP)       ;DATA TO BE READ
5931  037332  012705  000400                    MOV     #256.,R5        ;COUNTER
5932  037336  012700  054256                    MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
5933  037342  011620                  1$:       MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
5934  037344  005305                            DEC     R5              ;COUNT
5935  037346  001375                            BNE     1$              ;BRANCH IF 256 NOT COMPLETE
5936  037350  005726                            TST     (SP)+           ;UNDO -(SP)
5937  037352  022020                            CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
5938  037354  012705  000017                    MOV     #15.,   R5      ;1 DATA GAP
5939                                                                    ;14 TOLERANCE GAP
5940  037360  005020                  2$:       CLR     (R0)+           ;CLEAR DATA GAP, AND
5941  037362  005305                            DEC     R5              ;TOLERANCE GAP
5942  037364  001375                            BNE     2$              ;BRANCH IF NOT COMPLETE
5943
5944
5945  037366  004737  051164            -       JSR     PC,@#FILLEC     ;INSERT ECC IN PROPER PLACE ON DISK
5946
5947
5948
5949                                    ;*THESE ARE FOR ECC TEST ONLY
5950
5951  037372  012737  177777  015144            MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
5952  037400  005037  050402                    CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
5953  037404  013737  050376  050400            MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
5954  037412  013737  050404  050412            MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
5955  037420  005037  050370                    CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
5956  037424  005037  050372                    CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
5957  037430  005037  050406                    CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
5958  037434  005037  050410                    CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
5959
5960
5961                                    ;*THESE ARE TO SETUP FOR DISKLESS USE ONLY -
5962
```

```
 5963  037440  012737  010000  052340          MOV     #FMT22,@#CYL     ;16 BITS PER WORD
 5964                                                                   ;CYLINDER 0, FORMAT 16 BITS
 5965  037446  112737  000000  052343          MOVB    #0,@#SECOTR+1    ;TRACK 0
 5966  037454  112737  000000  052342          MOVB    #0,@#SECOTR      ;SECTOR 0
 5967  037462  012737  000000  052344          MOV     #0,@#KEY1        ;KEY1=0
 5968  037470  012737  000000  052346          MOV     #0,@#KEY2        ;KEY2=0
 5969  037476  012737  000400  052420          MOV     #256.,@#DAWORD   ;NO. OF DATA WORDS
 5970  037504  005037  052350                  CLR     @#X              ;THIS IS A READ COMMAND
 5971  037510  004537  047102                  JSR     R5,@#CRC         ;GO TO CALCULATE CRC
 5972  037514  052340                          CYL
 5973  037516  054240                          WCRC
 5974
 5975
 5976                                          ;*THIS IS TO INSERT ERROR
 5977                                          ;*THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
 5978                                          ;*THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
 5979                                          ;*THIS MOVE
 5980
 5981  037520  012737  077777  054260          MOV     #77777,@#DISK+2  ;FORCE ERROR ON BIT NUMBER 32
 5982                                                                   ;SO ERROR POSITION REGISTER WILL SHOW
 5983                                                                   ;22
 5984  037526  012737  000026  037702          MOV     #22.,@#8$        ;INSERT POSITION REG.
 5985
 5986
 5987                                          ;*THESE ARE REGULAR SETUPS
 5988
 5989  037534  004737  045674                  JSR     PC,@#CLDISK      ;SETUP GENERAL REGISTERS
 5990  037540  012777  177374  155204          MOV     #-256.-4.,@RHWC  ;256. DATA 4 HEADER WORDS
 5991  037546  012777  016264  155200          MOV     #REINTO,@RHBA    ;STARTING ADDRESS OF READ BUFFER
 5992  037554  112746  000000                  MOVB    #0,-(SP)         ;IN LOWER BYTE GET SECTOR
 5993  037560  112766  000000  000001          MOVB    #0,1(SP)         ;GET TRACK IN HIGHER BYTE
 5994  037566  012677  155172                  MOV     (SP)+,@RHDST     ;TRACK/SECTOR IN RHDST
 5995  037572  012777  010000  155170          MOV     #FMT22,@RHOF     ;16 BITS PER WORD
 5996                                                                   ;ECC CORRECTION NOT INHIBIT
 5997                                                                   ;BECAUSE ECC IS NOT GOING
 5998                                                                   ;TO BE CHECKED
 5999  037600  005077  155166                  CLR     @RHCA            ;CYLINDER 0
 6000  037604  004737  045730                  JSR     PC,@#CHECKT      ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
 6001  037610  104400  005124                  TYPE    ,CPHALT          ;CANNOT CONTINUE TESTING IF ANY OF THE
 6002                                                                   ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
 6003  037614  000000                          HALT                     ;STOP THE TEST
 6004  037616  013711  015200                  MOV     @#REFOR,@R1      ;READ HEADER AND DATA=72
 6005  037622  005037  015126                  CLR     @#ERFLG$         ;CLEAR ERROR FLAG
 6006  037626  004737  052200                  JSR     PC,@#COMHD       ;READ HEADER AND DATA
 6007                                                                   ;IF THERE ARE READ ERRORS THEN
 6008                                                                   ;ECC WILL NOT BE CHECKED
 6009
 6010
 6011                                          ;*IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
 6012                                          ;*FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
 6013                                          ;*FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
 6014                                          ;*SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
 6015                                          ;*DETECTED
 6016                                          ;*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
037632  005737  015126                  TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
037636  001077                          BNE     TST62           ;BRANCH IF YES
037640  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
037644  022737  100000  015036          CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
037652  001401                          BEQ     6$              ;BRANCH IF YES
037654  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
037656  013746  050370          6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
037662  042716  174000                  BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
037666  022637  015066                  CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
037672  001401                          BEQ     7$              ;BRANCH IF GOOD
037674  104032                          ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT

037676  004037  051012          7$:     JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
037702  000026                  8$:     22.                     ;EXPECTED POSITION REG. WHEN CORRECTION
                                                                ;IS COMPLETE



037704  004737  046120                  JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
037710  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
037714  000000                          HALT                    ;STOP THE TEST AND RESTART PROGRAM
037716  012700  015220                  MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
037722  012720  010000                  MOV     #0!FMT22,(R0)+  ;CYLINDER 0
037726  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
037732  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
037740  012620                          MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
037742  012720  000000                  MOV     #0,(R0)+        ;KEY1 IN BUFFER
037746  012720  000000                  MOV     #0,(R0)+        ;KEY2 IN BUFFER
037752  012701  000400                  MOV     #256.,R1        ;DATA WORD COUNTER
037756  012702  177777                  MOV     #-1,R2          ;DATA
037762  010220                  3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
037764  005301                          DEC     R1              ;COUNT
037766  001375                          BNE     3$              ;BRANCH IF 256 NOT DONE

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

037770  012737  077777  015232          MOV     #77777,@#WRFROM+<5*2>   ;INSERTED ERROR
037776  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
040002  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG


                                        ;*NOW READ DATA BUFFER WILL BE CHECKED

040006  004037  046570                  JSR     R0,@#COMPAR     ;CHECK
040012  015220                          WRFROM                  ;GOOD BUFFER
```

```
6071  040014  016264                          REINTO                  ;TEST BUFFER
6072  040016  000404                          4+256.                  ;NUMBER OF WORDS CHECKED
6073  040020  040026                          4$                      ;RETURN POINT FOR ERROR HEADER
6074  040022  040032                          5$                      ;RETURN POINT FOR ERROR DATA
6075
6076  040024  040036                          TST62                   ;RETURN FOR GOOD COMPARISON
6077
6078  040026  104004              4$:         ERROR   4               ;READ NEXT ERROR
6079  040030  000207                          RTS     PC              ;RETURN TO "COMPAR"
6080  040032  104005              5$:         ERROR   5               ;WORD NOS 1 TO 4 ARE
6081                                                                  ;HEADER WORDS
6082                                                                  ;5 TO 260 ARE DATA WORDS
6083  040034  000207                          RTS     PC              ;RETURN TO "COMPAR"
6084
```

```
6085
6086                            ;;*****************************************************************
6087                            ;*TEST 62        READ ECC ENABLED 2C
6088
6089                            ;*      THIS IS AN ECC READ DATA TEST
6090                            ;*      ERROR CORRECTION IS ENABLED
6091                            ;*      A NON CORRECTABLE ERROR IS INSERTED IN BIT POSITION 32 AND 21
6092                            ;*      GOOD DATA USED IS 256 WORDS OF 177777
6093                            ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
6094                            ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
6095
6096                            ;;*****************************************************************
6097  040036  000004            TST62:  SCOPE
6098  040040  012706  001000            MOV     #STACK,SP       ;RESET STACK
6099
6100  040044  012737  000062  017330    MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
6101
6102
6103                            ;       SETUP FOR WHAT IS TO BE READ
6104                            ;       HEADER CRC IS RESTORED FROM A SUBROUTINE
6105
6106  040052  012746  177777            MOV     #-1,-(SP)       ;DATA TO BE READ
6107  040056  012705  000400            MOV     #256.,R5        ;COUNTER
6108  040062  012700  054256            MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
6109  040066  011620            1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
6110  040070  005305                    DEC     R5              ;COUNT
6111  040072  001375                    BNE     1$              ;BRANCH IF 256 NOT COMPLETE
6112  040074  005726                    TST     (SP)+           ;UNDO -(SP)
6113  040076  022020                    CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
6114  040100  012705  000017            MOV     #15.,R5         ;1 DATA GAP
6115                                                            ;14 TOLERANCE GAP
6116  040104  005020            2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
6117  040106  005305                    DEC     R5              ;TOLERANCE GAP
6118  040110  001375                    BNE     2$              ;BRANCH IF NOT COMPLETE
6119
6120
6121  040112  004737  051164            JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
6122                                                            ;IN THE CORRECT PLACE
6123
6124                                    ;*THESE ARE FOR ECC TEST ONLY
6125
6126  040116  012737  177777  015144    MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
6127  040124  005037  050402            CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
6128  040130  013737  050376  050400    MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
6129  040136  013737  050404  050412    MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
6130  040144  005037  050370            CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
6131  040150  005037  050372            CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
6132  040154  005037  050406            CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
6133  040160  005037  050410            CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
6134
6135
6136                                    ;*THESE ARE TO SETUP FOR DISKLESS USE ONLY
6137
6138  040164  012737  010000  052340    MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
                                                        ;CYLINDER 0, FORMAT 16 BITS
040172  112737  000000  052343          MOVB    #0,@#SECOTR+1   ;TRACK 0
040200  112737  000000  052342          MOVB    #0,@#SECOTR     ;SECTOR 0
040206  012737  000000  052344          MOV     #0,@#KEY1       ;KEY1=0
040214  012737  000000  052346          MOV     #0,@#KEY2       ;KEY2=0
040222  012737  000400  052420          MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
040230  005037  052350                  CLR     @#X             ;THIS IS A READ COMMAND
040234  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
040240  052340                          CYL
040242  054240                          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

040244  012737  077757  054260          MOV     #77757,@#DISK+2 ;FORCE ERROR ON BIT NUMBER 32 AND 21
                                                                ;SO ERROR POSITION REGISTER WILL SHOW
                                                                ;22
040252  012737  010040  040426          MOV     #4128.,@#8$     ;INSERT POSITION REG.

                                        ;*THESE ARE REGULAR SETUPS

040260  004737  045674                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
040264  012777  177374  154460          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
040272  012777  016264  154454          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
040300  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
040304  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
040312  012677  154446                  MOV     (SP)+, @RHDST   ;TRACK/SECTOR IN RHDST
040316  012777  010000  154444          MOV     #FMT22,@RHOF    ;16 BITS PER WORD
                                                                ;ECC CORRECTION NOT INHIBIT
                                                                ;BECAUSE ECC IS NOT GOING
                                                                ;TO BE CHECKED
040324  005077  154442                  CLR     @RHCA           ;CYLINDER 0

040330  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
040334  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
040340  000000                          HALT                    ;STOP THE TEST

040342  013711  015200                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
040346  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
040352  004737  052200                  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

040356  005737  015126                  TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
040362  001106                          BNE     TST63           ;BRANCH IF YES
040364  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
040370  022737  100000  015036          CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
040376  001401                          BEQ     6$              ;BRANCH IF YES
040400  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
040402  013746  050370          6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
040406  042716  174000                  BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
040412  022637  015066                  CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
040416  001401                          BEQ     7$              ;BRANCH IF GOOD
040420  104032                          ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT

040422  004037  051012          7$:     JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
040426  000000                  8$:     .WORD                   ;EXPECTED POSITION REG. WHEN CORRECTION
                                                                ;IS COMPLETE

040430  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS


040434  022737  100100  015036          CMP     #DCK!ECH,@#ER1  ;WITH ERRORS INSERTED IN BIT POSITION 21
                                                                ;AND 32 HARD ERROR BIT SHOULD SET
040442  001401                          BEQ     9$              ;BRANCH IF GOOD
040444  104036                          ERROR   36              ;WITH ERROR INSERTED IN BIT POSITION 21 THRU
                                                                ;32 HCE SHOULD SET


040446                          9$:
040446  004737  046120                  JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
040452  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
040456  000000                          HALT                    ;STOP THE TEST AND RESTART PROGRAM
040460  012700  015220                  MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
040464  012720  010000                  MOV     #0!FMT22,(R0)+  ;CYLINDER 0
040470  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
040474  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
040502  012620                          MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
040504  012720  000000                  MOV     #0,(R0)+        ;KEY1 IN BUFFER
040510  012720  000000                  MOV     #0,(R0)+        ;KEY2 IN BUFFER
040514  012701  000400                  MOV     #256.,R1        ;DATA WORD COUNTER
040520  012702  177777                  MOV     #-1,R2          ;DATA
040524  010220                  3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
040526  005301                          DEC     R1              ;COUNT
040530  001375                          BNE     3$              ;BRANCH IF 256 NOT DONE
```

```
6247                                            ;*ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
6248                                            ;*NOW THE INSERTED ERROR WILL BE PUT IN
6249
6250  040532  012737  077757  015232            MOV     #77757,@#WRFROM+<5*2>   ;INSERTED ERROR
6251  040540  004737  045374                    JSR     PC,@#PUTREG     ;SAVE REGISTERS
6252  040544  005037  015126                    CLR     @#ERFLG$        ;CLEAR ERROR FLAG
6253
6254
6255                                            ;*NOW READ DATA BUFFER WILL BE CHECKED
6256
6257  040550  004037  046570                    JSR     R0,@#COMPAR     ;CHECK
6258  040554  015220                            WRFROM                  ;GOOD BUFFER
6259  040556  016264                            REINTO                  ;TEST BUFFER
6260  040560  000404                            4+256.                  ;NUMBER OF WORDS CHECKED
6261  040562  040570                            4$                      ;RETURN POINT FOR ERROR HEADER
6262  040564  040574                            5$                      ;RETURN POINT FOR ERROR DATA
6263
6264  040566  040600                            TST63                   ;RETURN FOR GOOD COMPARISON
6265
6266  040570  104004                    4$:     ERROR   4               ;READ NEXT ERROR
6267  040572  000207                            RTS     PC              ;RETURN TO "COMPAR"
6268  040574  104005                    5$:     ERROR   5               ;WORD NOS 1 TO 4 ARE
6269                                            ;HEADER WORDS
6270                                            ;5 TO 260 ARE DATA WORDS
6271  040576  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.
                                ;
                                ;;*****************************************************************
040600  000004                  †ST63:  SCOPE
040602  012706  001000                  MOV     #STACK,SP       ;RESET STACK
                                ;
040606  012737  000063  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
040614  012700  054160                  MOV     #SECGAP,R0      ;POINTER
040620  012701  000460                  MOV     #304.,R1        ;COUNTER
040624  005020                  1$:     CLR     (R0)+           ;CLEAR SIMULATED DISK AREA
040626  005301                          DEC     R1
040630  001375                          BNE     1$
040632  004737  045674                  JSR     PC,CLDISK       ;THIS IS USED TO SET GENERAL REGISTERS
                                ;
                                        ;*THESE ARE FOR ECC TEST ONLY
                                ;
040636  012737  177777  015144          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
040644  005037  050402                  CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
040650  013737  050376  050400          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
040656  013737  050404  050412          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
040664  005037  050370                  CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
040670  005037  050372                  CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
040674  005037  050406                  CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
040700  005037  050410                  CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
                                ;
                                ;
                                ;
                                ;
                                        ;*THESE ARE TO BE SETUP FOR DISKLESS USE ONLY
                                ;
040704  012737  010000  055476          MOV     #FMT22,@#WCYL   ;FORMAT22=16BIT WORDS AND
                                                                ;CYLINDER 0
040712  012737  000001  055500          MOV     #1,@#WSECTR     ;TRACK=0, SECTOR=1
040720  005037  055502                  CLR     @#WKEY1         ;KEY1=0
040724  005037  055504                  CLR     @#WKEY2         ;KEY2=0
040730  012737  000400  055536          MOV     #256.,@#FNWORD  ;256 DATA WORDS
040736  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
040742  055476                          WCYL
040744  055506                          GCRC
                                ;
                                        ;*THESE ARE REGULAR SETUPS
                                ;
040746  012777  177374  153776          MOV     #-260.,@RHWC    ;256 DATA WORDS 4 HEADER WORDS
040754  012700  015220                  MOV     #WRFROM,R0      ;THESE TWO INSTRUCTIONS GETS
040760  010077  153770                  MOV     R0,@RHBA        ;ADDR. OF WRFROM INTO R0 AND
                                                                ;BUS ADDRESS REGISTER
040764  012720  010000                  MOV     #FMT22,(R0)+    ;FORMAT=16 BIT WORDS
```

```
6326
6327  040770  012720  000001          2$:   MOV   #1,(R0)+      ;CYLINDER=0
6328  040774  005020                        CLR   (R0)+         ;TRACK=0, SECTOR=1, KEYS=0
6329  040776  005020                        CLR   (R0)+         ;KEY1=0
6330  041000  012705  000400                MOV   #256.,R5      ;KEY2=0
6331  041004  012720  052525          3$:   MOV   #52525,(R0)+  ;COUNTER
6332  041010  005305                        DEC   R5            ;MOVE ALL 52525 FOR DATA
6333  041012  001374                        BNE   3$            ;BRANCH IF DATA NOT COMPLETE
6334  041014  012777  000001  153742        MOV   #1,@RHDST     ;TRACK=0 SECTOR=1
6335
6336  041022  004737  045730                JSR   PC,@#CHECKT   ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
6337  041026  104400  005124                TYPE  ,CPHALT       ;CANNOT CONTINUE TESTING IF ANY OF THE
6338                                                            ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
6339  041032  000000                        HALT                ;STOP THE TEST
6340
6341  041034  013711  015174                MOV   @#WRIFOR,@R1  ;GET READY FOR WRITE HEADER AND
6342                                                            ;DATA WITH 62 IN RHCS1
6343  041040  005037  015126                CLR   @#ERFLG$      ;CLEAR ERROR FLAG
6344  041044  012777  010000  153716        MOV   #FMT22,@RHOF  ;FORMAT BIT=1 (16 BIT WORDS)
6345  041052  005077  153714                CLR   @RHCA         ;CYLINDER =0
6346  041056  004737  055322                JSR   PC,@#COMWHD   ;WRITE HEADER AND DATA
6347
6348                                        ;*IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
6349                                        ;*FROM THE "COMWHD" ROUTINE THAT MEANS ALL HEADER ON DISK
6350                                        ;*IS GOOD IE. ONLY DATA IS TO BE CHECKED TO SEE IF THEY ARE
6351                                        ;*ALL 52525 AND WRITE DATA GAP AND TOLERANCE GAP TO SEE IF
6352                                        ;*THEY ARE ALL ZEROS
6353
6354  041062  005737  015126                TST   @#ERFLG$      ;HAS ANY ERRORS OCCURED?
6355                                                            ;IF WRITE ERROR OCCURS ECC IS NOT CHECKED
6356  041066  001056                        BNE   TST64         ;;BRANCH IF YES
6357
6358
6359                              ;COMPARE SOFTWARE GENERATED ECC WITH THAT GENERATED BY HARDWARE
6360  041070  023737  050370  055256        CMP   @#GECC1,@#WECC1;COMPARE SOFTWARE ECC WITH HARDWARE ECC
6361  041076  001402                        BEQ   6$            ;BRANCH IF GOOD
6362  041100  104031                        ERROR 31            ;LOW ORDER ECC IN ERROR
6363  041102  000405                        BR    7$            ;BRANCH TO CONTINUE
6364  041104  023737  050372  055260  6$:   CMP   @#GECC2,@#WECC2 ;COMPARE SOFTWARE ECC WITH HARDWARE ECC
6365  041112  001401                        BEQ   7$            ;BRANCH IF GOOD
6366  041114  104031                        ERROR 31            ;HIGH ORDER ECC IN ERROR
6367
6368
6369  041116                          7$:
6370  041116  004737  046120                JSR   PC,@#CHECKE   ;CHECK THAT DVA,RDY,DPR,DRY = 1
6371  041122  104400  005124                TYPE  ,CPHALT       ;CANNOT CONTINUE IF THEY DON'T
6372  041126  000000                        HALT                ;STOP THE TEST AND RESTART PROGRAM
6373
6374
6375
6376
6377                                        ;*FILL "REINTO" BUFFER WITH EXPECTED DATA
6378
6379  041130  004037  045612                JSR   R0,@#CLAREA   ;FILL REINTO BUFFER
```

```
6380  041134  016264                          REINTO          ;FROM
6381  041136  017262                          REINTO+<255.*2>  ;TO
6382  041140  052525                  .WORD   52525           ;DATA
6383
6384  041142  013737  050370  017264  MOV     @#GECC1,@#REINTO+<256.*2>;FILL ECC1
6385  041150  013737  050372  017266  MOV     @#GECC2,@#REINTO+<257.*2>;FILL ECC2
6386  041156  004037  045612          JSR     R0,@#CLAREA     ;FILL REST
6387  041162  017270                  REINTO+<258.*2>         ;FROM
6388  041164  017324                  REINTO+<272.*2>         ;TO
6389  041166  000000                  0                       ;DATA
6390
6391
6392  041170  005037  015126          CLR     @#ERFLG$        ;CLEAR ERROR FLAG
6393
6394
6395                                  ;*NOW COMPARE "DISK" BUFFER WITH "REINTO"
6396
6397  041174  004037  046570          JSR     R0,@#COMPAR     ;CHECK
6398  041200  016264                  REINTO                  ;GOOD BUFFER
6399  041202  054256                  DISK                    ;TEST BUFFER
6400  041204  000402                  258.                    ;NUMBER OF WORDS CHECKED
6401  041206  041214                  4$                      ;RETURN POINT FOR ERROR HEADER
6402  041210  041220                  5$                      ;RETURN POINT FOR ERROR DATA
6403
6404  041212  041224                  TST64                   ;RETURN FOR GOOD COMPARISON
6405
6406  041214  104007          4$:     ERROR   7               ;READ ERROR 10 NEXT
6407  041216  000207                  RTS     PC              ;RETURN TO COMPARE
6408  041220  104010          5$:     ERROR   10              ;WORD NOS 1 TO 256 ARE
6409                                                          ;DATA WORDS
6410                                                          ;WORD NOS 257 AND 258
6411                                                          ;ARE ECC WHICH ARE CHECKED
6412                                                          ;WORD NOS 259
6413                                                          ;IS DATA GAP
6414                                                          ;WORD NOS 260 TO 273
6415                                                          ;ARE TOLERANCE GAP
6416  041222  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

                                ;;*****************************************************************
041224  000004                  TST64:  SCOPE
041226  012706  001000                  MOV     #STACK,SP       ;RESET STACK
041232  012737  000064  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER

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

041240  012746  052525                  MOV     #52525,-(SP)    ;DATA TO BE READ
041244  012705  000400                  MOV     #256.,R5        ;COUNTER
041250  012700  054256                  MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
041254  011620                  1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
041256  005305                          DEC     R5              ;COUNT
041260  001375                          BNE     1$              ;BRANCH IF 256 NOT COMPLETE
041262  005726                          TST     (SP)+           ;UNDO -(SP)
041264  022020                          CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
041266  012705  000017                  MOV     #15.,R5         ;1 DATA GAP
                                                                ;14 TOLERANCE GAP
041272  005020                  2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
041274  005305                          DEC     R5              ;TOLERANCE GAP
041276  001375                          BNE     2$              ;BRANCH IF NOT COMPLETE

041300  004737  051164                  JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
                                                                ;IN THE CORRECT PLACE

                                        ;*THESE ARE FOR ECC TEST ONLY

041304  012737  177777  015144          MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
041312  005037  050402                  CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
041316  013737  050376  050400          MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
041324  013737  050404  050412          MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
041332  005037  050370                  CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
041336  005037  050372                  CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
041342  005037  050406                  CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
041346  005037  050410                  CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT


                                        ;*THESE ARE TO SETUP FOR DISKLESS USE ONLY

041352  012737  010000  052340          MOV     #FMT22,@#CYL    ;16 BITS PER WORD
                                                                ;CYLINDER 0, FORMAT 16 BITS
041360  112737  000000  052343          MOVB    #0,@#SECOTR+1   ;TRACK 0
```

```
6471  041366  112737  000000  052342          MOVB    #0,@#SECOTR     ;SECTOR 0
6472  041374  012737  000000  052344          MOV     #0,@#KEY1       ;KEY1=0
6473  041402  012737  000000  052346          MOV     #0,@#KEY2       ;KEY2=0
6474  041410  012737  000400  052420          MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
6475  041416  005037  052350                  CLR     @#X             ;THIS IS A READ COMMAND
6476  041422  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
6477  041426  052340                          CYL
6478  041430  054240                          WCRC
6479
6480
6481
6482
6483                                          ;*THESE ARE REGULAR SETUPS
6484
6485  041432  004737  045674                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
6486  041436  012777  177374  153306          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
6487  041444  012777  016264  153302          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
6488  041452  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
6489  041456  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
6490  041464  012677  153274                  MOV     (SP)+,  @RHDST  ;TRACK/SECTOR IN RHDST
6491  041470  012777  010000  153272          MOV     #FMT22,@RHOF ;16 BITS PER WORD
6492                                                                  ;ECC CORRECTION NOT INHIBIT
6493                                                                  ;BECAUSE ECC IS NOT GOING
6494                                                                  ;TO BE CHECKED
6495  041476  005077  153270                  CLR     @RHCA           ;CYLINDER 0
6496
6497  041502  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
6498  041506  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
6499                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
6500  041512  000000                          HALT                    ;STOP THE TEST
6501
6502  041514  013711  015200                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
6503  041520  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
6504  041524  004737  052200                  JSR     PC,@#COMHD      ;READ HEADER AND DATA
6505                                                                  ;IF THERE ARE READ ERRORS THEN
6506                                                                  ;ECC WILL NOT BE CHECKED
6507
6508
6509                                          ;*IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
6510                                          ;*FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
6511                                          ;*FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
6512                                          ;*SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
6513                                          ;*DETECTED
6514                                          ;*HEADER AND DATA ARE TO BE CHECKED.
6515                                          ;*IN CHECKING READ DATA THE WRITE FROM BUFFER
6516                                          ;*"WRFROM" IS FILLED WITH EXPECTED DATA AND
6517                                          ;*COMPARISONS ARE MADE
6518
6519  041530  005737  015126                  TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
6520  041534  001102                          BNE     TST65           ;BRANCH IF YES
6521  041536  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
6522  041542  005737  015036                  TST     @#ER1           ;NO ERRORS SHOULD BE SET
6523  041546  001401                          BEQ     6$              ;BRANCH IF NO ERRORS SET
6524  041550  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
041552  013746  050370          6$:   MOV     @#GECC1,-(SP)     ;GET PATTERN REGISTER
041556  042716  174000                BIC     #174000,(SP)      ;KEEP ONLY 11 BITS
041562  022637  015066                CMP     (SP)+,@#EC2       ;COMPARE PATTERN REGISTER
041566  001401                      BEQ     7$                ;BRANCH IF GOOD
041570  104032                      ERROR   32                ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT


                                                                ;*ADD 16 MAINTENANCE CLOCKS TO
                                                                ;*BRING EBL DOWN

041572  012700  000020          7$:   MOV     #16.,R0           ;COUNTER
041576  052777  000002  153174  8$:   BIS     #MCLK,@RHMR       ;SET CLOCK
041604  042777  000002  153166        BIC     #MCLK,@RHMR       ;CLEAR CLOCK
041612  005300                      DEC     R0                ;COUNT
041614  001370                      BNE     8$                ;BRANCH IF 16 CLOCKS NOT DONE
041616  004737  046120                JSR     PC,@#CHECKE       ;CHECK THAT DVA,RDY,DPR,DRY = 1
041622  104400  005124                TYPE    ,CPHALT           ;CANNOT CONTINUE IF THEY DON'T
041626  000000                      HALT                      ;STOP THE TEST AND RESTART PROGRAM
041630  012700  015220                MOV     #WRFROM,R0        ;GETTING READY TO FILL EXPECTED DATA
041634  012720  010000                MOV     #0!FMT22,(R0)+    ;CYLINDER 0
041640  112746  000000                MOVB    #0,-(SP)          ;IN LOWER BYTE GET SECTOR
041644  112766  000000  000001        MOVB    #0,1(SP)          ;GET TRACK IN HIGHER BYTE
041652  012620                      MOV     (SP)+,(R0)+       ;GET TRACK/SECTOR IN BUFFER
041654  012720  000000                MOV     #0,(R0)+          ;KEY1 IN BUFFER
041660  012720  000000                MOV     #0,(R0)+          ;KEY2 IN BUFFER
041664  012701  000400                MOV     #256.,R1          ;DATA WORD COUNTER
041670  012702  052525                MOV     #52525,R2         ;DATA
041674  010220                3$:   MOV     R2,(R0)+          ;DATA INTO BUFFER
041676  005301                      DEC     R1                ;COUNT
041700  001375                      BNE     3$                ;BRANCH IF 256 NOT DONE
041702  005037  015126                CLR     @#ERFLG$          ;CLEAR ERROR FLAG
041706  004737  045374                JSR     PC,@#PUTREG       ;SAVE REGISTERS

                                                                ;*NOW READ DATA BUFFER WILL BE CHECKED

041712  004037  046570                JSR     R0,@#COMPAR       ;CHECK
041716  015220                      WRFROM                    ;GOOD BUFFER
041720  016264                      REINTO                    ;TEST BUFFER
041722  000404                      4+256.                    ;NUMBER OF WORDS CHECKED
041724  041732                      4$                        ;RETURN POINT FOR ERROR HEADER
041726  041736                      5$                        ;RETURN POINT FOR ERROR DATA

041730  041742                      TST65                     ;RETURN FOR GOOD COMPARISON

041732  104004                4$:   ERROR   4                 ;READ NEXT ERROR
041734  000207                      RTS     PC                ;RETURN TO "COMPAR"
041736  104005                5$:   ERROR   5                 ;WORD NOS 1 TO 4 ARE
                                                                ;HEADER WORDS
                                                                ;5 TO 260 ARE DATA WORDS
```

```
 6579  041740  000207                          RTS     PC              ;RETURN TO "COMPAR"
```

```
6580
6581                                    ;;*****************************************************************
6582                                    ;*TEST 65        READ ECC ENABLED 3B
6583
6584                                    ;*      THIS IS AN ECC READ DATA TEST
6585                                    ;*      ERROR CORRECTION IS ENABLED
6586                                    ;*      A CORRECTABLE ERROR IS INSERTED IN BIT POSITION 4128
6587                                    ;*      THIS IS THE LAST BIT OF THE ECC
6588                                    ;*      GOOD DATA USED IS 256 WORDS OF 52525
6589                                    ;*      COMMAND IS GIVEN FOR CYLINDER 0 FORMAT 16 BITS PER WORD
6590                                    ;*      TRACK 0, SECTOR 0 KEYS 0  READ HEADER AND DATA
6591
6592                                    ;;*****************************************************************
6593  041742  000004                    TST65:  SCOPE
6594  041744  012706  001000                    MOV     #STACK,SP       ;RESET STACK
6595  041750  012737  000065  017330            MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
6596
6597                                            ;*SETUP FOR WHAT IS TO BE READ
6598                                            ;*HEADER CRC IS RESTORED FROM A SUBROUTINE
6599
6600  041756  012746  052525                    MOV     #52525,-(SP)    ;DATA TO BE READ
6601  041762  012705  000400                    MOV     #256.,R5        ;COUNTER
6602  041766  012700  054256                    MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
6603  041772  011620                    1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
6604  041774  005305                            DEC     R5              ;COUNT
6605  041776  001375                            BNE     1$              ;BRANCH IF 256 NOT COMPLETE
6606  042000  005726                            TST     (SP)+           ;UNDO -(SP)
6607  042002  022020                            CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
6608  042004  012705  000017                    MOV     #15.,   R5      ;1 DATA GAP
6609                                                                    ;14 TOLERANCE GAP
6610  042010  005020                    2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
6611  042012  005305                            DEC     R5              ;TOLERANCE GAP
6612  042014  001375                            BNE     2$              ;BRANCH IF NOT COMPLETE
6613
6614
6615  042016  004737  051164                    JSR     PC,@#FILLEC     ;INSERT ECC IN PROPER PLACE ON DISK
6616
6617
6618
6619                                            ;*THESE ARE FOR ECC TEST ONLY
6620
6621  042022  012737  177777  015144            MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
6622  042030  005037  050402                    CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
6623  042034  013737  050376  050400            MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
6624  042042  013737  050404  050412            MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
6625  042050  005037  050370                    CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
6626  042054  005037  050372                    CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
6627  042060  005037  050406                    CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
6628  042064  005037  050410                    CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
6629
6630
6631                                            ;*THESE ARE TO SETUP FOR DISKLESS USE ONLY
6632
6633  042070  012737  010000  052340            MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

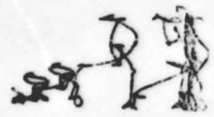
```
6634
6635  042076  112737  000000  052343          MOVB    #0,@#SECOTR+1   ;CYLINDER 0, FORMAT 16 BITS
                                                                        ;TRACK 0
6636  042104  112737  000000  052342          MOVB    #0,@#SECOTR     ;SECTOR 0
6637  042112  012737  000000  052344          MOV     #0,@#KEY1       ;KEY1=0
6638  042120  012737  000000  052346          MOV     #0,@#KEY2       ;KEY2=0
6639  042126  012737  000400  052420          MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
6640  042134  005037  052350                  CLR     @#X             ;THIS IS A READ COMMAND
6641  042140  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
6642  042144  052340                          CYL
6643  042146  054240                          WCRC
6644
6645
6646                                          ;*THIS IS TO INSERT ERROR
6647                                          ;*THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
6648                                          ;*THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
6649                                          ;*THIS MOVE
6650                                          ;*THIS CHANGES THE LAST BIT OF THE ECC
6651
6652  042150  013746  055260                  MOV     @#WECC2,-(SP)   ;GET LAST ECC
6653  042154  005116                          COM     (SP)            ;INVERT ALL BITS OF WECC2
6654  042156  042716  077777                  BIC     #^C100000,(SP)  ;KEEP BIT 16
6655  042162  042737  100000  055260          BIC     #100000,@#WECC2 ;CLEAR BIT 16 IN ECC
6656  042170  052637  055260                  BIS     (SP)+,@#WECC2   ;THIS WILL SET BIT 16 IF IT WAS 0
                                                                        ;OR WILL SET NOTHING IF IT WAS A 1
6657
6658
6659
6660  042174  012737  010026  042350          MOV     #4118.,@#8$     ;INSERT POSITION REG.
6661
6662
6663                                          ;*THESE ARE REGULAR SETUPS
6664
6665  042202  004737  045674                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
6666  042206  012777  177374  152536          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
6667  042214  012777  016264  152532          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
6668  042222  112746  000000                  MOVB    #0,     -(SP)   ;IN LOWER BYTE GET SECTOR
6669  042226  112766  000000  000001          MOVB    #0,     1(SP)   ;GET TRACK IN HIGHER BYTE
6670  042234  012677  152524                  MOV     (SP)+,  @RHDST  ;TRACK/SECTOR IN RHDST
6671  042240  012777  010000  152522          MOV     #FMT22,@RHOF ;16 BITS PER WORD
6672                                                                  ;ECC CORRECTION NOT INHIBIT
6673                                                                  ;BECAUSE ECC IS NOT GOING
6674                                                                  ;TO BE CHECKED
6675  042246  005077  152520                  CLR     @RHCA           ;CYLINDER 0
6676
6677  042252  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
6678  042256  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
6679                                                                  ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
6680  042262  000000                          HALT                    ;STOP THE TEST
6681
6682  042264  013711  015200                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
6683  042270  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
6684  042274  004737  052200                  JSR     PC,@#COMHD      ;READ HEADER AND DATA
6685                                                                  ;IF THERE ARE READ ERRORS THEN
6686                                                                  ;ECC WILL NOT BE CHECKED
6687
```

```
                                        ;*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

042300  005737  015126          TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
042304  001074                  BNE     TST66           ;BRANCH IF YES
042306  004737  045374          JSR     PC,@#PUTREG     ;SAVE REGISTERS
042312  022737  100000  015036  CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
042320  001401                  BEQ     6$              ;BRANCH IF YES
042322  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
042324  013746  050370    6$:   MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
042330  042716  174000          BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
042334  022637  015066          CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
042340  001401                  BEQ     7$              ;BRANCH IF GOOD
042342  104032                  ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT

042344  004037  051012    7$:   JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
042350  010026            8$:   4118.                   ;EXPECTED POSITION REG. WHEN CORRECTION
                                                        ;IS COMPLETE


042352  004737  046120          JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
042356  104400  005124          TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
042362  000000                  HALT                    ;STOP THE TEST AND RESTART PROGRAM
042364  012700  015220          MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
042370  012720  010000          MOV     #0!FMT22,(R0)+  ;CYLINDER 0
042374  112746  000000          MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
042400  112766  000000  000001  MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
042406  012620                  MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
042410  012720  000000          MOV     #0,(R0)+        ;KEY1 IN BUFFER
042414  012720  000000          MOV     #0,(R0)+        ;KEY2 IN BUFFER
042420  012701  000400          MOV     #256.,R1        ;DATA WORD COUNTER
042424  012702  052525          MOV     #52525,R2       ;DATA
042430  010220            3$:   MOV     R2,(R0)+        ;DATA INTO BUFFER
042432  005301                  DEC     R1              ;COUNT
042434  001375                  BNE     3$              ;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
```

```
6742  042436  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
6743  042442  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
6744
6745
6746                                          ;*NOW READ DATA BUFFER WILL BE CHECKED
6747
6748  042446  004037  046570                  JSR     R0,@#COMPAR     ;CHECK
6749  042452  015220                          WRFROM                  ;GOOD BUFFER
6750  042454  016264                          REINTO                  ;TEST BUFFER
6751  042456  000404                          4+256.                  ;NUMBER OF WORDS CHECKED
6752  042460  042466                          4$                      ;RETURN POINT FOR ERROR HEADER
6753  042462  042472                          5$                      ;RETURN POINT FOR ERROR DATA
6754
6755  042464  042476                          TST66                   ;RETURN FOR GOOD COMPARISON
6756
6757  042466  104004          4$:     ERROR   4                       ;READ NEXT ERROR
6758  042470  000207                  RTS     PC                      ;RETURN TO "COMPAR"
6759  042472  104005          5$:     ERROR   5                       ;WORD NOS 1 TO 4 ARE
6760                                                                  ;HEADER WORDS
6761                                                                  ;5 TO 260 ARE DATA WORDS
6762  042474  000207                  RTS     PC                      ;RETURN TO "COMPAR"
6763
```

```
                                ;;*****************************************************************
                                ;*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
                                ;;*****************************************************************
042476  000004                TST66:  SCOPE
042500  012706  001000                MOV     #STACK,SP       ;RESET STACK
042504  012737  000066  017330        MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER

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

042512  012746  052525                MOV     #52525,-(SP)    ;DATA TO BE READ
042516  012705  000400                MOV     #256.,R5        ;COUNTER
042522  012700  054256                MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
042526  011620                1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
042530  005305                        DEC     R5              ;COUNT
042532  001375                        BNE     1$              ;BRANCH IF 256 NOT COMPLETE
042534  005726                        TST     (SP)+           ;UNDO -(SP)
042536  022020                        CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
042540  012705  000017                MOV     #15.,   R5      ;1 DATA GAP
                                                              ;14 TOLERANCE GAP
042544  005020                2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
042546  005305                        DEC     R5              ;TOLERANCE GAP
042550  001375                        BNE     2$              ;BRANCH IF NOT COMPLETE

042552  004737  051164                JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
                                                              ;IN THE CORRECT PLACE

                                ;*THESE ARE FOR ECC TEST ONLY

042556  012737  177777  015144        MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
042564  005037  050402                CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
042570  013737  050376  050400        MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
042576  013737  050404  050412        MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
042604  005037  050370                CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
042610  005037  050372                CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
042614  005037  050406                CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
042620  005037  050410                CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT

                                ;*THESE ARE TO SETUP FOR DISKLESS USE ONLY

042624  012737  010000  052340        MOV     #FMT22,@#CYL    ;16 BITS PER WORD
```

```
                                                                ;CYLINDER 0, FORMAT 16 BITS
042632  112737  000000  052343          MOVB    #0,@#SECOTR+1   ;TRACK 0
042640  112737  000000  052342          MOVB    #0,@#SECOTR     ;SECTOR 0
042646  012737  000000  052344          MOV     #0,@#KEY1       ;KEY1=0
042654  012737  000000  052346          MOV     #0,@#KEY2       ;KEY2=0
042662  012737  000400  052420          MOV     #256.,@#DAWORD  ;NO. OF DATA WORDS
042670  005037  052350                  CLR     @#X             ;THIS IS A READ COMMAND
042674  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
042700  052340                          CYL
042702  054240                          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

042704  012737  152652  054322          MOV     #152652,@#DISK+44;INSERT ERROR IN POSITION 296 THRU 304
                                                                ;IN WORD NUMBER 19
042712  012737  052532  054324          MOV     #52532,@#DISK+46;INSERT ERROR IN POSITION 305 THRU 308
                                                                ;IN WORD NUMBER 20
042720  012737  010040  043074          MOV     #4128.,@#8$     ;INSERT POSITION REG.


                                        ;*THESE ARE REGULAR SETUPS

042726  004737  045674                  JSR     PC,@#CLDISK     ;SETUP GENERAL REGISTERS
042732  012777  177374  152012          MOV     #-256.-4.,@RHWC ;256. DATA 4 HEADER WORDS
042740  012777  016264  152006          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
042746  112746  000000                  MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
042752  112766  000000  000001          MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
042760  012677  152000                  MOV     (SP)+,  @RHDST  ;TRACK/SECTOR IN RHDST
042764  012777  010000  151776          MOV     #FMT22,@RHOF    ;16 BITS PER WORD
                                                                ;ECC CORRECTION NOT INHIBIT
                                                                ;BECAUSE ECC IS NOT GOING
                                                                ;TO BE CHECKED
042772  005077  151774                  CLR     @RHCA           ;CYLINDER 0
042776  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
043002  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
043006  000000                          HALT                    ;STOP THE TEST
043010  013711  015200                  MOV     @#REFOR,@R1     ;READ HEADER AND DATA=72
043014  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
043020  004737  052200                  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
043024  005737  015126          TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
043030  001111                  BNE     TST67           ;BRANCH IF YES
043032  004737  045374          JSR     PC,@#PUTREG     ;SAVE REGISTERS
043036  022737  100000  015036  CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
043044  001401                  BEQ     6$              ;BRANCH IF YES
043046  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
043050  013746  050370  6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
043054  042716  174000          BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
043060  022637  015066          CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
043064  001401                  BEQ     7$              ;BRANCH IF GOOD
043066  104032                  ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT
043070  004037  051012  7$:     JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
043074  000000  8$:     .WORD                           ;EXPECTED POSITION REG. WHEN CORRECTION
                                                        ;IS COMPLETE
043076  004737  045374          JSR     PC,@#PUTREG     ;SAVE REGISTERS
043102  022737  100100  015036  CMP     #DCK!ECH,@#ER1  ;WITH ERRORS INSERTED IN BIT POSITION 21
                                                        ;THRU 32 HARD ERROR BIT SHOULD SET
043110  001401                  BEQ     9$              ;BRANCH IF GOOD
043112  104036                  ERROR   36              ;WITH ERROR INSERTED IN BIT POSITION 21 THRU
                                                        ;32 HCE SHOULD SET
043114          9$:
043114  004737  046120          JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
043120  104400  005124          TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
043124  000000                  HALT                    ;STOP THE TEST AND RESTART PROGRAM
043126  012700  015220          MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
043132  012720  010000          MOV     #0!FMT22,(R0)+  ;CYLINDER 0
043136  112746  000000          MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
043142  112766  000000  000001  MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
043150  012620                  MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
043152  012720  000000          MOV     #0,(R0)+        ;KEY1 IN BUFFER
043156  012720  000000          MOV     #0,(R0)+        ;KEY2 IN BUFFER
043162  012701  000400          MOV     #256.,R1        ;DATA WORD COUNTER
043166  012702  052525          MOV     #52525,R2       ;DATA
043172  010220          3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
043174  005301                  DEC     R1              ;COUNT
043176  001375                  BNE     3$              ;BRANCH IF 256 NOT DONE

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

```
6926
6927  043200  012737  152652  015274          MOV     #152652,@#WRFROM+54;INSERT ERROR IN POSITION 296 THRU 304
6928                                                    ;IN WORD NUMBER 19 IN DATA
6929  043206  012737  052532  015276          MOV     #52532,@#WRFROM+56;INSERT ERROR IN POSITION 305 THRU 308
6930                                                    ;IN WORD NUMBER 20 IN DATA
6931
6932  043214  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
6933  043220  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
6934
6935
6936                                          ;*NOW READ DATA BUFFER WILL BE CHECKED
6937
6938  043224  004037  046570                  JSR     R0,@#COMPAR     ;CHECK
6939  043230  015220                          WRFROM                  ;GOOD BUFFER
6940  043232  016264                          REINTO                  ;TEST BUFFER
6941  043234  000404                          4+256.                  ;NUMBER OF WORDS CHECKED
6942  043236  043244                          4$                      ;RETURN POINT FOR ERROR HEADER
6943  043240  043250                          5$                      ;RETURN POINT FOR ERROR DATA
6944
6945  043242  043254                          TST67                   ;RETURN FOR GOOD COMPARISON
6946
6947  043244  104004          4$:     ERROR   4                       ;READ NEXT ERROR
6948  043246  000207                  RTS     PC                      ;RETURN TO "COMPAR"
6949  043250  104005          5$:     ERROR   5                       ;WORD NOS 1 TO 4 ARE
6950                                                                  ;HEADER WORDS
6951                                                                  ;5 TO 260 ARE DATA WORDS
6952  043252  000207                  RTS     PC                      ;RETURN TO "COMPAR"
6953
```

```
                                ;;*****************************************************************
                                ;*TEST 67        READ ECC ENABLED 3D
                                ;
                                ;*      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
                                ;
                                ;;*****************************************************************
043254  000004                  TST67:  SCOPE
043256  012706  001000                  MOV     #STACK,SP       ;RESET STACK
043262  012737  000067  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
                                ;
                                ;*SETUP FOR WHAT IS TO BE READ
                                ;*HEADER CRC IS RESTORED FROM A SUBROUTINE
                                ;
043270  012746  052525                  MOV     #52525,-(SP)    ;DATA TO BE READ
043274  012705  000400                  MOV     #256.,R5        ;COUNTER
043300  012700  054256                  MOV     #DISK,R0        ;START OF SIMULATED DISK DATA
043304  011620                  1$:     MOV     (SP),(R0)+      ;MOVE IN DATA ON TO SIMULATED DISK
043306  005305                  DEC     R5              ;COUNT
043310  001375                  BNE     1$              ;BRANCH IF 256 NOT COMPLETE
043312  005726                  TST     (SP)+           ;UNDO -(SP)
043314  022020                  CMP     (R0)+,(R0)+     ;JUMP OVER THE TWO ECC WORDS
043316  012705  000017          MOV     #15.,R5         ;1 DATA GAP
                                                        ;14 TOLERANCE GAP
043322  005020                  2$:     CLR     (R0)+           ;CLEAR DATA GAP, AND
043324  005305                  DEC     R5              ;TOLERANCE GAP
043326  001375                  BNE     2$              ;BRANCH IF NOT COMPLETE
                                ;
043330  004737  051164          JSR     PC,@#FILLEC     ;INSERT THE TWO ECC WORDS ON THE DISK
                                                        ;IN THE CORRECT PLACE
                                ;
                                ;*THESE ARE FOR ECC TEST ONLY
                                ;
043334  012737  177777  015144  MOV     #-1,@#TSECC     ;THIS IS AN ECC TEST
043342  005037  050402          CLR     @#POSITI        ;CLEAR ERROR POSITION COUNTER
043346  013737  050376  050400  MOV     @#NCODE,@#NCOUNT  ;TEMPORARY N-CODE COUNTER
043354  013737  050404  050412  MOV     @#HARDER,@#HADTMP  ;TEMPORARY HARD ERROR COUNTER
043362  005037  050370          CLR     @#GECC1         ;ECC LOW ORDER TO BE GENERATED
043366  005037  050372          CLR     @#GECC2         ;ECC HIGH ORDER TO BE GENERATED
043372  005037  050406          CLR     @#DATENV        ;CLEAR DATA ENVELOPE CLOCK COUNT
043376  005037  050410          CLR     @#ZCODE         ;CLEAR LEADING ZEROS CLOCK COUNT
                                ;
                                ;*THESE ARE TO SETUP FOR DISKLESS USE ONLY
                                ;
```

```
7008  043402  012737  010000  052340          MOV     #FMT22,@#CYL      ;16 BITS PER WORD
7009                                                                    ;CYLINDER 0, FORMAT 16 BITS
7010  043410  112737  000000  052343          MOVB    #0,@#SECOTR+1     ;TRACK 0
7011  043416  112737  000000  052342          MOVB    #0,@#SECOTR       ;SECTOR 0
7012  043424  012737  000000  052344          MOV     #0,@#KEY1         ;KEY1=0
7013  043432  012737  000000  052346          MOV     #0,@#KEY2         ;KEY2=0
7014  043440  012737  000400  052420          MOV     #256.,@#DAWORD    ;NO. OF DATA WORDS
7015  043446  005037  052350                  CLR     @#X               ;THIS IS A READ COMMAND
7016  043452  004537  047102                  JSR     R5,@#CRC          ;GO TO CALCULATE CRC
7017  043456  052340                          CYL
7018  043460  054240                          WCRC
7019
7020
7021                                          ;*THIS IS TO INSERT ERROR
7022                                          ;*THE DISK DATA IS IN LOCATION STARTING FROM 'DISK'
7023                                          ;*THE POSITION OF THE ERROR CAN BE CHANGED BY CHANGING
7024                                          ;*THIS MOVE
7025
7026  043462  012737  152525  054260          MOV     #152525,@#DISK+2  ;FORCE ERROR ON BIT NUMBER 32
7027  043470  012737  152525  055254          MOV     #152525,@#DISK+<255.*2>;FORCE ERROR IN BIT 4096
7028  043476  012737  010040  043652          MOV     #4128.,@#8$       ;INSERT POSITION REG.
7029
7030
7031                                          ;*THESE ARE REGULAR SETUPS
7032
7033  043504  004737  045674                  JSR     PC,@#CLDISK       ;SETUP GENERAL REGISTERS
7034  043510  012777  177374  151234          MOV     #-256.-4.,@RHWC   ;256. DATA 4 HEADER WORDS
7035  043516  012777  016264  151230          MOV     #REINTO,@RHBA     ;STARTING ADDRESS OF READ BUFFER
7036  043524  112746  000000                  MOVB    #0,-(SP)          ;IN LOWER BYTE GET SECTOR
7037  043530  112766  000000  000001          MOVB    #0,1(SP)          ;GET TRACK IN HIGHER BYTE
7038  043536  012677  151222                  MOV     (SP)+,  @RHDST    ;TRACK/SECTOR IN RHDST
7039  043542  012777  010000  151220          MOV     #FMT22,@RHOF      ;16 BITS PER WORD
7040                                                                    ;ECC CORRECTION NOT INHIBIT
7041                                                                    ;BECAUSE ECC IS NOT GOING
7042                                                                    ;TO BE CHECKED
7043  043550  005077  151216                  CLR     @RHCA             ;CYLINDER 0
7044
7045  043554  004737  045730                  JSR     PC,@#CHECKT       ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
7046  043560  104400  005124                  TYPE    ,CPHALT           ;CANNOT CONTINUE TESTING IF ANY OF THE
7047                                                                    ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
7048  043564  000000                          HALT                      ;STOP THE TEST
7049
7050  043566  013711  015200                  MOV     @#REFOR,@R1       ;READ HEADER AND DATA=72
7051  043572  005037  015126                  CLR     @#ERFLG$          ;CLEAR ERROR FLAG
7052  043576  004737  052200                  JSR     PC,@#COMHD        ;READ HEADER AND DATA
7053                                                                    ;IF THERE ARE READ ERRORS THEN
7054                                                                    ;ECC WILL NOT BE CHECKED
7055
7056
7057                                          ;*IF THE PROGRAM COMES BACK HERE WITHOUT ERROR PRINTOUTS
7058                                          ;*FROM THE "COMHD" ROUTINE THAT MEANS SECTOR GAP,
7059                                          ;*FIRST SYNC, HEADER, HEADER CRC, HEADER GAP AND
7060                                          ;*SYNC BYTE HAVE GONE BY AND SYNCS WERE CORRECTLY
7061                                          ;*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

043602  005737  015126                   TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
043606  001111                           BNE     TST70           ;       BRANCH IF YES
043610  004737  045374                   JSR     PC,@#PUTREG     ;SAVE REGISTERS
043614  022737  100000  015036           CMP     #DCK,@#ER1      ;ONLY DATA CHECK ERROR SHOULD BE SET
043622  001401                           BEQ     6$              ;BRANCH IF YES
043624  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
043626  013746  050370           6$:     MOV     @#GECC1,-(SP)   ;GET PATTERN REGISTER
043632  042716  174000                   BIC     #174000,(SP)    ;KEEP ONLY 11 BITS
043636  022637  015066                   CMP     (SP)+,@#EC2     ;COMPARE PATTERN REGISTER
043642  001401                           BEQ     7$              ;BRANCH IF GOOD
043644  104032                           ERROR   32              ;11 BITS OF THE 32 BIT ECC REGISTER INCORRECT

043646  004037  051012           7$:     JSR     R0,@#ECORR      ;GO TO ECC CORRECTION PROCESS
043652  000000           8$:     .WORD                           ;EXPECTED POSITION REG. WHEN CORRECTION
                                                                 ;IS COMPLETE




043654  004737  045374                   JSR     PC,@#PUTREG     ;SAVE REGISTERS
043660  022737  100100  015036           CMP     #DCK!ECH,@#ER1  ;WITH ERRORS INSERTED IN BIT POSITION 32
                                                                 ;AND 4096 HARD ERROR BIT SHOULD SET
043666  001401                           BEQ     9$              ;BRANCH IF GOOD
043670  104036                           ERROR   36              ;WITH ERROR INSERTED IN BIT POSITION 21 THRU
                                                                 ;32 HCE SHOULD SET




043672                           9$:
043672  004737  046120                   JSR     PC,@#CHECKE     ;CHECK THAT DVA,RDY,DPR,DRY = 1
043676  104400  005124                   TYPE    ,CPHALT         ;CANNOT CONTINUE IF THEY DON'T
043702  000000                           HALT                    ;STOP THE TEST AND RESTART PROGRAM
043704  012700  015220                   MOV     #WRFROM,R0      ;GETTING READY TO FILL EXPECTED DATA
043710  012720  010000                   MOV     #0!FMT22,(R0)+  ;CYLINDER 0
043714  112746  000000                   MOVB    #0,-(SP)        ;IN LOWER BYTE GET SECTOR
043720  112766  000000  000001           MOVB    #0,1(SP)        ;GET TRACK IN HIGHER BYTE
043726  012620                           MOV     (SP)+,(R0)+     ;GET TRACK/SECTOR IN BUFFER
043730  012720  000000                   MOV     #0,(R0)+        ;KEY1 IN BUFFER
043734  012720  000000                   MOV     #0,(R0)+        ;KEY2 IN BUFFER
043740  012701  000400                   MOV     #256.,R1        ;DATA WORD COUNTER
043744  012702  052525                   MOV     #52525,R2       ;DATA
043750  010220           3$:     MOV     R2,(R0)+        ;DATA INTO BUFFER
043752  005301                           DEC     R1              ;COUNT
043754  001375                           BNE     3$              ;BRANCH IF 256 NOT DONE
```

```
                                        ;*ONLY GOOD DATA HAS BEEN PUT IN 'WRFROM'
                                        ;*NOW THE INSERTED ERROR WILL BE PUT IN
                                        
043756  012737  152525  015232          MOV     #152525,@#WRFROM+<5*2>  ;INSERTED ERROR IN BIT 32
043764  012737  152525  016226          MOV     #152525,@#WRFROM+<259.*2>  ;INSERT ERROR IN BIT 4096
                                        
043772  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
043776  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
                                        
                                        ;*NOW READ DATA BUFFER WILL BE CHECKED
                                        
044002  004037  046570                  JSR     R0,@#COMPAR     ;CHECK
044006  015220                          WRFROM                  ;GOOD BUFFER (CHANGED)
044010  016264                          REINTO                  ;TEST BUFFER
044012  000404                          4+256.                  ;NUMBER OF WORDS CHECKED
044014  044022                          4$                      ;RETURN POINT FOR ERROR HEADER
044016  044026                          5$                      ;RETURN POINT FOR ERROR DATA
                                        
044020  044032                          TST70                   ;RETURN FOR GOOD COMPARISON
                                        
044022  104004          4$:     ERROR   4                       ;READ NEXT ERROR
044024  000207                  RTS     PC                      ;RETURN TO "COMPAR"
044026  104005          5$:     ERROR   5                       ;WORD NOS 1 TO 4 ARE
                                                                ;HEADER WORDS
                                                                ;5 TO 260 ARE DATA WORDS
044030  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
                                ;;*****************************************************************
044032  000004                  TST70:  SCOPE

044034  012737  000070  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
044042  012706  001000                  MOV     #STACK,SP       ;RESET STACK

044046  004737  045674                  JSR     PC,@#CLDISK     ;CLEAR DISK
044052  013700  014746                  MOV     @#RPVEC,R0      ;GET VECTOR ADDRESS
044056  012720  044124                  MOV     #RPTRP1,(R0)+   ;SET INTERRUPT VECTOR
044062  012710  000340                  MOV     #340,(R0)       ;SET SERVICE ROUTINE PRIORITY
044066  012737  000200  177776          MOV     #200,PS         ;SET PROCESSOR PRIORITY
044074  012711  000300                  MOV     #RDY!IE,@R1     ;RDY, IE IN RHSC1 SHOULD CAUSE INTERRUPT
044100  013737  046244  001200          MOV     @#TIMCNT,@#$TMP1;COUNTER
044106  005337  001200          1$:     DEC     @#$TMP1         ;WAIT FOR INTERRUPT
044112  001375                  BNE     1$                      ;BRANCH IF NOT ZERO
                                                                ;BEFORE THIS IS ZERO INTERRUPT SHOULD
                                                                ;OCCUR
044114  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
044120  104021                  ERROR   21                      ;INTERRUPT DID NOT OCCUR

044122  000410                  BR      TST71                   ;       BRANCH TO NEXT TEST

044124  022626          RPTRP1: CMP     (SP)+,(SP)+             ;RESTORE STACK
044126  004737  045374          JSR     PC,@#PUTREG             ;SAVE REGISTERS
044132  022737  004200  015034  CMP     #DVA!RDY,@#CS1          ;'IE' SHOULD BE LOW
044140  001401                  BEQ     TST71                   ;       BRANCH IF GOOD
044142  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
                                ;;*************************************************************
044144  000004                  TST71:  SCOPE

044146  012737  000071  017330          MOV     #TTNO,@#TSTNM   ;THIS SAVES TEST NUMBER
044154  012706  001000                  MOV     #STACK,SP       ;RESET STACK

044160  004737  045677                  JSR     PC,@#CLDISK     ;CLEAR DISK
044164  013700  014746                  MOV     @#RPVEC,R0      ;GET VECTOR ADDRESS
044170  012720  044230                  MOV     #RPTRP2,(R0)+   ;SET INTERRUPT VECTOR
044174  012710  000340                  MOV     #340,(R0)       ;SET SERVICE ROUTINE PRIORITY
044200  012737  000240  177776          MOV     #240,PS         ;SET PROCESSOR PRIORITY
044206  012711  000300                  MOV     #RDY!IE,@R1     ;RDY, IE IN RHSC1 SHOULD CAUSE INTERRUPT
044212  013737  046244  001200          MOV     @#TIMCNT,@#$TMP1;COUNTER
044220  005337  001200          1$:     DEC     @#$TMP1         ;WAIT FOR INTERRUPT
044224  001375                  BNE     1$                      ;BRANCH IF NOT ZERO
                                                                ;BEFORE THIS IS ZERO INTERRUPT SHOULD
                                                                ;OCCUR
044226  000404                  BR      TST72                   ;       NO INTERRUPT SO BRANCH

044230  022626                  RPTRP2: CMP     (SP)+,(SP)+     ;RESTORE STACK
044232  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
044236  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

                                        ;;*****************************************************************
044240  000004                          TST72:  SCOPE
044242  012737  000001  001212                  MOV     #1,$TIMES       ;;DO 1 ITERATION
044250  004737  045674                          JSR     PC,@#CLDISK

044254  012737  000000  177776                  MOV     #0,PS           ;REINSTATE PS TO 0
044262  104400  044270                          TYPE    ,65$            ;;TYPE ASCIZ STRING
044266  000425                                  BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <15><12>/TOTAL ERRORS ON THIS PASS ON  UNIT NO./
044342                                  64$:
044342  013746  015114                          MOV     @#UNIT,-(SP)    ;GET READY TO TYPE UNIT NUMBER
044346  104404                                  TYPDS
044350  104400  044356                          TYPE    ,67$            ;;TYPE ASCIZ STRING
044354  000402                                  BR      66$             ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  /= /
044362                                  66$:
044362  013746  001112                          MOV     @#$ERTTL,-(SP)  ;GET READY TO TYPE NUMBER OF ERRORS
044366  104404                                  TYPDS
044370  005037  001112                          CLR     @#$ERTTL        ;CLEAR TOTAL NUMBER OF ERRORS
044374  005037  001102                          CLR     @#$TSTNM        ;CLEAR TEST NUMBER
044400  005737  015122                          TST     @#SELECT        ;STARTING FROM 200 ?
044404  001413                                  BEQ     3$              ;TEST NEXT DRIVE IF SO

044406  005237  001100                          INC     @#$PASS         ;INCREASE PASS COUNT
044412  104400  044575                          TYPE    ,$ENDMG         ;TYPE END PASS #
044416  013746  001100                          MOV     @#$PASS,-(SP)
044422  104404                                  TYPDS
044424  104400  044572                          TYPE    ,$ENULL
044430  000137  022554                          JMP     @#TST5          ;CONTINUE TESTING THIS DRIVE ---------->

044434  005337  015116          3$:             DEC     @#NOUNITS       ;NO. OF UNITS PRESENT DECREMENTED
044440  001413                                  BEQ     $EOP            ;BRANCH IF ALL DRIVES COMPLETE
044442  013700  015114                          MOV     @#UNIT,R0       ;UNIT UNDER TEST
044446  012701  015074                          MOV     #UNITS,R1       ;TABLE
044452  022100                  1$:             CMP     (R1)+,R0        ;IS THIS UNIT JUST TESTED
044454  001401                                  BEQ     2$              ;BRANCH IF YES
044456  000775                                  BR      1$              ;BRANCH IF NO
044460  011137  015114          2$:             MOV     (R1),@#UNIT     ;THIS IS NEXT UNIT
044464  000137  022554                          JMP     @#TST5          ;TEST NEXT DRIVE ---------------------->
```

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


                                .SBTTL  END OF PASS ROUTINE

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

044470                          $EOP:
044470  000004                          SCOPE
044472  005037  001102                  CLR     $TSTNM          ;;ZERO THE TEST NUMBER
044476  005037  001212                  CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
044502  005237  001100                  INC     $PASS           ;;INCREMENT THE PASS NUMBER
044506  042737  100000  001100          BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
044514  005327                          DEC     (PC)+           ;;LOOP?
044516  000001                  $EOPCT: .WORD   1
044520  003022                          BGT     $DOAGN          ;;YES
044522  012737                          MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
044524  000001                  $ENDCT: .WORD   1
044526  044516                          $EOPCT
044530  104400  044575                  TYPE    ,$ENDMG         ;;TYPE "END PASS #"
044534  013746  001100                  MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
044540  104404                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
044542  104400  044572                  TYPE    ,$ENULL         ;;TYPE A NULL CHARACTER
044546  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
044552  001405                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
044554  000005                          RESET                   ;;CLEAR THE WORLD
044556  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
044560  000240                          NOP                     ;;SAVE ROOM
044562  000240                          NOP                     ;;FOR
044564  000240                          NOP                     ;;ACT11
044566                          $DOAGN:
044566  000137                          JMP     @(PC)+          ;;RETURN
044570  021034                  $RTNAD: .WORD   TST1
044572     377     377     000  $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
044575     015  042412  042116  $ENDMG: .ASCIZ  <15><12>/END PASS #/
044602  050040  051501  020123
044610  000043


                                ;;*****************************************************************
                                ;*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.
                                        ;;*****************************************************************

044612  000000                TESTAD: 0                       ;FIRST ADDRESS OF TEST

044614                      OPERSEL:
044614  005037  177776              CLR     PS              ;MAKE PROCESSOR STATUS ZERO
044620  104400  044626              TYPE    ,65$            ;;TYPE ASCIZ STRING
044624  000421                      BR      64$             ;;GET OVER THE ASCIZ
                            ;;65$:  .ASCIZ  <15><12>/THE PROGRAM WAS IN TEST NUMBER /
044670                      64$:
044670  013746  017330              MOV     @#TSTNM,-(SP)   ;GET READY TO TYPE TEST
044674  104401                      TYPOC                   ;NUMBER
044676  104400  044704              TYPE    ,67$            ;;TYPE ASCIZ STRING
044702  000414                      BR      66$             ;;GET OVER THE ASCIZ
                            ;;67$:  .ASCIZ  <15><12>/THE LOOP BACK PC WAS /
044734                      66$:
044734  013746  001110              MOV     @#$LPERR,-(SP)  ;GET READY TO TYPE LOOP BACK PC
044740  104401                      TYPOC
044742  104400  001223              TYPE    ,$CRLF
044746  104400  044754              TYPE    ,69$            ;;TYPE ASCIZ STRING
044752  000426                      BR      68$             ;;GET OVER THE ASCIZ
                            ;;69$:  .ASCIZ  <15><12>/SET LOOP ON ERROR OR LOOP ON TEST SWITCH/
045030                      68$:
045030  104400  045036              TYPE    ,71$            ;;TYPE ASCIZ STRING
045034  000420                      BR      70$             ;;GET OVER THE ASCIZ
                            ;;71$:  .ASCIZ  <15><12>/TYPE THE FIRST PC OF THE TEST/
045076                      70$:
045076  104400  045104              TYPE    ,73$            ;;TYPE ASCIZ STRING
045102  000423                      BR      72$             ;;GET OVER THE ASCIZ
                            ;;73$:  .ASCIZ  <15><12>/ FOLLOWED BY A CARRIAGE RETURN  /<15><12>
045152                      72$:
045152  104411                      RDOCT
045154  062716  000002              ADD     #2,(SP)         ;GET LPADR
045160  012637  001106              MOV     (SP)+,@#$LPADR
045164  104400  045172              TYPE    ,75$            ;;TYPE ASCIZ STRING
045170  000417                      BR      74$             ;;GET OVER THE ASCIZ
                            ;;75$:  .ASCIZ  <15><12>/TYPE THE PC WHERE YOU WANT/
```

```
 7372  045230                          74$:
 7373  045230  104400  045236                  TYPE    ,77$             ;;TYPE ASCIZ STRING
 7374  045234  000441                  BR      76$              ;;GET OVER THE ASCIZ
 7375                                  ;;77$:  .ASCIZ  <15><12>/ THE PROGRAM TO LOOP BACK TO FOLLOWED BY A CARRIAGE RETURN  /<1
 7376  045240                          76$:
 7377  045340  104411                  RDOCT
 7378  045342  012637  001110          MOV     (SP)+,@#$LPERR  ;GET LPERR
 7379  045346  013746  001106          MOV     @#$LPADR,-(SP)
 7380                                  ;THIS CLEARS UP GARBAGE
 7381  045352  005037  052454          CLR     @#NOSYNC                ;CLEAR FLAG FOR HEADER ERROR COMMANDS
 7382  045356  005037  015144          CLR     @#TSECC                 ;CLEAR FLAG FOR ECC TEST
 7383                                                                  ;WHEN =177777 IT IS AN ECC TEST
 7384                                                                  ;WHEN =0 IT IS NOT AN ECC TEST
 7385
 7386  045362  005037  050374          CLR     @#TSECCG                ;EVEN IN AN ECC TEST EVERY CLOCK
 7387                                                                  ;IS NOT TO GENERATE ECC
 7388                                                                  ;IF =177777 GENERATE ECC
 7389                                                                  ;IF =0 DO NOT GENERATE ECC
 7390  045366  005037  015146          CLR     @#TESDTE                ;DRIVE TIMING ERROR TEST
 7391  045372  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
                                ;;**************************************************************

045374                          PUTREG:
045374  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
045376  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
045400  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
045402  012700  014752                  MOV     #RHWC,R0        ;STARTING ADDRESS OF REG
045406  012701  015026                  MOV     #WC,R1          ;STARTING ADDRESS OF SAVE LOCATIONS
045412  012702  000023                  MOV     #RHCC-RHWC+2/2,R2 ;NUMBER OF REG. INTO R2
045416  013021                  10$:     MOV     @(R0)+,(R1)+    ;SAVE HARDWARE REG.
045420  005302                          DEC     R2
045422  001375                          BNE     10$
045424  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
045426  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
045430  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
045432  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
                                ;;*****************************************************************

045434  000000                MASK:   0                       ;BITS UNDER TEST
045436  000000                LERR:   0                       ;ERROR HLT ADDRESS
045440  000000                REGADR: 0

045442  012537  045434        BITST:  MOV     (R5)+,  MASK    ;FETCH DATA MASK
045446  012504                        MOV     (R5)+,  R4      ;GET ADDRESS OF REG. UNDER TEST
045450  010437  045440                MOV     R4,     REGADR
045454  010537  045436                MOV     R5,     LERR    ;GET ERROR RETURN ADDR.
045460  062705  000004                ADD     #4,     R5      ;MODIFY RETURN ADDR. TO JUMP OVER RTS
045464  012703  000001                MOV     #1,     R3      ;INITIALIZE DATA PATTERN
045470  004737  045512        BLT1:   JSR     PC,     BLT2    ;OUTPUT FLOATING ZERO
045474  004737  045512                JSR     PC,     BLT2    ;OUTPUT FLOATING ONE
045500  000241                        CLC
045502  006103                        ROL     R3              ;SHIFT PATTERN
045504  005703                        TST     R3
045506  001370                        BNE     BLT1            ;BRANCH IF NOT COMPLETE
045510  000205                        RTS     R5              ;RETURN TO TEST
045512  005103                BLT2:   COM     R3              ;COMPLEMENT PATTERN
045514  012737  045522  045654        MOV     #BLT3,  @#LAD   ;SET SCOPE LOOP
045522  010337  001124        BLT3:   MOV     R3,@#$GDDAT     ;STORE GOOD DATA
045526  005137  045434                COM     @#MASK          ;AND MASK WITH PATTERN
045532  043737  045434  001124        BIC     @#MASK, @#$GDDAT;CLEAR THE REST
045540  005137  045434                COM     @#MASK          ;RESTORE MASK
045544  013714  001124                MOV     @#$GDDAT,(R4)   ;OUTPUT TO REGISTER
045550  011437  001126                MOV     (R4),@#$BDDAT   ;INPUT FROM REGISTER
045554  005137  045434                COM     @#MASK
045560  043737  045434  001126        BIC     @#MASK,@#$BDDAT ;AND MASK OUT RECEIVED DATA
045566  005137  045434                COM     @#MASK          ;RESTORE MASK
045572  023737  001124  001126        CMP     @#$GDDAT,@#$BDDAT;IS DATA CORRECT
045600  001403                        BEQ     1$              ;BRANCH IF GOOD
045602  004777  177630                JSR     PC,     @LERR   ;GO TO REPORT ERROR
045606  104412                        SCOP1                   ;LOCAL SCOPE LOOP
045610  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
                        ;;*****************************************************************

045612                  CLAREA:
045612  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
045614  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
045616  010346                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
045620  012001                  MOV     (R0)+,R1        ;FROM
045622  012002                  MOV     (R0)+,R2        ;TO
045624  012003                  MOV     (R0)+,R3        ;DATA
045626  160102                  SUB     R1,R2           ;NO. OF LOCATIONS MINUS TWO
045630  062702  000002          ADD     #2,R2           ;GET TWICE NO OF LOCATIONS
045634  010321          1$:     MOV     R3,(R1)+        ;MOVE IN DATA
045636  005302                  DEC     R2
045640  005302                  DEC     R2
045642  001374                  BNE     1$              ;BRANCH IF NOT COMPLETE
045644  012603                  MOV     (SP)+,R3        ;;POP STACK INTO R3
045646  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
045650  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
045652  000200                  RTS     R0              ;RETURN
```

```
                                                .SBTTL  LOCAL TRAPS
045654  000000                          LAD:    0

045656  032777  001000  133254          T.SCOP: BIT     #SW09,  @SWR
045664  001402                                  BEQ     1$
045666  013716  045654                          MOV     @#LAD,  (SP)
045672  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

045674  013701  014760                  CLDISK: MOV     @#RHCS1,R1      ;R1 WILL BE CONTROL AND STATUS1
045700  013702  014756                          MOV     @#RHCS2,R2      ;R2 WILL BE CONTROL AND STATUS2
045704  013703  015002                          MOV     @#RHDS1,R3      ;R3 WILL BE DISK STATUS REGISTER1
045710  013704  014762                          MOV     @#RHER1,R4      ;R4 WILL BE ERROR REGISTER #1

045714  012712  000040                          MOV     #CLR,@R2        ;CLEAR ALL REG.
045720  013712  015114                          MOV     @#UNIT,@R2      ;REINSTATE UNIT NO.
045724  005011                                  CLR     @R1             ;CLEAR FUNCTION BITS
045726  000207                                  RTS     PC
```

```
                                        .SBTTL  CHECK DISK STATUS ROUTINES

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

045730  011637  015134        CHECKT: MOV     (SP),@#PCJSR    ;SAVE PC OF JSR+4
045734  162737  000004  015134        SUB     #4,@#PCJSR      ;GET PC OF JSR
045742  004737  045374                JSR     PC,@#PUTREG     ;SAVE REGISTERS
045746  022737  004200  015034        CMP     #DVA!RDY,@#CS1  ;RHCS1 SHOULD HAVE DEVICE AVAILABLE
                                                                ;AND BE READY
045754  001423                        BEQ     3$              ;BRANCH IF GOOD TO RHDS1 CHECK

045756  032737  004000  015034        BIT     #DVA,@#CS1      ;BAD SO TEST DEVICE AVAILABLE
045764  001004                        BNE     1$              ;TEST READY IF DVA THERE
045766  010137  001122                MOV     R1,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHCS1)
045772  104026                        ERROR   26              ;RHCS1 DID NOT HAVE DEVICE
                                                                ;AVAILABLE AT START OF TEST
045774  000413                        BR      3$              ;BRANCH TO RHDS1 CHECK

045776  032737  000200  015034  1$:   BIT     #RDY,@#CS1      ;TEST READY
046004  001003                        BNE     2$              ;IF RDY THERE BRANCH
046006  010137  001122                MOV     R1,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHCS1)
046012  104026                        ERROR   26              ;RHCS1 DID NOT HAVE READY
                                                                ;AT THE START OF TEST
046014  000403                  2$:   BR      3$              ;BRANCH TO NEXT COMPARE
046016  010137  001122                MOV     R1,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHCS1)
046022  104026                        ERROR   26              ;RHCS1 HAD SOME BITS OTHER
                                                                ;THAN DVA AND RDY SET
                                                                ;ALL OTHER BITS SHOULD BE 0
                                                                ;AT START OF TEST

046024  013746  015056          3$:   MOV     @#DS1,-(SP)     ;GET RHDS1
046030  042716  001100                BIC     #VV!PROG,(SP)   ;CLEAR VV AND PROGRAMABLE BIT
046034  022726  000600                CMP     #DPR!DRY,(SP)+  ;RHDS1 SHOULD HAVE THESE SET
046040  001424                        BEQ     8$              ;RETURN TO TEST IF GOOD

046042  032737  000400  015056  4$:   BIT     #DPR,@#DS1      ;BAD SO TEST DRIVE PRESENT
046050  001004                        BNE     5$              ;CHECK DRY IF GOOD
046052  010337  001122                MOV     R3,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHDS1)
046056  104026                        ERROR   26              ;RHDS1 DOES NOT HAVE DPR
046060  000413                        BR      7$              ;BRANCH OUT
046062  032737  000200  015056  5$:   BIT     #DRY,@#DS1      ;TEST DRIVE READY
046070  001004                        BNE     6$              ;IF DPR WAS THERE SO BRANCH
046072  010337  001122                MOV     R3,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHDS1)
046076  104026                        ERROR   26              ;RHDS1 DOES NOT HAVE DRY
046100  000403                        BR      7$              ;BRANCH OUT
046102  010337  001122          6$:   MOV     R3,@#$BDADR     ;ADDRESS OF BAD REGISTER (RHDS1)
046106  104026                        ERROR   26              ;RHDS1 HAS SOME BITS OTHER
                                                                ;THAN MOL, DRY, DPR, SET
```

```
7579
7580  046110  000207                    7$:     RTS     PC              ;ALL OTHER BITS SHOULD BE 0
7581                                                                    ;RETURN TO TEST AND HALT - FATAL ERROR
7582  046112  062716  000006            8$:     ADD     #6,(SP)         ;ADJUST STACK PTR TO GET OVER HALT IN TEST
7583  046116  000207                            RTS     PC              ;RETURN TO TEST AND CONTINUE TESTING
7584
7585
7586                                    ;;*****************************************************************
7587                                    ;*THIS CHECKS THAT DEVICE AVAILABLE (DVA) AND READY (RDY) IN RHCS1 = 1
7588                                    ;*AND CHECKS THAT DEVICE PRESENT (DPR), DEVICE READY (DRY) IN RHDS1 = 1
7589                                    ;*IT DOES NOT CHECK THAT OTHER BITS IN THESE REGISTERS = 0
7590                                    ;;*****************************************************************
7591
7592  046120  011637  015134            CHECKE: MOV     (SP),@#PCJSR    ;SAVE PC OF JSR+4
7593  046124  162737  000004  015134            SUB     #4,@#PCJSR      ;GET PC OF JSR
7594  046132  004737  045374                    JSR     PC,@#PUTREG     ;SAVE REGISTERS
7595  046136  032737  000200  015034            BIT     #RDY,@#CS1      ;RHCS1 SHOULD HAVE DEVICE AVAILABLE
7596                                                                    ;AND BE READY
7597  046144  001004                            BNE     1$              ;BRANCH IF GOOD
7598  046146  010137  001122                    MOV     R1,@#$BDADR     ;FAILING REGISTER
7599  046152  104026                            ERROR   26              ;RHCS1 IS IN ERROR
7600                                                                    ;DOES NOT HAVE DVA, RDY
7601  046154  000427                            BR      4$              ;BRANCH
7602
7603  046156  032737  004000  015034  1$:     BIT     #DVA,@#CS1      ;RHCS1 SHOULD HAVE DEVICE AVAILABLE
7604                                                                    ;AND BE READY
7605  046164  001004                            BNE     2$              ;BRANCH IF GOOD
7606  046166  010137  001122                    MOV     R1,@#$BDADR     ;FAILING REGISTER
7607  046172  104026                            ERROR   26              ;RHCS1 IS IN ERROR
7608                                                                    ;DOES NOT HAVE DVA, RDY
7609  046174  000417                            BR      4$              ;BRANCH OUT
7610  046176  032737  000200  015056  2$:     BIT     #DRY,@#DS1      ;RHDS1 SHOULD HAVE DPR,DRY
7611  046204  001004                            BNE     3$              ;BRANCH IF THERE
7612  046206  010337  001122                    MOV     R3,@#$BDADR     ;FAILING REGISTER RHDS1
7613  046212  104026                            ERROR   26              ;RHDS1 DOES NOT HAVE DPR,DRY
7614  046214  000407                            BR      4$              ;BRANCH OUT
7615  046216  032737  000400  015056  3$:     BIT     #DPR,@#DS1      ;RHDS1 SHOULD HAVE DPR,DRY
7616  046224  001004                            BNE     5$              ;BRANCH IF THERE
7617  046226  010337  001122                    MOV     R3,@#$BDADR     ;FAILING REGISTER RHDS1
7618  046232  104026                            ERROR   26              ;RHDS1 DOES NOT HAVE DPR,DRY
7619  046234  000207                    4$:     RTS     PC              ;RETURN TO TEST AND HALT - FATAL ERROR
7620
7621  046236  062716  000006            5$:     ADD     #6,(SP)         ;ADJUST STACK TO GET OVER HALT IN TEST
7622  046242  000207                            RTS     PC              ;RETURN TO TEST AND CONTINUE TESTING
```

```
                                        .SBTTL  WAIT LOOP
                                ;;**************************************************************
                                ;*      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)
                                ;;**************************************************************

046244  177777                  TIMCNT: 177777                  ;WAITING COUNT

046246  010046                  WAIT.T: MOV     R0,-(SP)        ;SAVE R0
046250  016600  000002                  MOV     2(SP),R0        ;GET ADRESS OF REG. ADDRESS
046254  010037  001204                  MOV     R0,@#$TMP3      ;WAT PC+2 IN $TMP3
046260  162737  000002  001204          SUB     #2,@#$TMP3      ;WAT PC FOR TYPEOUT
046266  012037  001176                  MOV     (R0)+,@#$TMP0   ;WAIT REGISTER ADDRESS
046272  012037  001200                  MOV     (R0)+,@#$TMP1   ;WAIT ON BIT
046276  010066  000002                  MOV     R0,2(SP)        ;RESTORE RETURN ON STACK
046302  012600                          MOV     (SP)+,R0        ;RESTORE R0
046304  013737  046244  001202          MOV     @#TIMCNT,@#$TMP2;TEMPORARY COUNT

046312  033777  001200  132656  1$:     BIT     @#$TMP1,@$TMP0  ;IS REQUIRED BIT THERE?
046320  001021                          BNE     2$              ;BRANCH IF YES
046322  005337  001202                  DEC     @#$TMP2         ;COUNT
046326  001371                          BNE     1$              ;BRANCH IF NOT TIME UP
046330  013737  046244  001202          MOV     @#TIMCNT,@#$TMP2;TEMPORARY COUNT
046336  033777  001200  132632  3$:     BIT     @#$TMP1,@$TMP0  ;IS REQUIRED BIT THERE?
046344  001007                          BNE     2$              ;BRANCH IF YES
046346  005337  001202                  DEC     @#$TMP2         ;COUNT
046352  001371                          BNE     3$              ;BRANCH IF NOT TIME UP
046354  017737  132616  001126          MOV     @$TMP0,@#$BDDAT ;REGISTER CONTENTS
046362  104016                          ERROR   16              ;WAITED ON BIT FAILED TO SET
046364  000002                  2$:     RTI


                                ;*      CALL FOR THE ABOVE WAITLOOP IS
                                ;*
                                ;*      MOV     @A,@#X$         ;A CONTAINS REGISTER ADDRESS
                                ;*      -       -       -       ;HENCE X$ WILL HAVE ABSOLUTE REG. ADR.
                                ;*      -       -       -
                                ;*      -       -       -
                                ;*      WAT
                                ;*X$:   0                       ;ABSOLUTE REG. ADDRESS UNDER WAIT
                                ;*      .WORD   0               ;BIT WAITED FOR
                                ;*                              ;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
                                ;;**********************************************************************

046366                          SAVER:
046366  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
046370  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
046372  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
046374  012001                          MOV     (R0)+,R1        ;FROM
046376  012002                          MOV     (R0)+,R2        ;TO
046400  012003                          MOV     (R0)+,R3        ;NUMBER
046402  013122                  1$:     MOV     @(R1)+,(R2)+    ;SAVE REGISTER CONTENTS
046404  005303                          DEC     R3              ;COUNT
046406  001375                          BNE     1$              ;BRANCH IF NOT DONE
046410  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
046412  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
046414  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
046416  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

046420  012737  010000  052340  WRCHHD: MOV     #FMT22,@#CYL    ;CYLINDER 0 FORMAT 16 BIT WORDS
046426  112737  000001  052343          MOVB    #1,@#SECOTR+1   ;TRACK=1
046434  112737  000001  052342          MOVB    #1,@#SECOTR     ;SECTOR=1
046442  005037  052344                  CLR     @#KEY1          ;KEY1=0
046446  005037  052346                  CLR     @#KEY2          ;KEY2=0
046452  012737  000044  052420          MOV     #36.,DAWORD     ;NO OF DATA WORDS
046460  005037  052350                  CLR     @#X             ;THIS IS A READ OPERATION
046464  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
046470  052340                          CYL
046472  054240                          WCRC

                                ;THESE ARE REGULAR SETUPS

046474  004737  045674                  JSR     PC,@#CLDISK     ;SET UP GENERAL REGISTERS
```

```
 7722
 7723  046500  012777  177730  146244          MOV     #-40.,@RHWC     ;AND CLEAR DISK REGISTERS
 7724  046506  012777  016264  146240          MOV     #REINTO,@RHBA   ;36 DATA WORDS 4 HEADER WORDS
 7725  046514  112746  000001                  MOVB    #1,-(SP)        ;STARTING ADDRESS OF READ BUFFER
 7726  046520  112766  000001  000001          MOVB    #1,1(SP)        ;SECTOR=1
 7727  046526  012677  146232                  MOV     (SP)+,@RHDST    ;TRACK=1 IN UPPER BYTE
 7728  046532  012777  014000  146230          MOV     #FMT22!ECI,@RHOF ;TRACK=1, SECTOR=1 IN RHDST
 7729                                                                  ;16 BIT WORDS
 7730                                                                  ;ECC CORRECTION INHIBIT BECAUSE
 7731  046540  005077  146226                  CLR     @RHCA           ;ECC LOGIC IS NOT CHECKED YET
 7732  046544  004737  045730                  JSR     PC,@#CHECKT     ;CYLINDER=0
 7733  046550  104400  005124                  TYPE    ,CPHALT         ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
 7734                                                                  ;CANNOT CONTINUE TESTING IF ANY OF THE
 7735  046554  000000                          HALT                    ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
 7736  046556  013711  015170                  MOV     @#WRCHDT,@R1    ;STOP THE TEST
 7737                                                                  ;WRITE CHECK HEADER AND DATA=52
 7738  046562  004737  052200                  JSR     PC,@#COMHD      ;INTO RHCS1
 7739                                                                  ;WRITE CHECK HEADER AND DATA
 7740                                                                  ;SAME AS READ HEADER AND DATA
 7741  046566  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
                                ;;*****************************************************************

046570                          COMPAR:
046570  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
046572  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
046574  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
046576  010446                        MOV     R4,-(SP)        ;;PUSH R4 ON STACK
046600  010546                        MOV     R5,-(SP)        ;;PUSH R5 ON STACK
046602  012001                        MOV     (R0)+,R1        ;ADDRESS OF GOOD DATA BUFFER
046604  012002                        MOV     (R0)+,R2        ;ADDRESS OF TEST DATA BUFFER
046606  012003                        MOV     (R0)+,R3        ;NO OF WORDS TO BE COMPARED
046610  012037  001176                MOV     (R0)+,$TMP0     ;RETURN ON ERROR TO PRINT HEADER
046614  012037  001200                MOV     (R0)+,$TMP1     ;RETURN ON ERROR TO PRINT DATA
046620  011000                        MOV     (R0),R0         ;RETURN ON NO ERROR
046622  010304                        MOV     R3,R4           ;NO OF WORDS TO BE COMPARED
046624  005204                        INC     R4
046626  010437  052460        1$:     MOV     R4,@#ERWORD     ;FOR ERROR WORD NO
046632  022122                        CMP     (R1)+,(R2)+     ;COMPARE GOOD WITH TEST DATA
046634  001426                        BEQ     3$              ;BRANCH IF GOOD

046636  014137  001124                MOV     -(R1),@#$GDDAT  ;GOOD DATA
046642  014237  001126                MOV     -(R2),@#$BDDAT  ;BAD DATA
046646  160337  052460                SUB     R3,@#ERWORD     ;ERROR WORD NO.
046652  005737  015126                TST     @#ERFLG$        ;ANY ERRORS ALREAY THERE
046656  001003                        BNE     2$              ;BRANCH IF YES
046660  004777  132312                JSR     PC,@$TMP0       ;RETURN TO PRINT HEADER
046664  000402                        BR      5$              ;BRANCH TO AVOID PRINTING NEXT ERROR
046666  004777  132306        2$:     JSR     PC,@$TMP1       ;RETURN TO PRINT DATA
046672  022122                5$:     CMP     (R1)+,(R2)+     ;UNDO -(R1) AND -(R2) FOR ERRORS
046674  017746  132240                MOV     @SWR,-(SP)      ;GET SWITCH SETTING
046700  042716  177177                BIC     #^C600,(SP)     ;KEEP ONLY SWITCH 7 AND 8
046704  022726  000200                CMP     #SW07,(SP)+     ;IS 7 SET AND 8 RESET
046710  001402                        BEQ     4$              ;BRANCH OUT IF YES
046712  005303                3$:     DEC     R3              ;COUNT
046714  001344                        BNE     1$              ;BRANCH IF ALL NOT DEVICE
046716                          4$:
046716  012605                        MOV     (SP)+,R5        ;;POP STACK INTO R5
046720  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
046722  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
046724  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
046726  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
046730  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

046732  012737  010000  052340  WRCHDA: MOV     #FMT22,@#CYL    ;CYLINDER 0 FORMAT 16 BIT WORDS
046740  112737  000001  052343          MOVB    #1,@#SECOTR+1   ;TRACK=1
046746  112737  000001  052342          MOVB    #1,@#SECOTR     ;SECTOR=1
046754  005037  052344                  CLR     @#KEY1          ;KEY1=0
046760  005037  052346                  CLR     @#KEY2          ;KEY2=0
046764  012737  000040  052420          MOV     #32.,@#DAWORD   ;NO OF DATA WORDS
046772  005037  052350                  CLR     @#X             ;THIS IS A READ OPERATION

046776  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
047002  052340                          CYL
047004  054240                          WCRC

                                        ;THESE ARE REGULAR SETUPS

047006  004737  045674                  JSR     PC,@#CLDISK     ;SET UP GENERAL REGISTERS
                                                                ;AND CLEAR DISK REGISTERS

047012  012777  177740  145732          MOV     #-32.,@RHWC     ;36 DATA WORDS 4 HEADER WORDS
047020  012777  016264  145726          MOV     #REINTO,@RHBA   ;STARTING ADDRESS OF READ BUFFER
047026  112746  000001                  MOVB    #1,-(SP)        ;SECTOR=1
047032  112766  000001  000001          MOVB    #1,1(SP)        ;TRACK=1 IN UPPER BYTE
047040  012677  145720                  MOV     (SP)+,@RHDST    ;TRACK=1, SECTOR=1 IN RHDST
047044  012777  014000  145716          MOV     #FMT22!ECI,@RHOF        ;16 BIT WORDS
                                                                ;ECC CORRECTION INHIBIT BECAUSE
                                                                ;ECC LOGIC IS NOT CHECKED YET
047052  005077  145714                  CLR     @RHCA           ;CYLINDER=0
047056  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
047062  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
047066  000000                          HALT                    ;STOP THE TEST
047070  013711  015166                  MOV     @#WRCHEK,@R1    ;WRITE CHECK DATA=50 INTO RHCS1
047074  004737  052200                  JSR     PC,@#COMHD      ;WRITE CHECK HEADER AND DATA
                                                                ;SAME AS READ HEADER AND DATA

047100  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
                                ;;**************************************************************

047102                          CRC:
047102  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
047104  012500                         MOV     (R5)+,R0        ;GET POINTER TO CYL NO.
047106  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
047110  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
047112  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
047114  010446                         MOV     R4,-(SP)        ;;PUSH R4 ON STACK
047116  005001                         CLR     R1              ;CLEAR WORKING LOCATION
047120  005037  001210                 CLR     @#$TMP5
047124  012737  000004  001176         MOV     #4,@#$TMP0      ;WORD COUNT
047132  012037  001204         16$:    MOV     (R0)+,@#$TMP3   ;TEMPORARY WORD STORAGE
047136  012737  000020  001202         MOV     #16.,$TMP2      ;BIT COUNT
047144  013737  001204  001206         MOV     @#$TMP3,@#$TMP4 ;TEMPORARY WORD STORAGE
047152  006037  001204         15$:    ROR     @#$TMP3         ;GET LSB INTO "C"
047156  006037  001210                 ROR     @#$TMP5         ;GET ABOVE "C" INTO $TMP5
047162  032701  000001                 BIT     #BIT0,R1        ;IS POSITION 15 HIGH
047166  001403                         BEQ     1$              ;BRANCH IF POSITION 16 LOW
047170  012703  100000                 MOV     #BIT15,R3       ;GET POSITION 16
047174  000401                         BR      2$
047176  005003                 1$:     CLR     R3              ;GET POSITION 16
047200  063703  001210         2$:     ADD     @#$TMP5,R3      ;XOR POSITION 16 WITH D
                                                                ;TO GIVE B
047204  032701  040000                 BIT     #BIT14,R1       ;IS POSITION 2 HIGH
047210  001403                         BEQ     3$              ;BRANCH IF POSITION 2 LOW
```

```
7895  047212  012702  100000          MOV     #BIT15,R2       ;GET POSITION 2
7896  047216  000401                  BR      4$
7897  047220  005002          3$:     CLR     R2              ;GET POSITION 2
7898  047222  060302          4$:     ADD     R3,R2           ;XOR B WITH POSITION 2
7899                                                          ;TO GIVE C
7900  047224  032701  000002          BIT     #BIT1,R1        ;IS POSITION 15 HIGH
7901  047230  001403                  BEQ     5$              ;BRANCH IF POSITION 15 LOW
7902  047232  012704  100000          MOV     #BIT15,R4       ;GET POSITION 15
7903  047236  000401                  BR      6$
7904  047240  005004          5$:     CLR     R4              ;GET POSITION 15
7905  047242  060304          6$:     ADD     R3,R4           ;XOR POSITION 15 WITH B
7906                                                          ;TO GIVE E
7907  047244  006037  001206          ROR     @#$TMP4         ;GET LSB INTO "C"
7908  047250  006001                  ROR     R1              ;GET ABOVE C INTO R1
7909  047252  005703                  TST     R3              ;TEST B
7910  047254  100403                  BMI     7$              ;BRANCH IF B=1
7911  047256  042701  100000          BIC     #BIT15,R1       ;SET B IN POSITION 1
7912  047262  000402                  BR      10$
7913  047264  052701  100000  7$:     BIS     #BIT15,R1       ;SET B IN POSITION 1
7914  047270  005702          10$:    TST     R2              ;TEST C
7915  047272  100403                  BMI     11$             ;BRANCH IF C=1
7916  047274  042701  020000          BIC     #BIT13,R1       ;GET C IN POSITION 3
7917  047300  000402                  BR      12$
7918  047302  052701  020000  11$:    BIS     #BIT13,R1       ;GET C IN POSITION 3
7919  047306  005704          12$:    TST     R4              ;TEST E
7920  047310  100403                  BMI     13$             ;BRANCH IF E=1
7921  047312  042701  000001          BIC     #BIT0,R1        ;GET E IN POSITION 16
7922  047316  000402                  BR      14$
7923  047320  052701  000001  13$:    BIS     #BIT0,R1        ;GET E IN POSITION 16
7924  047324  005337  001202  14$:    DEC     @#$TMP2         ;BIT COUNTER
7925  047330  001310                  BNE     15$             ;BRANCH IF 16 NOT DONE
7926  047332  005337  001176          DEC     @#$TMP0         ;WORD COUNTER
7927  047336  001275                  BNE     16$             ;BRANCH IF 4 NOT DONE
7928  047340  010135                  MOV     R1,@(R5)+       ;PUT CRC WHERE DESIRED
7929  047342  012604                  MOV     (SP)+,R4        ;;POP STACK INTO R4
7930  047344  012603                  MOV     (SP)+,R3        ;;POP STACK INTO R3
7931  047346  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
7932  047350  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
7933  047352  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
7934  047354  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
                                ;;**********************************************************************
047356                          SETDSK:
047356  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
047360  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
047362  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
047364  012700  177400                  MOV     #177400,R0      ;DATA IN THE DISK
047370  012701  000400                  MOV     #256.,R1        ;COUNTER
047374  012702  054256                  MOV     #DISK,R2        ;START OF SIMULATOR DISK
047400  010022                  1$:     MOV     R0,(R2)+        ;MOVE IN DATA
047402  005301                          DEC     R1              ;COUNT FOR 256
047404  001375                          BNE     1$              ;BRANCH IF 256 NOT COMPLETE
047406  012701  000021                  MOV     #17.,R1         ;2 ECC WORDS, 1 DATA GAP
                                                                ;14 TOLERANCE GAP
047412  005022                  2$:     CLR     (R2)+           ;CLEAR ECC,DATA GAP AND
                                                                ;TOLERANCE GAP
047414  005301                          DEC     R1              ;COUNT
047416  001375                          BNE     2$              ;BRANCH IF NOT COMPLETE

                                ;NOW SET UP FOR DISKLESS USE

047420  012737  010000  052340          MOV     #FMT22,@#CYL    ;CYLINDER 0 (16 BIT WORDS)
047426  112737  000001  052343          MOVB    #1,@#SECOTR+1   ;TRACK=1
047434  112737  000001  052342          MOVB    #1,@#SECOTR     ;SECTOR=1
047442  012737  000001  052344          MOV     #1,@#KEY1       ;KEY1=1
047450  012737  000001  052346          MOV     #1,@#KEY2       ;KEY2=1
047456  013737  000400  052420          MOV     256.,@#DAWORD   ;NO. OF DATA WORDS
047464  004537  047102                  JSR     R5,@#CRC        ;GO TO CALCULATE CRC
047470  052340                          CYL                     ;FIRST CRC WORD
047472  054240                          WCRC                    ;PUT CALCULATED CRC
047474  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
047476  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
047500  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
047502  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
                                ;;**************************************************************

047504  010037  015134          HCCRCE: MOV     R0,@#PCJSR      ;SAVE PC OF JSR+4
047510  162737  000004  015134          SUB     #4,@#PCJSR      ;GET PC OF JSR
047516  004737  045674                  JSR     PC,@#CLDISK     ;INIT AND SETUP GENERAL REG.
047522  004737  045730                  JSR     PC,@#CHECKT     ;CHECK DVA,RDY,DPR,DRY = 1 AND OTHERS DON'T
047526  104400  005124                  TYPE    ,CPHALT         ;CANNOT CONTINUE TESTING IF ANY OF THE
                                                                ;ABOVE BITS DON'T = 1 OR OTHERS ARE STUCK @ 1
047532  000000                          HALT                    ;STOP THE TEST
047534  011037  001210                  MOV     (R0),@#STMPS    ;SAVE COMMAND
047540  012011                          MOV     (R0)+,@R1       ;COMMAND
047542  012077  145224                  MOV     (R0)+,@RHCA     ;CYLINDER
047546  112046                          MOVB    (R0)+,-(SP)     ;SECTOR
047550  105720                          TSTB    (R0)+           ;UP DATE R0
047552  112066  000001                  MOVB    (R0)+,1(SP)     ;TRACK
047556  105720                          TSTB    (R0)+           ;UPDATE R0
047560  012677  145200                  MOV     (SP)+,@RHDST    ;TRACK SECTOR
047564  012077  145162                  MOV     (R0)+,@RHWC     ;NO. OF DATA WORDS +4 HEADER
                                                                ;IF A READ HEADER AND DATA
047570  012077  145160                  MOV     (R0)+,@RHBA     ;STARTING ADDRESS OF BUFFER
047574  012037  052350                  MOV     (R0)+,@#X       ;X=0 READ HEADER AND DATA
                                                                ;X=1 WRITE DATA
047600  012777  014000  145162          MOV     #FMT22!ECI,@RHOF ;16 BITS PER WORD
                                                                ;ECC CORRECTION INHIBIT
047606  005037  015126                  CLR     @#ERFLG$        ;CLEAR ERROR FLAG
047612  004737  052200                  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.

047616  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
047622  005737  015126                  TST     @#ERFLG$        ;ANY ERRORS ALREADY THERE
047626  001034                          BNE     10$             ;BRANCH IF YES
```

```
 8036  047630  005737  052350                 TST     @#X             ;IS THIS A READ
 8037  047634  001015                         BNE     3$              ;IF A WRITE DATA BRANCH
 8038
 8039                                         ;NOW THE READ BUFFER WILL BE CHECKED
 8040                                         ;HEADER SHOULD BE COMPLETELY READ AS WRITTEN
 8041                                         ;NO DATA WORDS SHOULD BE READ
 8042                                         ;REINTO BUFFER HAS BEEN FILLED WITH 0
 8043                                         ;WRFROM BUFFER HAS BEEN FILLED WITH EXPECTED DATA
 8044
 8045  047636  004037  046570                 JSR     R0,@#COMPAR     ;CHECK
 8046  047642  015220                         WRFROM                  ;GOOD DATA
 8047  047644  016264                         REINTO                  ;TEST BUFFER
 8048  047646  000400                         256.                    ;4 HEADER 252 DATA
 8049  047650  047656                         1$                      ;RETURN POINT FOR ERROR HEADER
 8050  047652  047662                         2$                      ;RETURN POINT FOR ERROR DATA
 8051  047654  047720                         10$                     ;RETURN FOR GOOD COMPARISON
 8052  047656  104004          1$:    ERROR   4                       ;READ NEXT ERROR 5
 8053  047660  000207                 RTS     PC                      ;RETURN TO COMPARISON SUBROUTINE
 8054  047662  104005          2$:    ERROR   5                       ;WORD NO 1 THRU 4 ARE
 8055                                                                 ;HEADER WORDS AND HENCE
 8056                                                                 ;SHOULD BE READ AS WRITTEN ON
 8057                                                                 ;DISK, WORD NOS. 5 ONWARDS
 8058                                                                 ;SHOULD NOT BE READ AND HENCE
 8059                                                                 ;READ INTO BUFFER
 8060                                                                 ;SHOULD BE UNCHANGED
 8061  047664  000207                 RTS     PC                      ;RETURN TO COMPARISON
 8062
 8063  047666  000414                 BR      10$                     ;JUMP OUT
 8064
 8065                                         ;NOW THE DISK WILL BE CHECKED
 8066                                         ;NO DATA SHOULD BE WRITTEN
 8067                                         ;REINTO BUFFER HAS BEEN FILLED WITH EXPECTED DATA
 8068                                         ;DISK HAS BEEN FILLED WITH !77400
 8069                                         ;WRFROM HAS BEEN FILLED WITH 125252
 8070
 8071  047670  004037  046570          3$:    JSR     R0,@#COMPAR     ;CHECK
 8072  047674  016264                         REINTO                  ;GOOD DATA BUFFER
 8073  047676  054256                         DISK                    ;TEST BUFFER
 8074  047700  000400                         256.
 8075  047702  047710                         4$                      ;RETURN POINT FOR ERROR HEADER
 8076  047704  047714                         5$                      ;RETURN POINT FOR ERROR DATA
 8077  047706  047720                         10$                     ;RETURN POINT FOR GOOD COMPARISON
 8078  047710  104004          4$:    ERROR   4                       ;READ NEXT ERROR 5
 8079  047712  000207                 RTS     PC                      ;RETURN TO COMPARISON SUBROUTINE
 8080  047714  104005          5$:    ERROR   5                       ;WORD NO ARE ALL DATA
 8081                                                                 ;WORDS THE SHOULD NOT
 8082                                                                 ;HAVE BEEN CHANGED BY THE
 8083                                                                 ;WRITE COMMAND
 8084  047716  000207                 RTS     PC                      ;RETURN TO COMPARISON SUBROUTINE
 8085  047720  005720          10$:   TST     (R0)+                   ;IS THIS A HCRC ON HCE CHECK?
 8086  047722  001442                 BEQ     6$                      ;BRANCH IF HCRC
 8087  047724  022737  000072  001210         CMP     #72,@#$TMP5     ;IS THIS A READ COMMAND
 8088  047732  001417                 BEQ     11$                     ;BRANCH IF YES
 8089  047734  017737  145022  001126         MOV     @RHER1,@#$BDDAT ;TEST DATA
```

```
8090  047742  022737  000200  001126          CMP     #HCE,@#$BDDAT   ;ONLY HEADER COMPARE BIT?
8091                                                                  ;SHOULD BE SET
8092  047750  001470                          BEQ     7$              ;BRANCH IF GOOD
8093  047752  013737  014762  045440          MOV     @#RHER1,@#REGADR ;REGISTER ADDRESS RHER1
8094  047760  012737  000200  001124          MOV     #HCE,@#$GDDAT   ;GOOD DATA
8095  047766  104027                          ERROR   27              ;AFTER AN ERROR ON THE
8096                                                                  ;HEADER ONLY HCE SHOULD
8097  047770  000460                          BR      7$              ;BE SET
8098  047772                          11$:
8099  047772  017737  144764  001126          MOV     @RHER1,@#$BDDAT ;TEST DATA
8100  050000  022737  100200  001126          CMP     #DCK!HCE,@#$BDDAT       ;ONLY HEADER COMPARE BIT?
8101                                                                  ;SHOULD BE SET
8102                                                                  ;DCK IS SET BECAUSE ECC IS NOT READ
8103  050006  001451                          BEQ     7$              ;BRANCH IF GOOD
8104  050010  013737  014762  045440          MOV     @#RHER1,@#REGADR ;REGISTER ADDRESS RHER1
8105  050016  012737  100200  001124          MOV     #DCK!HCE,@#$GDDAT       ;GOOD DATA
8106  050024  104027                          ERROR   27              ;AFTER AN ERROR ON THE
8107                                                                  ;HEADER ONLY HCE SHOULD
8108  050026  000441                          BR      7$              ;BE SET
8109  050030  022737  000072  001210  6$:     CMP     #72,@#$TMP5     ;IS THIS A READ COMMAND?
8110  050036  001417                          BEQ     12$             ;BRANCH IF A READ
8111  050040  017737  144716  001126          MOV     @RHER1,@#$BDDAT ;TEST DATA
8112  050046  022737  000400  001126          CMP     #HCRC,@#$BDDAT  ;ONLY CRC ERROR SHOULD BE THERE
8113  050054  001426                          BEQ     7$
8114  050056  013737  014762  045440          MOV     @#RHER1,@#REGADR ;REG. ADDR = RHER1
8115  050064  012737  000400  001124          MOV     #HCRC,@#$GDDAT  ;GOOD DATA
8116  050072  104027                          ERROR   27              ;AFTER A CRC ERROR ONLY CRC
8117                                                                  ;SHOULD BE SET
8118  050074  000416                          BR      7$              ;BRANCH OUT
8119  050076  017737  144660  001126  12$:     MOV     @RHER1,@#$BDDAT ;TEST DATA
8120
8121  050104  022737  100400  001126          CMP     #DCK!HCRC,@#$BDDAT;HCRC AND DCK SHOULD BE SET
8122                                                                  ;DCK IS SET BECAUSE ECC IS NOT READ
8123  050112  001407                          BEQ     7$              ;BRANCH IF GOOD
8124  050114  012737  100400  001124          MOV     #DCK!HCRC,@#$GDDAT;GOOD DATA
8125  050122  013737  014762  045440          MOV     @#RHER1,@#REGADR;FAILING REGISTER RHER1
8126  050130  104027                          ERROR   27              ;AFTER A CRC ERROR ON A READ
8127                                                                  ;DCK AND HCRC SHOULD BE SET
8128                                                                  ;DCK IS SET BECAUSE ECC IS NOT READ
8129  050132  000200                  7$:     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
                        ;;**********************************************************************

050134                  MIDDLE:
050134  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
050136  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
050140  013777  015174  144612  MOV     @#WRIFOR,@RHCS1 ;WRITE HEADER AND DATA=62
                                                        ;IN RHCS1
050146  012777  177766  144576  MOV     #-10.,@RHWC     ;10 WORDS
050154  012777  015220  144572  MOV     #WRFROM,@RHBA   ;BUS ADDRESS=WRFROM
050162  012777  000010  144574  MOV     #10,@RHDST      ;DESIRED TRACK=0 SECTOR=10
050170  052777  000010  144560  BIS     #BAI,@RHCS2     ;BUS ADDRESS INCREMENT INHIBIT
050176  012777  010000  144564  MOV     #FMT22,@RHOF    ;FORMAT 16 BIT WORDS
050204  005077  144562          CLR     @RHCA           ;CYLINDER=0
050210  012737  000001  050236  MOV     #1,@#MID        ;SECTOR IS SET TO 1 SO THAT
                                                        ;WE CAN GET OUT AT THE
                                                        ;MIDDLE OF AN OPERATION
                                                        ;LOOKING FOR SECTOR 10
050216  012777  000001  144554  MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE
050224  052777  000001  144526  BIS     #GO,@RHCS1              ;GO TO RHCS1 WITH 62
050232  004137  056406          JSR     R1,@#SEARCH
050236  000000          MID:    .WORD   0               ;SECTOR
050240  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
050242  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
050244  000207                  RTS     PC
```

```
8163
8164                                        .SBTTL  JAM CURRENT CYLINDER ROUTINE
8165
8166                                    ;;*****************************************************************
8167                                    ;*THIS SUBROUTINE WILL CHANGE THE CURRENT CYLINDER REGISTER
8168                                    ;*THIS IS DONE BY GIVING A SEEK COMMAND THEN AN INIT
8169                                    ;*WHICH WILL LOAD THE CURRENT CYLINDER WITH THE DESIRED CYLINDER VALUE
8170                                    ;*
8171                                    ;*CALL IS:
8172                                    ;*      JSR     R0,@#MAKECYL
8173                                    ;*      XC                      ;DESIRED VALUE OF CURRENT CYLINDER
8174                                    ;;*****************************************************************
8175
8176  050246                            MAKECYL:
8177  050246  010546                           MOV     R5,-(SP)        ;;PUSH R5 ON STACK
8178  050250  010037  015134                   MOV     R0,@#PCJSR      ;PC OF JSR+4
8179  050254  162737  000004  015134           SUB     #4,@#PCJSR      ;SAVE PC OF JSR
8180  050262  012005                           MOV     (R0)+,R5        ;GETTING READY TO FILL DESIRED CYLINDER
8181  050264  010577  144502                   MOV     R5,@RHCA        ;FILL DESIRED CYLINDER REGISTER
8182  050270  005077  144470                   CLR     @RHDST          ;MAKE SURE DESIRED SECTOR TRACK IS NOT ILLEGAL
8183  050274  013777  015202  144456           MOV     @#SEECOM,@RHCS1 ;FILL SEEK COMMAND
8184  050302  012777  000001  144470           MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE
8185  050310  052777  000001  144442           BIS     #GO,@RHCS1      ;GO TO SEEK
8186  050316  000240                           NOP                     ;ALLOW TIME FOR SEEK TO HANG UP
8187  050320  000240                           NOP                     ;ALLOW TIME FOR SEEK TO HANG UP
8188  050322  000240                           NOP                     ;ALLOW TIME FOR SEEK TO HANG UP
8189  050324  000240                           NOP                     ;ALLOW TIME FOR SEEK TO HANG UP
8190  050326  004737  045674                   JSR     PC,@#CLDISK     ;GIVE INIT
8191  050332  017737  144460  001126           MOV     @RHCC,@#$BDDAT  ;TEST DATA
8192  050340  020537  001126                   CMP     R5,@#$BDDAT     ;COMPARE CURRENT CYLINDER
8193  050344  001406                           BEQ     1$              ;BRANCH IF GOOD
8194  050346  010537  001124                   MOV     R5,@#$GDDAT     ;GOOD VALUE OF RHCC
8195  050352  013737  015016  045440           MOV     @#RHCC,@#REGADR ;FAILING REGISTER ADDRESS
8196  050360  104030                           ERROR   30              ;CURRENT CYLINDER DOES NOT MATCH DESIRED CYLINDER
8197                                                                   ;REGISTER AFTER A SEEK AND AN INIT
8198  050362                            1$:
8199  050362  012605                           MOV     (SP)+,R5        ;;POP STACK INTO R5
8200  050364  000200                           RTS     R0
8201
```

```
8202
8203                                    .SBTTL  ECC GENERATION AND COMPARISON ROUTINE
8204
8205                                ;;******************************************************************
8206                                ;*THIS SUBROUTINE GENERATES AND TESTS ECC
8207                                ;*CALL    JSR PC,ECTEST
8208                                ;;******************************************************************
8209
8210
8211
8212
8213    100000                      PIE1    =100000
8214    040000                      PIE2    =40000
8215    020000                      PIE3    =20000
8216    010000                      PIE4    =10000
8217    004000                      PIE5    =4000
8218    002000                      PIE6    =2000
8219    001000                      PIE7    =1000
8220    000400                      PIE8    =400
8221    000200                      PIE9    =200
8222    000100                      PIE10   =100
8223    000040                      PIE11   =40
8224    000020                      PIE12   =20
8225    000010                      PIE13   =10
8226    000004                      PIE14   =4
8227    000002                      PIE15   =2
8228    000001                      PIE16   =1
8229    100000                      PIE17   =100000
8230    040000                      PIE18   =40000
8231    020000                      PIE19   =20000
8232    010000                      PIE20   =10000
8233    004000                      PIE21   =4000
8234    002000                      PIE22   =2000
8235    001000                      PIE23   =1000
8236    000400                      PIE24   =400
8237    000200                      PIE25   =200
8238    000100                      PIE26   =100
8239    000040                      PIE27   =40
8240    000020                      PIE28   =20
8241    000010                      PIE29   =10
8242    000004                      PIE30   =4
8243    000002                      PIE31   =2
8244    000001                      PIE32   =1
8245
8246  050366  000000                ECDATA: 0               ;DATA BIT FOR ECC
8247                                                        ;IF ALL ONES THEN CURRENT BIT IS A ONE
8248                                                        ;IF ZERO THEN CURRENT BIT IS A ZERO
8249
8250  050370  000000                GECC1:  0               ;LOW ORDER ECC WORD TO BE GENERATED HERE
8251                                                        ;=R1
8252
8253  050372  000000                GECC2:  0               ;HIGH ORDER ECC WORD TO BE GENERATED HERE
8254                                                        ;=R2
8255
```

```
8256  050374  000000                TSECCG: 0               ;IF =177777 GENERATE AND TEST ECC FOR THIS BIT
8257                                                        ;IF =0 DO NOT GENERATE AND TEST ECC FOR THIS BIT
8258
8259  050376  113713                NCODE:  38859.          ;N-CODE WORD
8260  050400  000000                NCOUNT: 0               ;TEMPORARY N CODE
8261  050402  000000                POSITI: 0               ;POSITION REGISTER
8262  050404  010041                HARDER: 4129.           ;HARD ERROR COUNT
8263                                                        ;TRUE COUNT IS 4128 BUT AS COMPARES ARE
8264                                                        ;DONE ONE STAGE LATER SO 4129
8265  050406  000000                DATENV: 0               ;DATA ENVELOPE FOR TYPE OUT
8266                                                        ;MAX FOR WRITE IS 4096
8267                                                        ;MAX FOR READ IS 4128
8268  050410  000000                ZCODE:  0               ;LEADING ZEROS ENVELOPE FOR TYPE OUT
8269                                                        ;THIS IS SHUT OFF WHEN POSITION COUNTER
8270                                                        ;IN ENABLED
8271                                                        ;MAX COUNT IS 38859
8272
8273
8274
8275  050412  000000                HADTMP: 0               ;TEMPORARY HARD ERROR COUNT
8276  050414  000000                P3:     0
8277  050416  000000                P12:    0
8278  050420  000000                P22:    0
8279  050422  000000                P24:    0
8280
8281
8282
8283
8284
8285  050424                        ECTEST:
8286  050424  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
8287  050426  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
9288  050430  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
8289  050432  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
8290  050434  010446                        MOV     R4,-(SP)        ;;PUSH R4 ON STACK
8291  050436  010546                        MOV     R5,-(SP)        ;;PUSH R5 ON STACK
8292  050440  013701  050370               MOV     @#GECC1,R1              ;ECC1 WORD
8293  050444  013702  050372               MOV     @#GECC2,R2              ;ECC2 WORD
8294  050450  005737  050366               TST     @#ECDATA                ;IS CURRENT BIT A ONE
8295  050454  001406                       BEQ     2$                      ;BRANCH IF CURRENT DATA D=0
8296
8297                                        ;IF CARRY IS NOT ZERO THEN D=1
8298                                        ;INVERT X32 TO GIVE R0
8299
8300  050456  010103                1$:     MOV     R1,R3
8301  050460  052703  177776              BIS     #^CPIE32,R3
8302  050464  005103                       COM     R3
8303  050466  010300                       MOV     R3,R0
8304  050470  000404                       BR      3$
8305
8306                                        ;IF CARRY IS ZERO THEN D=0
8307                                        ;X32 BECOMES R0
8308  050472  010103                2$:     MOV     R1,R3
8309  050474  042703  177776              BIC     #^CPIE32,R3
```

```
8310  050500  010300                        MOV     R3,R0
8311
8312  050502  000241              3$:       CLC
8313  050504  006000                        ROR     R0
8314  050506  006000                        ROR     R0
8315  050510  005700                        TST     R0
8316  050512  001462                        BEQ     10$             ;BRANCH IF R0=0
8317                                        ;INVERT X2
8318
8319  050514  010203                        MOV     R2,R3
8320  050516  052703  137777                BIS     #^CPIE2,R3
8321  050522  005103                        COM     R3
8322  050524  010337  050414                MOV     R3,@#P3
8323  050530  006237  050414                ASR     @#P3
8324
8325                                        ;INVERT X11
8326
8327
8328  050534  010203                        MOV     R2,R3
8329  050536  052703  177737                BIS     #^CPIE11,R3
8330  050542  005103                        COM     R3
8331  050544  010337  050416                MOV     R3,@#P12
8332  050550  006237  050416                ASR     @#P12
8333
8334                                        :INVERT X21
8335
8336  050554  010103                        MOV     R1,R3
8337  050556  052703  173777                BIS     #^CPIE21,R3
8338  050562  005103                        COM     R3
8339  050564  010337  050420                MOV     R3,@#P22
8340  050570  006237  050420                ASR     @#P22
8341
8342                                        ;INVERT X23
8343
8344  050574  010103                        MOV     R1,R3
8345  050576  052703  176777                BIS     #^CPIE23,R3
8346  050602  005103                        COM     R3
8347  050604  010337  050422                MOV     R3,@#P24
8348  050610  006237  050422                ASR     @#P24
8349
8350                                        ;NOW THAT R0 FOR POSITION 1
8351                                        ;         P3 FOR POSITION 3
8352                                        ;        P12 FOR POSITION 12
8353                                        ;        P22 FOR POSITION 22
8354                                        ;        P24 FOR POSITION 24
8355                                        ;ARE KNOWN THE ROTATE WILL BE DONE AND
8356                                        ;THESE BITS JAMED IN
8357
8358  050614  006002                        ROR     R2
8359  050616  006001                        ROR     R1
8360  050620  053700  050414                BIS     @#P3,R0
8361  050624  053700  050416                BIS     @#P12,R0
8362  050630  042702  120020                BIC     #PIE1!PIE3!PIE12,R2
8363  050634  050002                        BIS     R0,R2
```

```
8364
8365  050636  005000                          CLR     R0
8366  050640  053700  050420                  BIS     @#P22,R0
8367  050644  053700  050422                  BIS     @#P24,R0
8368  050650  042701  002400                  BIC     #PIE22!PIE24,R1
8369  050654  050001                          BIS     R0,R1
8370  050656  000404                          BR      12$
8371
8372                                          ;THE PROGRAM COMES HERE IF R0=0
8373                                          ;SO AFTER ROTATE R0 GETS PUT INTO POSITION 1
8374
8375  050660  006002                  10$:    ROR     R2
8376  050662  006001                          ROR     R1
8377  050664  042702  100000                  BIC     #PIE1,R2
8378  050670  010137  050370          12$:    MOV     R1,@#GECC1      ;SAVE ECC1
8379  050674  010237  050372                  MOV     R2,@#GECC2      ;SAVE ECC2
8380  050700  005737  050374                  TST     @#TSECCG        ;IS HARDWARE TO BE CHECKED
8381                                                                  ;IF =1777777 TEST HARDWARE
8382                                                                  ;IF = 0 DO NOT TEST HARDWARE
8383  050704  001432                          BEQ     14$             ;BRANCH IF HARDWARE NOT TO BE CHECKED
8384
8385
8386                                  ;*CHECK HARDWARE
8387  050706  032777  000400  130224          BIT     #SW8,@SWR       ;IS SWITCH 8 SET
8388  050714  001005                          BNE     15$             ;BRANCH IF SW8 IS SET
8389  050716  032777  000100  130214          BIT     #SW6,@SWR       ;IS SWITCH 6 SET
8390  050724  001401                          BEQ     15$             ;BRANCH IF SW6 IS NOT SET
8391  050726  000421                          BR      14$             ;IF SWITCH 8 IS NOT SET AND
8392                                                                  ;SWITCH 6 IS SET THEN
8393                                                                  ;DO NOT DO COMPARES
8394  050730  010146                  15$:    MOV     R1,-(SP)        ;GOOD PATTERN REGISTER
8395  050732  042716  174000                  BIC     #174000,(SP)    ;GET ONLY PATTERN BITS
8396  050736  022677  144050                  CMP     (SP)+,@RHEC2    ;COMPARE PATTERN REGISTER
8397  050742  001404                          BEQ     13$             ;BRANCH IF GOOD
8398                                          ;TO SAVE TIME
8399  050744  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
8400  050750  104035                          ERROR   35              ;PATTERN REGISTER IN 11 BITS IN ERROR
8401  050752  000407                          BR      14$             ;BRANCH OUT
8402  050754  023777  050402  144026  13$:    CMP     @#POSITI,@RHEC1 ;COMPARE POISTION REGISTER
8403  050762  001403                          BEQ     14$             ;BRANCH IF GOOD
8404                                          ;TO SAVE TIME
8405  050764  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
8406  050770  104035                          ERROR   35              ;POSITION REGISTER IN ERROR
8407                                                                  ;"DATA ENVLOP" GIVES NUMBER OF CLOCK
8408                                                                  ;PULSES FROM BEGINING OF COMMAND
8409                                                                  ;THAT IS THE CLOCKS IN THE R/W DATA FIELD ENVELOPE
8410                                                                  ;
8411                                                                  ;IN A WRITE THERE ARE 10000 OCTAL CLOCKS
8412                                                                  ;IN A READ THERE ARE 10040 OCTAL CLOCKS
8413                                                                  ;
8414
8415                                                                  ;"N-CODE ZEROS" GIVE THE NUMBER OF CLOCKS
8416                                                                  ; GIVEN FOR THE LEADING ZEROS FIELD
8417                                                                  ;MAX COUNT IS 113713 OCTAL
```

```
 8418                                                    ;
 8419                                                    ;"GOOD POSITION" GIVES NUMBER OF CLOCKS
 8420                                                    ;GIVEN AFTER LEADING ZEROS WHICH IS FOR THE DATA
 8421                                                    ;FIELD
 8422                                                    ;MAX COUNT IS 10040 OR 10041 OCTAL
 8423
 8424
 8425  050772                          14$:
 8426  050772  012605                      MOV     (SP)+,R5        ;;POP STACK INTO R5
 8427  050774  012604                      MOV     (SP)+,R4        ;;POP STACK INTO R4
 8428  050776  012603                      MOV     (SP)+,R3        ;;POP STACK INTO R3
 8429  051000  012602                      MOV     (SP)+,R2        ;;POP STACK INTO R2
 8430  051002  012601                      MOV     (SP)+,R1        ;;POP STACK INTO R1
 8431  051004  012600                      MOV     (SP)+,R0        ;;POP STACK INTO R0
 8432  051006  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
                                ;;*****************************************************************

051010  000000                  ERPOS:  0                       ;POSITION REG. WHEN CORRECTION IS COMPLETE

051012  010037  015134          ECORR:  MOV     R0,@#PCJSR      ;SAVE PC OF JSR + 4
051016  162737  000004  015134          SUB     #4,@#PCJSR      ;SAVE PC OF JSR
051024  012037  051010                  MOV     (R0)+,@#ERPOS   ;GET POSITION REG. WHEN CORRECTION IS COMPLETE
051030  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
051032  013701  015000                  MOV     @#RHMR,R1       ;MAIMTENANCE REGISTER
051036  012711  000001                  MOV     #DMD,@R1        ;SET DIAGNOSTIC MODE BIT
051042  005037  050366                  CLR     @#ECDATA        ;ECC DATA IS ZERO

051046  005737  050402          1$:     TST     @#POSITI        ;IS  SOFTWARE POSITION NON ZERO
051052  001007                          BNE     2$              ;BRANCH IF N-CODE S COMPLETE
051054  005337  050400                  DEC     @#NCOUNT        ;DECREMENT N-CODE
051060  001001                          BNE     6$              ;BRANCH IF N-CODE IS NOT COMPLETE
051062  000403                          BR      2$              ;BRANCH  AS N-CODE IS COMPLETE
051064  005237  050410          6$:     INC     @#ZCODE         ;INCREMENT CLOCKS GIVEN FOR LEADING ZEROS
051070  000420                          BR      3$              ;BRANCH AS N-CODE IS NOT COMPLETE
                                                                ;GO TO GIVE CLOCK AND TEST ECC
051072  005237  050402          2$:     INC     @#POSITI        ;INCREMENT SOFTWARE POSITION
051076  023737  051010  050402          CMP     @#ERPOS,@#POSITI;HAVE ENOUGH CLOCKS BEEN GIVEN TO DETECT ERROR
051104  103012                          BHIS    3$              ;BRANCH IF MORE CLOCKS TO BE GIVEN
051106  023737  050412  050402          CMP     @#HADTMP,@#POSITI;HAVE ENOUGH CLOCKS BEEN GIVEN FOR HARD ERROR
                                                                ;THAT IS HAVE 4128 MORE CLOCKS BEEN GIVEN
051114  001415                          BEQ     5$              ;BRANCH IF YES
051116  032711  000400                  BIT     #ZER,@R1        ;CHECK ZERO DETECT BIT IN RHMR
051122  001016                          BNE     4$              ;BRANCH IS ZER SET
                                        ;TO SAVE TIME
051124  004737  045374                  JSR     PC,@#PUTREG     ;SAVE REGISTERS
051130  104034                          ERROR   34              ;ZERO DETECT BIT NOT HIGH
                                                                ;WHEN 21 BITS IN ECC 32 BIT REGISTER IS  0

051132  052711  000002          3$:     BIS     #MCLK,@R1       ;SET CLOCK
051136  042711  000002                  BIC     #MCLK,@R1       ;CLEAR CLOCK
051142  004737  050424                  JSR     PC,@#ECTEST     ;GO TO GENERATE AND TEST ECC
051146  000737                          BR      1$              ;CONTINUE

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

```
 8487  051150  052711  000002          5$:     BIS     #MCLK,@R1       ;SET CLOCK
 8488  051154  042711  000002                  BIC     #MCLK,@R1       ;CLEAR CLOCK
 8489
 8490  051160                          4$:
 8491  051160  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 8492  051162  000200                          RTS     R0
```

```
 8493                                   .SBTTL  SOFTWARE DISK DATA ECC GEN. ROUTINE
 8494
 8495                                   ;;*****************************************************************
 8496                                   ;*THIS SUBROUTINE GENERATES THE ECC FOR WHAT IS ON DISK AND INSERTS THEM
 8497                                   ;*ON LOCATIONS "DISK+1000" AND "DISK+1002"
 8498                                   ;;*****************************************************************
 8499
 8500
 8501  051164                           FILLEC:
 8502  051164  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 8503  051166  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 8504  051170  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 8505  051172  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 8506  051174  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
 8507  051176  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
 8508  051200  005037  050402                  CLR     @#POSITI        ;CLEAR POSITION
 8509  051204  005037  050370                  CLR     @#GECC1         ;CLEAR GECC1
 8510  051210  005037  050372                  CLR     @#GECC2         ;CLEAR
 8511  051214  012701  054256                  MOV     #DISK,R1        ;POINTER TO DATA FOR ECC GENERATION
 8512  051220  012702  000400                  MOV     #256.,R2        ;COUNTER FOR NUMBER OF DATA WORDS
 8513  051224  012703  000020          9$:     MOV     #16.,R3         ;COUNTER FOR NUMBER OF BITS PER WORD
 8514  051230  012104                  10$:    MOV     (R1)+,R4        ;DATA IN R4
 8515  051232  006004                          ROR     R4              ;GET ONE DATA BIT IN CARRY
 8516  051234  103004                          BCC     11$             ;BRANCH IF DATA BIT IS ZERO
 8517  051236  012737  177777  050366          MOV     #-1,@#ECDATA    ;ECC DATA BIT IS A ONE
 8518  051244  000402                          BR      12$             ;BRANCH TO GENERATE ECC
 8519  051246  005037  050366          11$:    CLR     @#ECDATA        ;ECC DATA BIT IS A ZERO
 8520  051252  004737  050424          12$:    JSR     PC,@#ECTEST     ;GO TO GENERATE ECC
 8521  051256  005303                          DEC     R3              ;DECREMENT BIT COUNT
 8522  051260  001364                          BNE     10$             ;BRANCH IF 16 BITS NOT DONE
 8523  051262  005302                          DEC     R2              ;DECREMENT WORD COUNT
 8524  051264  001357                          BNE     9$              ;BRANCH IF 256 WORDS NOT DONE
 8525  051266  013737  050370  055256          MOV     @#GECC1,@#DISK+<256.*2>;INSERT ECC1 ON DISK
 8526  051274  013737  050372  055260          MOV     @#GECC2,@#DISK+<257.*2>;INSERT ECC2 ON DISK
 8527  051302  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
 8528  051304  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
 8529  051306  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
 8530  051310  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
 8531  051312  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 8532  051314  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
 8533  051316  000207                          RTS     PC
```

```
 8534
 8535                                           .SBTTL  RH BASE ADDRESS CHANGE ROUTINE
 8536
 8537                                   ;;*****************************************************************
 8538                                   ;*      THIS ROUTINE WILL ALLOW THE CHANGE OF THE BASE
 8539                                   ;*      ADDRESS FROM 176700 TO ANY TYPED VALUE
 8540                                   ;;*****************************************************************
 8541
 8542  051320                           BASECH:
 8543  051320  104400  051326                 TYPE    ,65$                    ;;TYPE ASCIZ STRING
 8544  051324  000425                         BR      64$                     ;;GET OVER THE ASCIZ
 8545                                   ;;65$:  .ASCIZ  <15><12>/PRESENT BASE ADDRESS OF REGISTERS IS   /
 8546  051400                           64$:
 8547  051400  013746  014760                 MOV     @#RHCS1,-(SP)   ;GET READY TO TYPE OLD BASE
 8548  051404  104401                         TYPOC
 8549  051406  104400  051414                 TYPE    ,67$                    ;;TYPE ASCIZ STRING
 8550  051412  000425                         BR      66$                     ;;GET OVER THE ASCIZ
 8551                                   ;;67$:  .ASCIZ  <15><12>/TYPE NEW BASE ADDRESS FOLLOWED BY 'CR' /
 8552  051466                           66$:
 8553  051466  004737  060036                 JSR     PC,@#$TKINT             ;INITIALIZE THE TTY KEYBOARD
 8554  051472  104411                         RDOCT
 8555  051474  012700  014750                 MOV     #RHDB,R0                ;GET STARTING ADDRESS OF REGISTERS
 8556  051500  012701  000024                 MOV     #20.,R1                 ;NUMBER OF REGISTERS
 8557  051504  042710  177700         1$:     BIC     #^C77,(R0)              ;CLEAR OLD BASE ADDRESS
 8558  051510  051620                         BIS     (SP),(R0)+              ;SET NEW BASE
 8559  051512  005301                         DEC     R1                      ;COUNT
 8560  051514  001373                         BNE     1$                      ;BRANCH IF 20 NOT DONE
 8561  051516  104400  051524                 TYPE    ,69$                    ;;TYPE ASCIZ STRING
 8562  051522  000417                         BR      68$                     ;;GET OVER THE ASCIZ
 8563                                   ;;69$:  .ASCIZ  <15><12>/PRESENT VECTOR ADDRESS IS /
 8564  051562                           68$:
 8565  051562  013746  014746                 MOV     @#RPVEC,-(SP)   ;GET READY TO TYPE OLD VECTOR ADDRESS
 8566  051566  104401                         TYPOC
 8567  051570  104400  051576                 TYPE    ,71$                    ;;TYPE ASCIZ STRING
 8568  051574  000437                         BR      70$                     ;;GET OVER THE ASCIZ
 8569                                   ;;71$:  .ASCIZ  <15><12>/TYPE NEW VECTOR ADDRESS OR RETYPE OLD ONE FOLLOWED BY "CR" /
 8570  051674                           70$:
 8571  051674  104411                         RDOCT
 8572  051676  012637  014746                 MOV     (SP)+,@#RPVEC   ;SETUP VECTOR ADDRESS
 8573  051702  104400  051710                 TYPE    ,73$                    ;;TYPE ASCIZ STRING
 8574  051706  000421                         BR      72$                     ;;GET OVER THE ASCIZ
 8575                                   ;;73$:  .ASCIZ  <15><12>/RESTART PROGRAM FROM 200 OR 210/
 8576  051752                           72$:
 8577  051752  104400  051760                 TYPE    ,75$                    ;;TYPE ASCIZ STRING
 8578  051756  000416                         BR      74$                     ;;GET OVER THE ASCIZ
 8579                                   ;;75$:  .ASCIZ  <15><12>/NEW BASE WILL REMAIN   - /
 8580  052014                           74$:
 8581  052014  013746  014760                 MOV     @#RHCS1,-(SP)
 8582  052020  104401                         TYPOC
 8583  052022  104400  052030                 TYPE    ,77$                    ;;TYPE ASCIZ STRING
 8584  052026  000416                         BR      76$                     ;;GET OVER THE ASCIZ
 8585                                   ;;77$:  .ASCIZ  <15><12>/NEW VECTOR WILL REMAIN - /
 8586  052064                           76$:
 8587  052064  013746  014746                 MOV     @#RPVEC,-(SP)
```

```
 8588  052070  104401                          TYPOC
 8589  052072  104400  052100                  TYPE    ,79$            ;;TYPE ASCIZ STRING
 8590  052076  000402                          BR      78$             ;;GET OVER THE ASCIZ
 8591                                  ;;79$:  .ASCIZ  <15><12>/ /
 8592  052104                          78$:
 8593  052104  104400  052112                  TYPE    ,81$            ;;TYPE ASCIZ STRING
 8594  052110  000416                          BR      80$             ;;GET OVER THE ASCIZ
 8595                                  ;;81$:  .ASCIZ  <15><12>/UNTIL PROGRAM IS RELOADED/
 8596  052146                          80$:
 8597  052146  000000                          HALT
 8598
 8599
 8600
 8601
 8602
 8603                                  ;*THIS IS A LITTLE ROUTINE THAT TESTS NED BIT 11 IN RHCS2
 8604                                  ;*THIS LOOPS HERE FOR EVER
 8605                                  ;*TO BE USED ONLY IF DRIVES PRESENT LOOKING AT NED DOES NOT AGREE
 8606                                  ;*WITH WHAT IS REALY THERE
 8607  052150  000000                  ERUNIT: 0                       ;UNIT UNDER MANUAL TEST
 8608  052152  004737  045674          ERSTART:JSR     PC,@#CLDISK     ;SET GENERAL REG.
 8609  052156  013712  052150                  MOV     @#ERUNIT,@R2    ;SELECT UNIT
 8610  052162  005714                  1$:     TST     @R4             ;TEST RHER1
 8611  052164  032712  010000                  BIT     #NED,@R2        ;TEST NED
 8612  052170  001401                          BEQ     2$              ;BRANCH IF GOOD
 8613  052172  000773                          BR      1$              ;NED NOT SET
 8614  052174  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
```

```
 8669                                   ;*
```

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



                        ;*THIS SUBROUTINE IS THE FIRST IN A SERIES OF NESTED SUBROUTINES

                        ;*IT ISSUES DIAGNOSTIC MODE, AND EXTRA DIAGNOSTIC INDEX, AND THE
                        ;*'GO' BIT

                        ;*IT THEN CALLS THREE OTHER SUBROUTINES, WHICH IN TURN CALL
                        ;*OTHER SUBROUTINES.  THE SUBROUTINES CALLED HERE ARE:

                        ;*      SEARCH          ;ISSUES SECTOR CLOCKS TO SET SECTOR FOUND FLOP
                        ;*      RDHEAD          ;READS THE SECTOR HEADER
                        ;*      WRDATA          ;WRITES THE SECTOR DATA (WRITE OPERATION)
                        ;*      REDATA          ;READS THE SECTOR DATA (READ OPERATION)



                        RUNCTR: .WORD   0
052200 011637 015134    COMHD:  MOV     (SP),@#PCJSR    ;SAVE PC OF JSR + 4
052204 162737 000004 015134     SUB     #4,@#PCJSR      ;SAVE PC OF JSR
052212 010046                   MOV     R0,-(SP)        ;;PUSH R0 ON STACK
052214 010146                   MOV     R1,-(SP)        ;;PUSH R1 ON STACK
052216 010246                   MOV     R2,-(SP)        ;;PUSH R2 ON STACK
052220 010346                   MOV     R3,-(SP)        ;;PUSH R3 ON STACK
052222 010446                   MOV     R4,-(SP)        ;;PUSH R4 ON STACK
052224 010546                   MOV     R5,-(SP)        ;;PUSH R5 ON STACK

052226 012777 000001 142544     MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE
052234 052777 000004 142536     BIS     #MINX,@RHMR     ;SET DIAGNOSTIC INDEX
052242 042777 000004 142530     BIC     #MINX,@RHMR     ;CLEAR DIAGNOSTIC INDEX
052250 052777 000001 142502     BIS     #GO,@RHCS1      ;ISSUE 'GO' BIT & STALL 'TILL 'RUN'
                                                        ;FUNCTION CODE WAS ISSUED BY THE TEST
052256 012737 000113 052176 RUNWAT: MOV     #75.,@#RUNCTR   ;LOAD STALL COUNT = APPROX. 450US FOR 11/50 CPU
052264 005337 052176        1$:     DEC     @#RUNCTR        ;COUNT DOWN ONE
052270 001375                       BNE     1$              ;CONTINUE UNTIL = 0

052272 013746 052342                MOV     SECOTR,-(SP)    ;GET DESIRED SECTOR/TRACK
052276 042716 177740                BIC     #177740,(SP)    ;MAKE ONLY SECTOR
052302 012637 052312                MOV     (SP)+,@#TRK     ;SAVE SECTOR
```

```
8724  052306  004137  056406                    JSR     R1,@#SEARCH     ;ISSUE SECTOR CLOCKS <---------------->
8725
8726  052312  000000                  TRK:      .WORD   0
8727  052314  012701  000240                    MOV     #+NOP,R1        ;GOING TO MOVE NOPS
8728  052320  010137  052352                    MOV     R1,@#SSYN       ;NOP INTO SSYN
8729  052324  010137  052354                    MOV     R1,@#HEDGAP     ;NOP INTO HEDGAP
8730  052330  010137  052356                    MOV     R1,@#HEDSYN     ;NOP INTO HEDSYN
8731  052334  004137  052462                    JSR     R1,@#RDHEAD     ;READ THE HEADER <------------->
8732
8733  052340  000000                  CYL:      .WORD   0               ;CYLINDER ADDRESS
8734  052342  000000                  SECOTR:   .WORD   0               ;SECTOR/TRACK ADDRESS
8735  052344  000000                  KEY1:     .WORD   0               ;KEY1 WORD
8736  052346  000000                  KEY2:     .WORD   0               ;KEY2 WORD
8737  052350  000000                  X:        .WORD   0               ;X=1 WRITE COMMAND
8738                                                                    ;X=0 READ COMMAND
8739
8740
8741                                              ;DUMMY ERROR CALL LOCATIONS FOR THE READ HEADER OPERATION
8742
8743  052352  000240                  SSYN:     NOP                     ;IF "ERROR 2" INSERTED BY RDHEAD
8744                                                                    ;SUBROUTINE, THEN THE FIRST SYNC
8745                                                                    ;IS NOT DETECTED.  NO BAD DATA
8746                                                                    ;IS GIVEN BECAUSE SYNC=144000
8747                                                                    ;CANNOT BE READ.  WORD NUMBER
8748                                                                    ;IS "1" BECAUSE THIS IS THE FIRST
8749                                                                    ;WORD TESTED.
8750
8751  052354  000240                  HEDGAP:   NOP                     ;IF "ERROR 3" INSERTED BY
8752                                                                    ;RDHEAD SUBROUTINE, THEN THE
8753                                                                    ;HEADER GAP 0'S WERE NOT
8754                                                                    ;WRITTEN RIGHT.
8755
8756                                                                    ;IF "WORD NO" CONTAINS, SAY
8757                                                                    ;3(8), THEN IT IS THE THIRD
8758                                                                    ;WORD OF A 5 WORD HEADER
8759                                                                    ;GAP THAT IS WRONG.
8760
8761                                                                    ;"BAD DATA" CONTAINS WHAT IS
8762                                                                    ;GOING ON THE DISK.
8763
8764  052356  000240                  HEDSYN:   NOP
8765                                                                    ;IF "ERROR 3" INSERTED BY RDHEAD
8766                                                                    ;SUBROUTINE, THEN THE HEADER SYNC
8767                                                                    ;GENERATED BY DCL IS WRONG,
8768                                                                    ;OR THE LAST BYTE
8769                                                                    ;OF THE HEADER GAP 0'S IS WRONG.
8770
8771                                                                    ;IN EITHER CASE WORD NO=6,
8772                                                                    ;RIGHT BYTE IS HEADER 0,
8773                                                                    ;LEFT BYTE IS SYNC.
8774
8775                                                                    ;"BAD DATA" HAS WHAT IS GOING
8776                                                                    ;ON DISK.
8777
```

```
 8778  052360  005737  015126                  TST     @#ERFLGS        ;WERE ANY ERRORS DETECTED ?
 8779  052364  001017                          BNE     OUT             ;IF YES, EXIT ---------------------->
 8780
 8781  052366  005737  052350                  TST     @#X             ;IS IT A DATA WRITE OPERATION ?
 8782  052372  001410                          BEQ     DAREAD          ;NO...THEN DO A DATA READ
 8783  052374  005737  052454                  TST     @#NOSYNC        ;IS THIS FORCED HEADER ERROR COMMAND ?
 8784                                                                  ;IF YES  NOSYNC=-1 THEN WRITE OR READ
 8785                                                                  ;IS SHUT OFF, SO BRANCH OUT
 8786                                                                  ;IF  NOSYNC=0 THEN CONTINUE
 8787  052400  001011                          BNE     OUT             ;EXIT IF SET ---------------------->
 8788
 8789  052402  004137  053726                  JSR     R1,@#WRDATA     ;WRITE DATA <---------------------->
 8790  052406  000000          NOWORD: .WORD   0               ;NO OF WORDS TO BE WRITTEN
 8791  052410  000000          Y:      .WORD   0               ;
 8792  052412  000404                  BR      OUT             ;EXIT ---------------------------->
 8793
 8794  052414  004137  056662  DAREAD: JSR     R1,@#REDATA     ;READ DATA <---------------------->
 8795  052420  000000          DAWORD: .WORD   0               ;NO OF WORDS TO BE READ
 8796  052422  000000                  .WORD   0
 8797
 8798  052424                  OUT:
 8799  052424  012605                  MOV     (SP)+,R5        ;;POP STACK INTO R5
 8800  052426  012604                  MOV     (SP)+,R4        ;;POP STACK INTO R4
 8801  052430  012603                  MOV     (SP)+,R3        ;;POP STACK INTO R3
 8802  052432  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
 8803  052434  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
 8804  052436  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
 8805  052440  000207                  RTS     PC              ;EXIT
 8806
```

```
 8807
 8808                                   ;;*****************************************************************
 8809
 8810                                   ;*THE DISK SECTOR IS DEVIDED AS FOLLOWS
 8811
 8812                                   ;*19 WORDS OF 0, ONE WORD 144000
 8813                                   ;*THESE MAKE 39 BYTES FOR SECTOR GAP AND ONE SYNC. BYTE
 8814
 8815
 8816  052442  014400                   RSYNC:  14400
 8817  052444  000000                   RCYL:   0
 8818  052446  000000                   RSETR:  0
 8819  052450  000000                   RKEY1:  0
 8820  052452  000000                   RKEY2:  0
 8821
 8822
 8823                                   ;*5 WORDS OF 0'S, ONE WORD 144000
 8824                                   ;*THESE MAKE 11 BYTES FOR HEADER GAP AND ONE SYNC. BYTE
 8825                                   ;*THESE ARE DCL GENERATED
 8826
 8827
 8828
 8829                                   ;*THERE ARE 256 WORDS OF DATA
 8830                                   ;*THERE ARE 2 WORDS FOR ECC GENERATED BY DCL
 8831                                   ;*15 WORDS OF 0'S FOR DATA GAP AND TOLERANCE GAP
 8832                                   ;;*****************************************************************
 8833
 8834
 8835
 8836
 8837
 8838
```

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



052454  000000                  NOSYNC: 0                       ;FORCED HEADER ERROR = -1
                                                                ;NORMAL = 0
052456  000000                  TY:     0                       ;ERROR TYPE NO.
052460  000000                  ERWORD: 0                       ;ERROR WORD NO.


052462  012137  052444          RDHEAD: MOV     (R1)+,@#RCYL    ;STORE CYLINDER ADDRESS
052466  012137  052446                  MOV     (R1)+,@#RSETR   ;STORE SECTOR AND TRACK ADDRESS
052472  012137  052450                  MOV     (R1)+,@#RKEY1   ;STORE KEY1
052476  012137  052452                  MOV     (R1)+,@#RKEY2   ;STORE KEY2
052502  012137  053252                  MOV     (R1)+,@#COMPA   ;STORE COMPARE OR NOT
052506  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK

052510  013700  015000                  MOV     @#RHMR,R0       ;R0 CONTAINS MAINTANENCE REG.
052514  012705  000002                  MOV     #2,R5           ;R5 IS A COUNTER FOR WORDS
052520  012710  000001                  MOV     #DMD,@R0        ;SET DIAG. MODE
052524  052710  000010                  BIS     #MSTCK,@R0      ;SET SECTOR CLOCK FOR FIRST WORD
052530  052710  000002                  BIS     #MCLK,@R0       ;SET MAINT.CLOCK FOR FIRST WORD
052534  042710  000012                  BIC     #MSTCK!MCLK,@R0 ;RESET THEM

052540  000404                          BR      2$              ;DON'T GIVE SECTOR CLOCK FIRST TIME
052542  012710  000013          1$:     MOV     #MSTCK!MCLK!DMD,@R0;SET SECTOR, CLOCK, DIAG. MODE, RESET INDEX
052546  042710  000012                  BIC     #MSTCK!MCLK,@R0 ;RESET SECTOR & MAINT.CLOCK

052552  012702  000007          2$:     MOV     #7,R2           ;LOAD BYTE COUNTER
052556  052710  000002          3$:     BIS     #MCLK,@R0       ;SET MAINT. CLOCK
052562  042710  000002                  BIC     #MCLK,@R0       ;RESET IT
052566  005302                          DEC     R2              ;BYTE COUNTER
052570  001372                          BNE     3$              ;CONTINUE IF BYTE NOT COMPLETE
052572  005305                          DEC     R5              ;WORD COUNTER
052574  001362                          BNE     1$              ;CONTINUE IF WORD NOT COMPLETE

052576  012702  000022                  MOV     #18.,R2         ;LOAD NO OF WORDS OF ZEROS
052602  005037  053250          4$:     CLR     @#WORD          ;DO 0'S
052606  004737  053254                  JSR     PC,@#READ       ;READ 0'S <------------------->
052612  005302                          DEC     R2              ;COUNT DOWN WORDS
052614  001372                          BNE     4$              ;CONTINUE

052616  013737  052442  053250          MOV     @#RSYNC,@#WORD  ;SYNC. WORD
052624  004737  053254                  JSR     PC,@#READ       ;READ IT <---------------------->
052630  032710  001000                  BIT     #DTSY,  @R0     ;SYNC. BYTE DETECTED?
052634  001012                          BNE     5$              ;CONTINUE IF SYNC DETECTED
052636  012737  000001  052460          MOV     #1,@#ERWORD     ;ERROR WORD NO
052644  013737  052442  001124          MOV     @#RSYNC,@#$GDDAT;SYNC WORD
```

```
 8893  052652  012737  104002  052352          MOV   #104002,@#SSYN  ;INSERT "ERROR 2" IN SSYN
 8894  052660  000571                          BR    13$             ;BRANCH OUT ---------->
 8895
 8896  052662  013737  052444  053250  5$:     MOV   @#RCYL, @#WORD  ;SETUP CYLINDER
 8897  052670  004737  053254                  JSR   PC,@#READ       ;READ IT <----------
 8898  052674  013737  052446  053250          MOV   @#RSETR,@#WORD  ;SETUP SECTOR/TRACK
 8899  052702  004737  053254                  JSR   PC,@#READ       ;READ THEM <----------
 8900  052706  013737  052450  053250          MOV   @#RKEY1,@#WORD  ;SETUP KEY1
 8901  052714  004737  053254                  JSR   PC,@#READ       ;READ IT <----------
 8902  052720  013737  052452  053250          MOV   @#RKEY2,@#WORD  ;SETUP KEY2
 8903  052726  004737  053254                  JSR   PC,@#READ       ;READ IT <----------
 8904  052732  013737  054240  053250          MOV   @#WCRC,@#WORD   ;SETUP CRC
 8905  052740  004737  053254                  JSR   PC,@#READ       ;READ IT <----------
 8906
 8907  052744  005737  015146                  TST   @#TESDTE        ;IS THIS A DRIVE TIMING ERROR ?
 8908  052750  001135                          BNE   13$             ;BRANCH OUT IF YES ---------->
 8909  052752  005737  053252                  TST   @#COMPA         ;IS THIS A READ OR WRITE COMMAND ?
 8910  052756  001472                          BEQ   11$             ;DO READ IF = 0
 8911
 8912                                  ;*CONTINUE WITH DIAGNOSTIC WRITE COMMAND
 8913
 8914  052760  012705  054242                  MOV   #HEGAP, R5      ;POINTER FOR HEADER GAP
 8915  052764  012702  000005                  MOV   #5,R2           ;NO OF WORDS OF ZEROS
 8916  052770  012737  000006  052460  6$:     MOV   #6,@#ERWORD     ;ERROR WORD NO SET
 8917  052776  004737  053506                  JSR   PC,@#WRITE      ;FOR HEADER GAP
 8918  053002  005737  053504                  TST   @#WWORD         ;TEST WRITTEN WORD
 8919  053006  001413                          BEQ   7$              ;CONTINUE IF GOOD, THAT IS = 0
 8920  053010  160237  052460                  SUB   R2,@#ERWORD     ;WORD NO IN ERROR
 8921  053014  005037  001124                  CLR   @#$GDDAT        ;GOOD WORD SHOULD BE 0
 8922  053020  013737  053504  001126          MOV   @#WWORD,$BDDAT  ;BAD DATA
 8923  053026  012737  104003  052354          MOV   #104003,@#HEDGAP;"ERROR 2" GOES IN HEDGAP
 8924  053034  000503                          BR    13$             ;BRANCH OUT ---------->
 8925
 8926  053036  013725  053504          7$:     MOV   @#WWORD,(R5)+   ;SAVE HEADER GAP
 8927  053042  005302                          DEC   R2
 8928  053044  001351                          BNE   6$
 8929  053046  004737  053506                  JSR   PC,@#WRITE      ;WRITE HEADER (DATA) GAP SYNC
 8930  053052  023737  052442  053504          CMP   @#RSYNC,@#WWORD
 8931  053060  001426                          BEQ   10$
 8932  053062  005737  052454                  TST   @#NOSYNC        ;IS THIS FORCED HEADER ERROR COMMAND ?
 8933                                          ;IF YES  NOSYNC=-1 THEN WRITE OR READ
 8934                                          ;IS SHUT OFF SO BRANCH OUT
 8935                                          ;IF NO NOSYNC=0 THEN CONTINUE
 8936  053066  001406                          BEQ   14$             ;PRINT IT IF TRUE ERROR
 8937
 8938  053070  005737  053504                  TST   @#WWORD         ;IS IT = 0 ?
 8939  053074  001420                          BEQ   10$             ;CONTINUE IF GOOD
 8940  053076  005037  001124                  CLR   @#$GDDAT        ;IT SHOULD BE ZERO
 8941  053102  000403                          BR    15$             ;BRANCH TO TYPE ERROR
 8942  053104  013737  052442  001124  14$:     MOV   @#RSYNC,@#$GDDAT;GOOD DATA
 8943  053112  013737  053504  001126  15$:     MOV   @#WWORD,@#$BDDAT;BAD DATA
 8944  053120  012737  000006  052460          MOV   #6,@#ERWORD
 8945  053126  012737  104003  052356          MOV   #104003,@#HEDSYN
 8946  053134  000443                          BR    13$             ;BRANCH OUT ---------->
```

```
8947
8948  053136  013725  053504          10$:    MOV     @#WWORD,(R5)+   ;SAVE DATA SYNC.
8949  053142  000440                  .       BR      13$             ;EXIT ------------------------->
8950
8951                                  ;*READ COMMAND START FROM HERE
8952
8953  053144  012702  000005          11$:    MOV     #5,R2
8954  053150  005037  053250          12$:    CLR     WORD
8955  053154  004737  053254                  JSR     PC,@#READ       ;READ HEADER GAP <---------------->
8956  053160  005302                          DEC     R2              ;ARE 5 HEADER GAP ZEROS COMPLETE ?
8957  053162  001372                          BNE     12$             ;IF NOT CONTINUE
8958  053164  013737  052442  053250          MOV     @#RSYNC,@#WORD  ;SYNC WORD
8959  053172  004737  053254                  JSR     PC,@#READ       ;READ HEADER (DATA) SYNC)
8960  053176  005737  052454                  TST     @#NOSYNC        ;FORCED SYNC ERROR ?
8961  053202  001404                          BEQ     16$             ;IF NOT ERROR COMMAND CONTINUE
8962  053204  032710  001000                  BIT     #DTSY,@R0       ;SYNC. DETECTED
8963  053210  001415                          BEQ     13$             ;IF ZERO BRANCH OUT ------------>
8964  053212  000403                          BR      17$             ;IF NOT ZERO BRANCH TO ERROR
8965
8966  053214  032710  001000          16$:    BIT     #DTSY,  @R0     ;SYNC. DETECTED ?
8967  053220  001011                          BNE     13$             ;EXIT IF YES ------------------->
8968  053222  012737  000006  052460  17$:    MOV     #6,@#ERWORD     ;ERROR WORD NO.
8969  053230  013737  052442  001124          MOV     @#RSYNC,@#$GDDAT;SYNC WORD
8970  053236  012737  104002  052356          MOV     #104002,@#HEDSYN;MOVE "ERROR 2"
8971  053244                          13$:
8972  053244  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
8973  053246  000201                          RTS     R1              ;EXIT ------------------------->
8974
8975
8976
8977
8978
8979
8980
8981
```

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



053250  000000          WORD:   0
053252  000000          COMPA:  0


053254                  READ:
053254  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
053256  012705  000002          MOV     #2,R5           ;WORD COUNTER
053262  012710  000001          MOV     #DMD,@R0        ;SET DIAG. MODE
053266  006037  053250          ROR     @#WORD          ;CHECKING IF THERE IS A ONE
053272  103002                  BCC     1$              ;IF NO ONE BRANCH
053274  052710  000020          BIS     #MRD,@R0        ;SET BIT 4 IF DATA HAS ONE
053300  012702  000007  1$:     MOV     #7,R2           ;BYTE COUNTER
053304  052710  000012          BIS     #MSTCK!MCLK,@R0 ;SET CLOCK,DATA IF ANY, SECTOR
053310  005737  050374          TST     @#TSECCG        ;IS THIS BIT TO GENERATE AND TEST ECC ?
053314  001411                  BEQ     6$              ;BRANCH IF NO
053316  032710  000020          BIT     #MRD,@R0        ;IS DATA BIT A ONE ?
053322  001404                  BEQ     5$              ;BRANCH IF DATA BIT IS 0
053324  012737  177777  050366  MOV     #-1,@#ECDATA    ;ECC DATA BIT IS A ONE
053332  000402                  BR      6$              ;BRANCH
053334  005037  050366  5$:     CLR     @#ECDATA        ;ECC DATA BIT IS A 0
053340  012746  000001  6$:     MOV     #DMD,-(SP)      ;KEEP ONLY DIAG. MODE
053344  006037  053250          ROR     @#WORD          ;CHECKING IF THERE IS A ONE
053350  103002                  BCC     2$              ;IF NO ONE BRANCH
053352  012716  000021          MOV     #MRD!DMD,(SP)   ;KEEP DATA AND DIAG. MODE
053356  012610          2$:     MOV     (SP)+,@R0       ;PUT IN DATA,RESET CLOCK, SECTOR
053360  005737  050374          TST     @#TSECCG        ;IS ECC TO BE GENERATED FOR THIS BIT
053364  001404                  BEQ     3$              ;BRANCH IF NO
053366  005237  050406          INC     @#DATENV        ;NUMBER OF CLOCKS GIVEN FOR DATA ENVELOPE
053372  004737  050424          JSR     PC,@#ECTEST     ;GO TO GENERATE AND TEST ECC
053376  052710  000002  3$:     BIS     #MCLK,@R0       ;SET CLOCK
053402  005737  050374          TST     @#TSECCG        ;IS THIS BIT TO GENERATE ECC
053406  001411                  BEQ     8$              ;BRANCH IF NO
053410  032710  000020          BIT     #MRD,@R0        ;IS DATA BIT A ONE
053414  001404                  BEQ     7$              ;BRANCH IF DATA BIT IS = 0
053416  012737  177777  050366  MOV     #-1,@#ECDATA    ;ECC DATA BIT IS A ONE
053424  000402                  BR      8$              ;BRANCH
053426  005037  050366  7$:     CLR     @#ECDATA        ;ECC DATA BIT IS = 0
053432  012746  000001  8$:     MOV     #DMD,-(SP)      ;KEEP DIAG. MODE
053436  006037  053250          ROR     @#WORD          ;CHECKING IF THERE IS A ONE
053442  103002                  BCC     4$              ;BRANCH IF NO ONE
053444  012716  000021          MOV     #MRD!DMD,(SP)   ;KEEP DIAG. MODE AND DATA
053450  012610          4$:     MOV     (SP)+,@R0       ;SET DATA, DIAG. MODE, CLEAR CLOCK
053452  005737  050374          TST     @#TSECCG        ;IS THIS BIT TO GENERATE ECC
053456  001404                  BEQ     9$              ;BRANCH IF NO
053460  005237  050406          INC     @#DATENV        ;NUMBER OF CLOCKS FOR DATA ENVELOPE
```

```
 9036  053464  004737  050424                    JSR     PC,@#ECTEST     ;GO TO GENERATE AND TEST ECC
 9037
 9038  053470  005302                    9$:     DEC     R2              ;BYTE COUNTER
 9039  053472  001341                            BNE     3$              ;CONTINUE IF ONE BYTE NOT COMPLETE
 9040  053474  005305                            DEC     R5              ;WORD COUNTER
 9041  053476  001300                            BNE     1$              ;CONTINUE IF ONE WORD NOT COMPLETE
 9042  053500  012602                            MOV     (SP)+,R2        ;;POP STACK INTO R2
 9043  053502  000207                            RTS     PC              ;EXIT ---------------------------->
 9044
 9045
 9046
 9047
 9048
 9049
```

```
 9050                                   ;;*****************************************************************
 9051                                   ;*WRITE ONE WORD WHICH COMES BACK IN "WWORD"
 9052                                   ;;*****************************************************************
 9053
 9054
 9055
 9056
 9057
 9058
 9059  053504  000000                   WWORD:  0
 9060
 9061
 9062
 9063
 9064  053506                           WRITE:
 9065  053506  010046                           MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 9066  053510  010246                           MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 9067  053512  010346                           MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 9068  053514  010546                           MOV     R5,-(SP)        ;;PUSH R5 ON STACK
 9069  053516  012705  000002                   MOV     #2,R5           ;WORD COUNTER
 9070  053522  012710  000001                   MOV     #1,@R0          ;SET DIAG. MODE
 9071  053526  012702  000007           1$:     MOV     #7,R2           ;BYTE COUNTER
 9072  053532  012710  000013                   MOV     #MSTCK!MCLK!DMD,@R0;SET SECTOR & MANT. CLOCKS
 9073  053536  032710  000040                   BIT     #MWR,@R0        ;CHECK WRITEBIT IN MAINT. REG.
 9074  053542  001406                           BEQ     2$              ;BRANCH IF ZERO
 9075  053544  012737  177777  050366           MOV     #-1,@#ECDATA    ;ECC DATA BIT IS A ONE
 9076  053552  000261                           SEC                     ;SET CARRY
 9077  053554  006003                           ROR     R3              ;MOVE 1 FORWARD
 9078  053556  000404                           BR      3$
 9079  053560  005037  050366           2$:     CLR     @#ECDATA        ;ECC DATA BIT IS = 0
 9080  053564  000241                           CLC                     ;CLEAR CARRY
 9081  053566  006003                           ROR     R3              ;MOVE 0 FOR WWORD
 9082  053570  012710  000001           3$:     MOV     #DMD,@R0        ;CLEAR SECTOR AND CLOCK
 9083  053574  005737  050374                   TST     @#TSECCG        ;IS THIS BIT TO GENERATE ECC ?
 9084  053600  001404                           BEQ     4$              ;BRANCH IF NO
 9085  053602  005237  050406                   INC     @#DATENV        ;NUMBER OF CLOCKS FOR DATA ENVELOPE
 9086  053606  004737  050424                   JSR     PC,@#ECTEST     ;GO TO GENERATE AND TEST ECC <-------->
 9087
 9088  053612  052710  000002           4$:     BIS     #MCLK,@R0       ;SET CLOCK
 9089  053616  032710  000040                   BIT     #MWR,@R0        ;CHECK WRITE BIT IN MAINT. REG.
 9090  053622  001406                           BEQ     5$              ;BRANCH IF ZERO
 9091  053624  012737  177777  050366           MOV     #-1,@#ECDATA    ;ECC DATA BIT IS A ONE
 9092  053632  000261                           SEC                     ;SET CARRY
 9093  053634  006003                           ROR     R3              ;MOVE 1 FOR WWORD
 9094  053636  000404                           BR      6$
 9095  053640  005037  050366           5$:     CLR     @#ECDATA        ;ECC DATA BIT IS ZERO
 9096  053644  000241                           CLC                     ;CLEAR CARRY
 9097  053646  006003                           ROR     R3              ;MOVE 0 FOR WWORD
 9098  053650  012710  000001           6$:     MOV     #DMD,@R0        ;CLEAR CLOCK
 9099  053654  005737  050374                   TST     @#TSECCG        ;IS THIS BIT TO GENERATE ECC ?
 9100  053660  001404                           BEQ     7$              ;BRANCH IF NO
 9101  053662  005237  050406                   INC     @#DATENV        ;NUMBER OF CLOCKS FOR DATA ENVELOPE
 9102  053666  004737  050424                   JSR     PC,@#ECTEST     ;GO TO GENERATE AND TEST ECC <-------->
 9103
```

```
 9104  053672  005302                    7$:     DEC     R2              ;COUNT FOR BYTE END
 9105  053674  001346                            BNE     4$              ;IF NOT BYTE END CONTINUE
 9106  053676  005305                            DEC     R5              ;COUNT FOR WORD END
 9107  053700  001312                            BNE     1$              ;IF NOT WORD END CONTINUE
 9108  053702  010337  053504                    MOV     R3,@#WWORD      ;STORE THE WORD
 9109  053706  012605                            MOV     (SP)+,R5        ;;POP STACK INTO R5
 9110  053710  012603                            MOV     (SP)+,R3        ;;POP STACK INTO R3
 9111  053712  012602                            MOV     (SP)+,R2        ;;POP STACK INTO R2
 9112  053714  012600                            MOV     (SP)+,R0        ;;POP STACK INTO R0
 9113  053716  000207                            RTS     PC              ;EXIT ------------------------------>
 9114
 9115
 9116
 9117
 9118
 9119
```

```
                                ;;*****************************************************************
                                ;*WRITE DATA HOUSEKEEPING ROUTINE
                                ;;*****************************************************************
                                
                                
                                
                                
                                
                                
                                
                                
                                
053720  000000        COUNTD: 0
053722  000400        FORMAT: 256.
053724  000000        ZWORDS: 0
053726                WRDATA:
053726  011137  053720        MOV     (R1),@#COUNTD   ;STORE NO. OF WORDS TO BE WRITTEN
053732  012102                MOV     (R1)+,R2        ;SAME IN R2
053734  012137  053252        MOV     (R1)+,@#COMPA   ;COMPARE OR NOT
053740  010046                MOV     R0,-(SP)        ;;PUSH R0 ON STACK
053742  010146                MOV     R1,-(SP)        ;;PUSH R1 ON STACK
053744  010246                MOV     R2,-(SP)        ;;PUSH R2 ON STACK
053746  010346                MOV     R3,-(SP)        ;;PUSH R3 ON STACK
053750  010446                MOV     R4,-(SP)        ;;PUSH R4 ON STACK
053752  012701  000016        MOV     #14.,R1         ;NO. OF TOLERANCE GAP WORDS
053756  012703  055264        MOV     #TOLGAP,R3      ;START OF TOLERANCE GAP TABLE
053762  012723  177777  1$:   MOV     #-1,(R3)+       ;MAKE IT 177777
053766  005301                DEC     R1              ;IS 14 COMPLETED ?
053770  001374                BNE     1$              ;IF NOT, CONTINUE
                              
053772  013700  015000        MOV     @#RHMR,R0       ;R0 CONTAINS MAINTANENCE REG.
053776  013746  053722        MOV     @#FORMAT,-(SP)
054002  163716  053720        SUB     @#COUNTD,(SP)
054006  011637  053724        MOV     (SP),@#ZWORDS   ;NO. OF ZERO WORDS TO BE WRITTEN
054012  012604                MOV     (SP)+,R4
054014  005737  015144        TST     @#TSECC         ;IS THIS AN ECC TEST
054020  001403                BEQ     7$              ;BRANCH IF NO
054022  012737  177777  050374 MOV     #-1,@#TSECCG    ;THESE BITS ARE TO GENERATE ECC
054030  012703  054256  7$:   MOV     #DISK,R3        ;SIMULATED DISK AREA
054034  004737  053506  2$:   JSR     PC,@#WRITE      ;WRITE ON SIMULATED DISK
054040  013723  053504        MOV     @#WWORD,(R3)+   ;STORE ON SIMULATED DISK
054044  005302                DEC     R2
054046  001372                BNE     2$
054050  005704                TST     R4              ;ANY ZEROS TO BE WRITTEN ?
054052  001406                BEQ     4$              ;BRANCH IF NONE TO BE WRITTEN
                              
054054  004737  053506  3$:   JSR     PC,@#WRITE      ;WRITE ZEROS ON SIMULATED DISK
054060  013723  053504        MOV     @#WWORD,(R3)+   ;STORE THEM
054064  005304                DEC     R4
054066  001372                BNE     3$
054070  005037  050374  4$:   CLR     @#TSECCG        ;NO MORE ECC TO BE GENERATED
054074  012701  000002        MOV     #2,R1
054100  004737  053506  5$:   JSR     PC,@#WRITE      ;WRITE ECC1 AND ECC2 ON SIMULATED DISK
054104  013723  053504        MOV     @#WWORD,(R3)+   ;STORE IN WEEC1 AND WEEC2
054110  005301                DEC     R1
054112  001372                BNE     5$
```

```
 9174  054114  004737  053506                    JSR     PC,@#WRITE      ;WRITE DATA GAP
 9175  054120  013723  053504                    MOV     @#WWORD,(R3)+   ;STORE IT
 9176  054124  012701  000016                    MOV     #14.,R1
 9177  054130  004737  053506          6$:       JSR     PC,@#WRITE      ;WRITE TOLERANCE GAP ZEROS
 9178  054134  013723  053504                    MOV     @#WWORD,(R3)+   ;STORE THEM
 9179  054140  005301                            DEC     R1
 9180  054142  001372                            BNE     6$
 9181  054144  012604                            MOV     (SP)+,R4        ;;POP STACK INTO R4
 9182  054146  012603                            MOV     (SP)+,R3        ;;POP STACK INTO R3
 9183  054150  012602                            MOV     (SP)+,R2        ;;POP STACK INTO R2
 9184  054152  012601                            MOV     (SP)+,R1        ;;POP STACK INTO R1
 9185  054154  012600                            MOV     (SP)+,R0        ;;POP STACK INTO R0
 9186  054156  000201                            RTS     R1              ;EXIT ---------------------------->
 9187
 9188
 9189
 9190
 9191
 9192
 9193
 9194
```

```
9195
9196                                    ;*THIS IS THE SIMULATED DISK
9197                                    ;*ONLY ONE SECTOR OF SPACE IS ALLOCATED
9198                                    ;;*****************************************************************
9199                                    ;;*****************************************************************
9200
9201
9202
9203
9204
9205
9206
9207  054160  000023    SECGAP: .BLKW   19.          ;SECTOR GAP 38 BYTES OF 0
9208  054226  000001    WSSYNC: .BLKW   1           ;SECTOR GAP 1 BYTE OF 0 ONE SYNC BYTE
9209  054230  000004    HEADER: .BLKW   4           ;HEADER = CYL, SECTOR/TRACK, KEY1, KEY2
9210  054240  000001    WCRC:   .BLKW   1           ;CRC
9211  054242  000005    HEGAP:  .BLKW   5           ;HEADER GAP 10 BYTES OF 0
9212  054254  000001    HDWSYN: .BLKW   1           ;HEADER GAP 1 BYTE OF 0 ONE SYNC. BYTE
9213  054256            SILOTB:                     ;(ALSO USED IN SILO TEST AS SILO TABLE)
9214  054256  000400    DISK:   .BLKW   256.        ;DATA SPACE
9215  055256  000001    WECC1:  .BLKW   1           ;ECC1
9216  055260  000001    WECC2:  .BLKW   1           ;ECC2
9217  055262  000001    DTAGAP: .BLKW   1           ;DATA GAP 2 BYTES OF 0
9218  055264  000016    TOLGAP: .BLKW   14.          ;TOLERANCE GAP 28 BYTES OF 0
9219
9220
9221
9222
9223
9224
```

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



                                ;*THIS SUBROUTINE IS THE FIRST IN A SERIES OF NESTED SUBROUTINES

                                ;*IT ISSUES DIAGNOSTIC MODE, AN EXTRA DIAGNOSTIC INDEX, AND THE
                                ;*'GO' BIT

                                ;*IT THEN CALLS THREE OTHER SUBROUTINES, WHICH IN TURN CALL OTHER
                                ;*SUBROUTINES.  THE THREE SUBROUTINES CALLED HERE ARE:

                                ;*      SEARCH          ;ISSUES SECTOR CLOCKS TO SET SECTOR FOUND FLOP
                                ;*      WRHEAD          ;WRITES THE SECTOR HEADER
                                ;*      WRDATA          ;WRITES THE ACTUAL SECTOR DATA

                                ;*ALL OF THE ABOVE MENTIONED "WRITING" IS ACTUALLY DONE INTO A CORE
                                ;*BUFFER AREA CALLED 'DISK' VIA THE MAINTENANCE REGISTER (RHMR)



 055320  000000                 RNCTR1: .WORD   0               ;'RUN' LINE STALL COUNTER

 055322  011637  015134         COMWHD: MOV     (SP),@#PCJSR    ;SAVE PC OF JSR + 4
 055326  162737  000004  015134         SUB     #4,@#PCJSR      ;SAVE PC OF JSR
 055334  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 055336  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 055340  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 055342  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 055344  010446                         MOV     R4,-(SP)        ;;PUSH R4 ON STACK
 055346  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK

 055350  012777  000001  137422         MOV     #DMD,@RHMR      ;SET DIAGNOSTIC MODE
 055356  052777  000004  137414         BIS     #MINX,@RHMR     ;SET DIAGNOSTIC INDEX
 055364  042777  000004  137406         BIC     #MINX,@RHMR     ;CLEAR DIAGNOSTIC INDEX
 055372  052777  000001  137360         BIS     #GO,@RHCS1      ;SET 'GO' BIT & STALL 'TILL 'RUN'
                                                                 ;(FUNCTION CODE WAS SET UP BY THE TEST)
 055400  012737  000113  055320 RNWAT1: MOV     #75.,@#RNCTR1   ;LOAD STALL COUNTER = APPROX 450US
                                                                 ;FOR 11/50 CPU
 055406  005337  055320         1$:     DEC     @#RNCTR1        ;COUNT DOWN 1 TIME
 055412  001375                         BNE     1$              ;CONTINUE UNTIL = 0

 055414  013746  055500                 MOV     @#WSECTR,-(SP)  ;GET DESIRED SECTOR/TRACK
 055420  042716  177740                 BIC     #177740,(SP)    ;MAKE ONLY SECTOR
 055424  012637  055434                 MOV     (SP)+,@#WTRK    ;SAVE SECTOR
 055430  004137  056406         2$:     JSR     R1,@#SEARCH     ;ISSUE SECTOR CLOCKS TO GET TO
                                                                 ;DESIRED SECTOR <-------------------->
```

```
9279
9280  055434  000000                WTRK:   .WORD   0               ;SECTOR NO.
9281  055436  012701  000240                MOV     #+NOP,R1        ;GOING TO MOVE NOPS
9282  055442  010137  055510                MOV     R1,@#SEGPER     ;NOP INTO SEGAP
9283  055446  010137  055512                MOV     R1,@#FSYNER     ;NOP INTO FSYNER
9284  055452  010137  055514                MOV     R1,@#ERHEAD     ;NOP INTO ERHEAD
9285  055456  010137  055516                MOV     R1,@#ERCRC      ;NOPINTO ERCRC
9286  055462  010137  055520                MOV     R1,@#ERHDGP     ;NOP INTO ERHDGAP
9287  055466  010137  055522                MOV     R1,@#HDESYN     ;NOP INTO HDESYN
9288
9289  055472  004137  055572                JSR     R1,@#WRHEAD     ;WRITE THE HEADER <----------------->
9290
9291  055476  000000                WCYL:   0                       ;CYLINDER
9292  055500  000000                WSECTR: 0                       ;SECTOR AND TRACK
9293  055502  000000                WKEY1:  0                       ;KEY1
9294  055504  000000                WKEY2:  0                       ;KEY2
9295  055506  000000                GCRC:   0                       ;GOOD CRC
9296
9297
9298                                        ;DUMMY ERROR CALL LOCATIONS FOR THE WRITE HEADER OPERATION
9299
9300  055510  000240                SEGPER: NOP                     ;IF "ERROR 6" INSERTED BY
9301                                                                ;WRHEAD SUBROUTINE, THEN
9302                                                                ;SECTOR GAP GOING ON DISK
9303                                                                ;IS NOT RIGHT.
9304
9305                                                                ;WORD NO. CONTAINS WHICH
9306                                                                ;WORD IS WRONG, THAT IS
9307                                                                ;FIRST OF TENTH, OR WHAT EVER.
9308
9309                                                                ;BAD WORD IS WHAT IS GOING ON DISK
9310
9311  055512  000240                FSYNER: NOP                     ;IF "ERROR 6" INSERTED BY
9312                                                                ;WRHEAD SUBROUTINE, THEN
9313                                                                ;THE LAST 0 BYTE OF SECTOR
9314                                                                ;GAP OF FIRST SYNC. BYTE
9315                                                                ;AFTER SECTOR GAP IS IN
9316                                                                ;ERROR.
9317
9318                                                                ;WORD NO. CONTAINS 20
9319                                                                ;RIGHT BYTE IS SECTOR GAP
9320                                                                ;LEFT BYTE IS SYNC. BYTE.
9321
9322                                                                ;BAD WORD IS WHAT IS GOING ON
9323                                                                ;DISK
9324
9325  055514  000240                ERHEAD: NOP
9326
9327                                                                ;IF "ERROR 6" INSERTED BY
9328                                                                ;WRHEAD SUBROUTINE, THEN
9329                                                                ;HEADER GOING ON DISK
9330                                                                ;IS WRONG.
9331
9332                                                                ;WORD NO 1 = CYLINDER NO
                                                                    ;WORD NO 2 = SECTOR/TRACK
```

```
                                                                ;WORD NO 3 = KEY1
                                                                ;WORD NO 4 = KEY2

                                                                ;BAD WORD IS WHAT IS GOING ON
                                                                ;DISK

055516  000240                  ERCRC:  NOP

                                                                ;IF "ERROR 6" INSERTED BY
                                                                ;WRHEAD SUBROUTINE, THEN CRC WRITTEN
                                                                ;ON DISK IS IN ERROR.

                                                                ;GOOD DATA IS WHAT SHOULD BE ON DISK
                                                                ;BAD DATA IS WHAT IS GOING ON DISK.

                                                                ;WORD NO IS 5

055520  000240                  ERHDGP: NOP

                                                                ;IF "ERROR 6" INSERTED BY
                                                                ;WRHEAD SUBROUTINE, THEN HEADER
                                                                ;GAP GOING ON DISK IS WRONG.

                                                                ;WORD NO GIVES WHICH OF
                                                                ;THE HEADER GAP WORDS
                                                                ;ARE WRONG. FOR EXAMPLE:

                                                                ;WORD NO 1 = FIRST HEADER
                                                                ;            GAP WORD
                                                                ;BAD WORD IS WHAT IS GOING ON DISK

055522  000240                  HDESYN: NOP

                                                                ;IF "ERROR 6" INSERTED BY
                                                                ;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.

055524  005737  015126                  TST     @#ERFLG$        ;ARE ANY ERRORS DETECTED ?
055530  001004                          BNE     FOUT            ;IF YES BRANCH
055532  004137  053726                  JSR     R1,@#WRDATA     ;WRITE THE DATA

055536  000000                  FNWORD: .WORD   0               ;FORMAT COMMAND NO. OF DATA
055540  000000                          .WORD   0

055542                          FOUT:
055542  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
055544  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
055546  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
```

```
 9387  055550  012602                    MOV     (SP)+,R2        ;;POP STACK INTO R2
 9388  055552  012601                    MOV     (SP)+,R1        ;;POP STACK INTO R1
 9389  055554  012600                    MOV     (SP)+,R0        ;;POP STACK INTO R0
 9390  055556  000207                    RTS     PC              ;EXIT
```

```
 9391
 9392                                   ;;*****************************************************************
 9393                                   ;*WRITE HEADER
 9394                                   ;;*****************************************************************
 9395
 9396
 9397
 9398
 9399
 9400                                   ;*R0 = MAINT.REG.
 9401                                   ;*R1 = SIMULATED DISK
 9402                                   ;*R2 = BYTE COUNT
 9403                                   ;*R3 = WRITE WORD
 9404                                   ;*R5 = WORD COUNT
 9405
 9406
 9407
 9408
 9409  055560  000000                   SCYL:   0                       ;
 9410  055562  000000                   SSECTR: 0                       ;
 9411  055564  000000                   SKEY1:  0                       ;
 9412  055566  000000                   SKEY2:  0                       ;
 9413  055570  000000                   SCRC:   0                       ;
 9414
 9415
 9416  055572  012137  055560           WRHEAD: MOV     (R1)+,@#SCYL
 9417  055576  012137  055562                   MOV     (R1)+,@#SSECTR
 9418  055602  012137  055564                   MOV     (R1)+,@#SKEY1
 9419  055606  012137  055566                   MOV     (R1)+,@#SKEY2
 9420  055612  012137  055570                   MOV     (R1)+,@#SCRC
 9421  055616  010146                           MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 9422
 9423  055620  012701  054160                   MOV     #SECGAP,R1      ;SIMULATED DISK INDICATOR
 9424  055624  013700  015000                   MOV     @#RHMR, R0      ;R0 NOW HAS MAINT. REG. ADDR.
 9425  055630  012710  000001                   MOV     #DMD,@R0        ;SET DIAG. MODE
 9426  055634  012705  000002                   MOV     #2,R5           ;WORD COUNTER
 9427  055640  052710  000010                   BIS     #MSTCK,@R0      ;SET SECTOR FOR FIRST BYTE
 9428  055644  012710  000013           1$:     MOV     #MSTCK!MCLK!DMD,@R0;SET SECTOR, CLOCK, DIAG.
 9429                                                                   ;MODE, RESET INDEX
 9430  055650  032710  000040                   BIT     #MWR,@R0        ;CHECK WRITE BIT IN MAINT. REG.
 9431  055654  001403                           BEQ     2$
 9432  055656  000261                           SEC                     ;SET CARRY
 9433  055660  006003                           ROR     R3              ;MOVE ONE FORWARD
 9434  055662  000402                           BR      3$              ;
 9435  055664  000241           2$:     CLC                             ;CLEAR CARRY
 9436  055666  006003                           ROR     R3              ;MOVE ZERO FORWARD
 9437  055670  012710  000001           3$:     MOV     #DMD,@R0        ;CLEAR CLOCK, SECTOR
 9438  055674  012702  000007                   MOV     #7,R2           ;BYTE COUNTER
 9439  055700  052710  000002           4$:     BIS     #MCLK,@R0       ;SET BIT CLOCK
 9440  055704  032710  000040                   BIT     #MWR,@R0        ;CHECK WRITE BIT IN MAINT.REG.
 9441  055710  001403                           BEQ     5$              ;BRANCH IF ZERO
 9442
 9443  055712  000261                           SEC                     ;SET CARRY
 9444  055714  006003                           ROR     R3              ;MOVE ONE FORWARD
```

```
 9445  055716  000402                        BR      6$
 9446  055720  000241                5$:     CLC
 9447  055722  006003                        ROR     R3
 9448  055724  012710  000001        6$:     MOV     #DMD,@R0
 9449  055730  005302                        DEC     R2
 9450  055732  001362                        BNE     4$
 9451  055734  005305                        DEC     R5
 9452  055736  001342                        BNE     1$
 9453  055740  010321                        MOV     R3,(R1)+
 9454  055742  005703                        TST     R3
 9455  055744  001414                        BEQ     7$
 9456
 9457  055746  012737  000001  052460        MOV     #1,@#ERWORD
 9458  055754  005037  001124                CLR     @#$GDDAT
 9459  055760  010337  001126                MOV     R3,@#$BDDAT
 9460  055764  012737  104006  055510        MOV     #104006,@#SEGPER
 9461  055772  000137  056400                JMP     @#17$           ;BRANCH OUT ---------------------->
 9462
 9463  055776  012702  000022        7$:     MOV     #18.,R2         ;COUNT NO. OF SECTOR GAP
 9464  056002  012737  000024  052460 10$:    MOV     #20.,@#ERWORD   ;COUNT TO GIVE ERROR WORD
 9465  056010  004737  053506                JSR     PC,@#WRITE      ;WRITE SECTOR GAP
 9466  056014  013721  053504                MOV     @#WWORD,(R1)+   ;STORE SECTOR GAP WORD
 9467  056020  001413                        BEQ     11$
 9468  056022  160237  052460                SUB     R2,@#ERWORD     ;IF NOT GET ERROR WORD NO.
 9469  056026  005037  001124                CLR     @#$GDDAT        ;GOOD WORD
 9470  056032  013737  053504  001126        MOV     @#WWORD,@#$BDDAT;BAD WORD
 9471  056040  012737  104006  055510        MOV     #104006,@#SEGPER;STORE "ERROR 6" IN SEGPER
 9472  056046  000554                        BR      17$             ;BRANCH OUT
 9473  056050  005302                11$:     DEC     R2              ;HAVE 18 WORDS OF ZEROS BEEN WRITTEN ?
 9474  056052  001353                        BNE     10$             ;IF NOT CONTINUE
 9475
 9476                                        ;AT THIS POINT THE SECTOR FOUND FLOP SHOULD
 9477                                        ;BE HIGH,  SO THAT THE HEADER SYNC BYTE CAN BE GIVEN.
 9478
 9479                                        ;HOWEVER, IN THE DRIVE TIMING ERROR TEST THE REST OF THE ROUTINE
 9480                                        ;IS ABORTED
 9481
 9482  056054  005737  015146                TST     @#TESDTE        ;IS THIS A DRIVE TIMING ERROR TEST ?
 9483  056060  001147                        BNE     17$             ;BRANCH OUT IF YES ------------------->
 9484
 9485  056062  004737  053506                JSR     PC,@#WRITE      ;WRITE ONE SECTOR GAP 0 BYTE
 9486                                                                  ;AND ONE SYNC. BYTE = 230
 9487  056066  013711  053504                MOV     @#WWORD,(R1)    ;SAVE 0 BYTE AND SYNC BYTE
 9488  056072  023721  052442                CMP     @#RSYNC,(R1)+   ;IF SYNC. BYTE RIGHT
 9489  056076  001414                        BEQ     12$             ;IF YES CONTINUE OPERATION
 9490  056100  012737  000024  052460        MOV     #20.,@#ERWORD   ;IF NOT GET READY FOR ERROR PRINT
 9491
 9492  056106  013737  052442  001124        MOV     @#RSYNC,@#$GDDAT;GOOD WORD
 9493  056114  014137  001126                MOV     -(R1),@#$BDDAT  ;BAD WORD
 9494  056120  012737  104006  055512        MOV     #104006,@#FSYNER;INSERT "ERROR 6" IN FSYNER
 9495  056126  000524                        BR      17$             ;BRANCH OUT ------------------------>
 9496
 9497  056130  012702  000004        12$:    MOV     #4,R2           ;FOUR HEADER WORDS
 9498  056134  012703  055560                MOV     #SCYL,R3        ;POINTER FOR HEADER TABLE
```

```
 9499  056140  012737  000005  052460  13$:    MOV     #5,@#ERWORD     ;ERROR WORD NO SET
 9500  056146  004737  053506                  JSR     PC,@#WRITE      ;WRITE 4 HEADER WORDS
 9501  056152  013711  053504                  MOV     @#WWORD,(R1)    ;STORE WRITTEN WORD
 9502  056156  022321                          CMP     (R3)+,(R1)+     ;IS IT CORRECT ?
 9503  056160  001412                          BEQ     14$             ;IF GOOD CONTINUE OPERATION
 9504                                                                  ;IF NOT GET READY FOR ERROR PRINT
 9505
 9506  056162  160237  052460                  SUB     R2,@#ERWORD     ;WORD NO
 9507  056166  014337  001124                  MOV     -(R3),@#$GDDAT  ;GOOD DATA
 9508  056172  014137  001126                  MOV     -(R1),@#$BDDAT  ;BAD DATA
 9509  056176  012737  104006  055514          MOV     #104006,@#ERHEAD;INSERT "ERROR 6"
 9510  056204  000475                          BR      17$             ;BRANCH OUT ---------------------------->
 9511
 9512  056206  005302                  14$:    DEC     R2              ;ARE 4 HEADER WORDS DONE?
 9513  056210  001353                          BNE     13$             ;IF NOT CONTINE
 9514  056212  004737  053506                  JSR     PC,@#WRITE      ;WRITE CRC
 9515  056216  013711  053504                  MOV     @#WWORD,(R1)    ;STORE CRC
 9516  056222  022137  055506                  CMP     (R1)+,@#GCRC    ;COMPARE GOOD CRC
 9517  056226  001414                          BEQ     20$             ;IF GOOD CONTINUE OPERATION
 9518                                                                  ;IF NOT GET READY FOR ERROR PRINT
 9519
 9520  056230  014137  001126                  MOV     -(R1),@#$BDDATA ;BAD CRC WRITTEN
 9521  056234  013737  055506  001124          MOV     @#GCRC,@#$GDDAT ;GOOD CRC
 9522  056242  012737  000005  052460          MOV     #5,@#ERWORD     ;ERROR WORD NO
 9523  056250  012737  104006  055516          MOV     #,04006,@#ERCRC ;INSERT ERROR 6
 9524  056256  000450                          BR      17$             ;EXIT ------------------------------->
 9525
 9526  056260  012702  000005          20$:    MOV     #5,R2           ;NO OF HEADER GAP
 9527  056264  012737  000006  052460  15$:    MOV     #6,@#ERWORD     ;ERROR WORD NO SET
 9528  056272  004737  053506                  JSR     PC,@#WRITE      ;WRITE HEADER GAP
 9529  056276  013721  053504                  MOV     @#WWORD,(R1)+   ;STORE
 9530  056302  001412                          BEQ     16$             ;IF GOOD CONTINUE OPERATION
 9531                                                                  ;IF NOT GET READY FOR PRINT
 9532
 9533  056304  160237  052460                  SUB     R2,@#ERWORD     ;ERROR WORD NO
 9534  056310  005037  001124                  CLR     @#$GDDAT        ;GOOD DATA
 9535  056314  014137  001126                  MOV     -(R1),@#$BDDAT  ;BAD DATA
 9536  056320  012737  104006  055520          MOV     #104006,@#ERHDGP;STORE "ERROR 6"
 9537  056326  000424                          BR      17$             ;BRANCH OUT ---------------------->
 9538
 9539  056330  005302                  16$:    DEC     R2              ;ARE 5 HEADER GAP ZEROS DONE ?
 9540  056332  001354                          BNE     15$             ;IF NOT CONTINUE
 9541  056334  004737  053506                  JSR     PC,@#WRITE
 9542  056340  013711  053504                  MOV     @#WWORD,(R1)
 9543  056344  023721  052442                  CMP     @#RSYNC,(R1)+
 9544  056350  001413                          BEQ     17$             ;A-OK, EXIT ---------------------->
 9545
 9546  056352  012737  000005  052460          MOV     #5,@#ERWORD     ;IF NOT GET READY FOR ERROR PRINT
 9547  056360  014137  001126                  MOV     -(R1),@#$BDDAT
 9548  056364  013737  052442  001124          MOV     @#RSYNC,@#$GDDAT
 9549  056372  012737  104006  055522          MOV     #104006,@#HDESYN
 9550
 9551  056400                          17$:
 9552  056400  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
```

```
 9553  056402  000201                          R1S     R1              ;EXIT ------------------------->
 9554
 9555
 9556
 9557
 9558
 9559
 9560
 9561
```

```
9562                                    ;;*****************************************************************
9563                                    ;*SEARCH SECTOR
9564                                    ;;*****************************************************************
9565
9566
9567
9568
9569
9570
9571                                    ;*      R0=RHMR ADDRESS
9572                                    ;*      R1=PASSED ARGUMENT (SECTOR SEARCHED FOR)
9573                                    ;*      R2=CLOCK COUNT (PER BYTE)
9574                                    ;*      R3=SECTOR COUNTER FROM R1
9575                                    ;*      R5=BYTES PER WORD COUNT
9576
9577                                    ;*BEFORE INDEX IS GIVEN TWO SECTOR CLOCKS ARE GIVEN TO RESET
9578                                    ;*SECTOR PULSE IN CASE IT IS SET.
9579
9580                                    ;*AT THE BEGINNING OF EACH SECTOR, ONE SECTOR CLOCK HAS TO RISE
9581                                    ;*BEFORE MAINT. CLOCK, THEN EVERY EIGHT MAINT.CLOCKS, ONE SECTOR CLOCK
9582                                    ;*IS IDENTICAL WITH THE MAINT. CLOCK
9583                                    ;*THE SECTOR CLOCKS ARE NUMBERED AS FOLLOWS:
9584
9585                                    ;*THE SECTOR CLOCK UNDER INDEX - 0
9586                                    ;*THE NEXT - 1
9587                                    ;*THE NEXT - 2
9588                                    ;*ETC.
9589                                    ;*THEN THE LAST SECTOR CLOCK IN ONE SECTOR HAS NUMBER - 608
9590                                    ;*THE NEXT SECTOR WILL HAVE 608 SECTOR CLOCKS
9591                                    ;*THE NEXT SECTOR THEN HAS ANOTHER 608 SECTOR CLOCKS
9592                                    ;*AND SO ON
9593
9594
9595
9596  056404  000000                    SECTR:  0                       ;SECTOR SEARCHED FOR
9597
9598  056406  012137  056404            SEARCH: MOV     (R1)+,@#SECTR ;SAVE SECTOR SEARCHED FOR
9599  056412  010046                            MOV     R0,-(SP)        ;;PUSH R0 ON STACK
9600  056414  010146                            MOV     R1,-(SP)        ;;PUSH R1 ON STACK
9601  056416  010246                            MOV     R2,-(SP)        ;;PUSH R2 ON STACK
9602  056420  010346                            MOV     R3,-(SP)        ;;PUSH R3 ON STACK
9603  056422  010446                            MOV     R4,-(SP)        ;;PUSH R4 ON STACK
9604  056424  010546                            MOV     R5,-(SP)        ;;PUSH R5 ON STACK
9605  056426  013700  015000                    MOV     @#RHMR, R0      ;NOW R0 HAS MAINTENANCE REG. ADR.
9606  056432  013703  056404                    MOV     @#SECTR,R3      ;LOAD SECTOR COUNTER
9607
9608  056436  012710  000001                    MOV     #DMD,@R0        ;SET DIAGNOSTIC MODE
9609  056442  052710  000010                    BIS     #MSTCK, @R0     ;SET SECTOR CLOCK
9610  056446  042710  000010                    BIC     #MSTCK, @R0     ;CLEAR SECTOR CLOCK
9611  056452  052710  000010                    BIS     #MSTCK, @R0     ;SET SECTOR CLOCK
9612  056456  042710  000010                    BIC     #MSTCK, @R0     ;CLEAR SECTOR CLOCK
9613                                                                    ;THE ABOVE TWO SECTOR CLOCKS ARE GIVEN FOR
9614                                                                    ;RESETING SECTOR PULSE
9615                                                                    ;IN CASE IT STARTS SET
```

```
 9616  056462  052710  000014                BIS     #MINX!MSTCK,@R0 ;SET INDEX AND SECTOR CLOCK
 9617  056466  042710  000014                BIC     #MINX!MSTCK,@R0 ;RESET INDEX AND SECTOR CLOCK
 9618  056472  005703                        TST     R3              ;TEST FOR SECTOR 0
 9619  056474  001461                        BEQ     7$              ;IF SECTOR 0 IS REQUIRED, EXIT ------>
 9620
 9621                                        ;NOW 304 WORDS WILL START (608 BYTES)
 9622
 9623                                ;*FOR FIRST BYTE MAINT. SECTOR CLOCK WILL GO HIGH, THEN MAINT. CLOCK WILL GO HIGH
 9624                                ;*BOTH WILL COME DOWN TOGETHER, THEN SEVEN MAINT. CLOCKS WILL BE GIVEN
 9625                                ;*FOR SECOND BYTE, AND ALL OTHER BYTES TILL NEXT SECTOR, SECTOR CLOCK
 9626                                ;*WILL BE IDENTICAL WITH ONE MAINT. CLOCK
 9627
 9629
 9629                                        ;ONE WORD ONLY
 9630
 9631  056476  012702  000010        1$:     MOV     #8.,    R2      ;BYTE COUNTER
 9632  056502  012705  000002                MOV     #2,     R5      ;BYTES PER WORD
 9633  056506  052710  000010                BIS     #MSTCK,@R0      ;SET SECTOR CLOCK
 9634  056512  052710  000002                BIS     #MCLK,@R0       ;SET MAINT. CLOCK
 9635  056516  000402                        BR      3$              ;BRANCH TO CLEAR SECTOR AND CLOCK
 9636  056520  052710  000012        2$:     BIS     #MSTCK!MCLK,@R0 ;SET BOTH CLOCKS
 9637  056524  042710  000012        3$:     BIC     #MSTCK!MCLK,@R0 ;CLEAR BOTH CLOCKS
 9638  056530  052710  000002        8$:     BIS     #MCLK,@R0       ;SET MAINT. CLOCK
 9639  056534  042710  000002                BIC     #MCLK,@R0       ;CLEAR MAINT.CLOCK
 9640  056540  005302                        DEC     R2              ;BYTE COUNTER
 9641  056542  001372                        BNE     8$              ;CONTINUE IF BYTE NOT COMPLETE
 9642
 9643  056544  012702  000007                MOV     #7,R2           ;SETUP FOR SECOND BYTE
 9644  056550  005305                        DEC     R5              ;IS WORD COMPLETE?
 9645  056552  001362                        BNE     2$              ;CONTINUE IF NOT COMPLETE
 9646                                                                ;TO GIVE SECTOR CLOCK AND MAINT. CLOCK
 9647
 9648
 9649                                        ;NOW 303 WORDS ARE LEFT AND ALL ARE IDENTICAL
 9650
 9651  056554  012701  000457                MOV     #303.,R1        ;WORDS PER SECTOR COUNTER
 9652  056560  012705  000002        4$:     MOV     #2,R5           ;BYTES PER WORD COUNTER
 9653  056564  012702  000007        5$:     MOV     #7,R2           ;BIT COUNTER (MAINT.CLOCK COUNTER)
 9654  056570  052710  000012                BIS     #MSTCK!MCLK,@R0 ;SET SECTOR CLOCK AND MAINT. CLOCK
 9655  056574  042710  000012                BIC     #MSTCK!MCLK,@R0 ;CLEAR CLOCKS
 9656  056600  052710  000002        6$:     BIS     #MCLK,@R0       ;SET MAINT. CLOCK
 9657  056604  042710  000002                BIC     #MCLK,@R0       ;RESET MAINT. CLOCK
 9658  056610  005302                        DEC     R2              ;IS BYTE COMPLETE ?
 9659  056612  001372                        BNE     6$              ;CONTINUE IF NOT COMPLETE
 9660
 9661  056614  005305                        DEC     R5              ;IS WORD COMPLETE ?
 9662  056616  001362                        BNE     5$              ;CONTINUE IF NOT
 9663
 9664  056620  005301                        DEC     R1              ;IS SECTOR COMPLETE ?
 9665  056622  001356                        BNE     4$              ;CONTINUE IF NOT
 9666
 9667  056624  052710  000010                BIS     #MSTCK,@R0      ;SET SECTOR CLOCK 1 MORE TIME (FOR 609)
 9668  056630  042710  000010                BIC     #MSTCK,@R0      ;CLEAR SECTOR CLOCK
 9669  056634  005303                        DEC     R3              ;IS REQUIRED NO OF SECTORS COMPLETE ?
```

```
 9670  056636  001317                          BNE     1$              ;CONTINUE IF NOT
 9671
 9672  056640                          7$:
 9673  056640  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
 9674  056642  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
 9675  056644  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
 9676  056646  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
 9677  056650  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 9678  056652  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
 9679  056654  000201                          RTS     R1
 9680
 9681
 9682                          ;;*****************************************************************
 9683                          ;*READ ONE SECTOR OF DATA
 9684                          ;;*****************************************************************
 9685
 9686  056656  000000          RNO:    0               ;NO. OF WORDS READ
 9687  056660  000000          RCOM:   0               ;EXTRA STORAGE
 9688
 9689
 9690
 9691  056662  012137  056656  REDATA: MOV     (R1)+,@#RNO     ;SAVE NO. OF WORDS ONLY FOR INFORMATION
 9692  056666  012137  056660          MOV     (R1)+,@#RCOM    ;EXTRA WORD ONLY FOR INFORMATION
 9693  056672  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 9694  056674  005737  015144          TST     @#TSECC         ;IS THIS AN ECC TEST
 9695  056700  001403                  BEQ     1$              ;BRANCH IF NO
 9696  056702  012737  177777  050374  MOV     #-1,@#TSECCG    ;THESE BITS ARE TO GENERATE ECC
 9697  056710  012702  000402  1$:     MOV     #258.,R2        ;256 WORDS PER SECTOR
 9698                                                          ;PLUS 2 ECC WORDS
 9699  056714  012703  054256          MOV     #DISK,R3        ;POINTE TO DISK SIMULATION
 9700  056720  012337  053250  2$:     MOV     (R3)+,@#WORD    ;READY TO READ CONTENTS
 9701  056724  004737  053254          JSR     PC,@#READ               ;READ
 9702  056730  005302                  DEC     R2              ;IS 256 WORDS DONE?
 9703  056732  001372                  BNE     2$              ;IF NOT BRANCH
 9704  056734  005737  015144          TST     @#TSECC         ;IS THIS AN ECC TEST
 9705  056740  001012                  BNE     4$              ;BRANCH OUT IF YES
 9706  056742  005037  050374          CLR     @#TSECCG        ;NO MORE ECC BITS ARE TO BE GENERATED
 9707  056746  012702  000017          MOV     #15.,R2         ;ONE DATA GAP, 14 TOLERANCE GAP
 9708  056752  012337  053250  3$:     MOV     (R3)+,@#WORD    ;READY TO READ CONTENTS OF WORD
 9709  056756  004737  053254          JSR     PC,@#READ       ;READ
 9710  056762  005302                  DEC     R2              ;COUNT
 9711  056764  001372                  BNE     3$              ;BRANCH IF 14 NOT DONE
 9712  056766                  4$:
 9713  056766  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
 9714  056770  000201                  RTS     R1              ;RETURN
```

```
 9715                                   ;;*****************************************************************
 9716  056772                           RPVECT:
 9717  056772  104400  057000                   TYPE    ,65$                ;;TYPE ASCIZ STRING
 9718  056776  000423                           BR      64$                 ;;GET OVER THE ASCIZ
 9719                                   ;;65$:  .ASCIZ  /UNEXPECTED RP04 INTERRUPT FROM PC = /
 9720  057046                           64$:
 9721  057046  104401                           TYPOC                       ;TYPE FROM PC
 9722  057050  012777  056772  135670           MOV     #RPVECT,@RPVEC      ;RESTORE TRAP RP04 VECTOR
 9723  057056  000000                           HALT                        ;CHANGE TO CONTINUE
 9724                                   ;;*****************************************************************
 9725
```

```
                                        .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

                                $SCOPE:
                                        CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
                                        CLR     @#NOSYNC        ;CLEAR FLAG FOR HEADER ERROR COMMANDS
                                        CLR     @#TSECC         ;CLEAR FLAG FOR ECC TEST
                                                                ;WHEN =177777 IT IS AN ECC TEST
                                                                ;WHEN =0 IT IS NOT AN ECC TEST

                                        CLR     @#TSECCG        ;EVEN IN AN ECC TEST EVERY CLOCK
                                                                ;IS NOT TO GENERATE ECC
                                                                ;IF =177777 GENERATE ECC
                                                                ;IF =0 DO NOT GENERATE ECC
                                        CLR     @#TESDTE        ;DRIVE TIMING ERROR TEST
                                1$:
                                1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
                                        BNE     $OVER           ;;YES IF SW14=1
                                ;#####START OF CODE FOR THE XOR TESTER#####
                                $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                                ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
                                        MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
                                        MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
                                        TST     @#177060        ;;TIME OUT ON XOR?
                                        MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
                                        BR      $SVLAD          ;;GO TO THE NEXT TEST
                                5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
                                        MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
                                        BR      7$              ;;LOOP ON THE PRESENT TEST
                                6$:;#####END OF CODE FOR THE XOR TESTER#####
                                        BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
                                        BEQ     2$              ;;BR IF NO
                                        CMPB    @SWR,$TSTNM     ;;ON THE RIGHT TEST?    SWR<7:0>
                                        BEQ     $OVER           ;;BR IF YES
                                2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
                                        BEQ     3$              ;;BR IF NO
                                        CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
```

```
 9780  057204  101015                        BHI     3$              ;;BR IF NO
 9781  057206  032777  001000  121724        BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
 9782  057214  001404                        BEQ     4$              ;;BR IF NO
 9783  057216  013737  001110  001106  7$:   MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
 9784  057224  000443                        BR      $OVER
 9785  057226  105037  001103          4$:   CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
 9786  057232  005037  001212                CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
 9787  057236  000415                        BR      1$              ;;ESCAPE TO THE NEXT TEST
 9788  057240  032777  004000  121672  3$:   BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
 9789  057246  001011                        BNE     1$              ;;BR IF YES
 9790  057250  005737  001100                TST     $PASS           ;;IF FIRST PASS OF PROGRAM
 9791  057254  001406                        BEQ     1$              ;;      INHIBIT ITERATIONS
 9792  057256  005237  001104                INC     $ICNT           ;;INCREMENT ITERATION COUNT
 9793  057262  023737  001212  001104        CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
 9794  057270  002021                        BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
 9795  057272  012737  000001  001104  1$:   MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
 9796  057300  013737  057350  001212        MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
 9797  057306  105237  001102          $SVLAD: INCB  $TSTNM          ;;COUNT TEST NUMBERS
 9798  057312  011637  001106                MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
 9799  057316  011637  001110                MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
 9800  057322  005037  001214                CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
 9801  057326  112737  000001  001115        MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
 9802  057334  013777  001102  121600  $OVER: MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
 9803  057342  013716  001106                MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
 9804  057346  000002                        RTI                     ;;FIXES PS
 9805  057350  000004          $MXCNT: 4                             ;;MAX. NUMBER OF ITERATIONS
```

```
 9806                                   .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
 9807
 9808                                   ;;*****************************************************************
 9809                                   ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
 9810                                   ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
 9811                                   ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
 9812                                   ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
 9813                                   ;*REPLACED WITH SPACES.
 9814                                   ;*CALL:
 9815                                   ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
 9816                                   ;*      TYPDS                   ;;GO TO THE ROUTINE
 9817
 9818  057352                           $TYPDS:
 9819  057352  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 9820  057354  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 9821  057356  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 9822  057360  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 9823  057362  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
 9824  057364  012746  020200                  MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
 9825  057370  016605  000020                  MOV     20(SP),R5       ;;GET THE INPUT NUMBER
 9826  057374  100004                          BPL     1$              ;;BR IF INPUT IS POS.
 9827  057376  005405                          NEG     R5              ;;MAKE THE BINARY NUMBER POS.
 9828  057400  112766  000055  000001          MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
 9829  057406  005000                  1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
 9830  057410  012703  057566                  MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
 9831  057414  112723  000040                  MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
 9832  057420  005002                  2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
 9833  057422  016001  057556                  MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
 9834  057426  160105                  3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
 9835  057430  002402                          BLT     4$              ;;BR IF DONE
 9836  057432  005202                          INC     R2              ;;INCREASE THE BCD DIGIT BY 1
 9837  057434  000774                          BR      3$
 9838  057436  060105                  4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
 9839  057440  005702                          TST     R2              ;;CHECK IF BCD DIGIT=0
 9840  057442  001002                          BNE     5$              ;;FALL THROUGH IF 0
 9841  057444  105716                          TSTB    (SP)            ;;STILL DOING LEADING 0'S?
 9842  057446  100407                          BMI     7$              ;;BR IF YES
 9843  057450  106316                  5$:     ASLB    (SP)            ;;MSD?
 9844  057452  103003                          BCC     6$              ;;BR IF NO
 9845  057454  116663  000001  177777          MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
 9846  057462  052702  000060          6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
 9847  057466  052702  000040          7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
 9848  057472  110223                          MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
 9849  057474  005720                          TST     (R0)+           ;;JUST INCREMENTING
 9850  057476  020027  000010                  CMP     R0,#10          ;;CHECK THE TABLE INDEX
 9851  057502  002746                          BLT     2$              ;;GO DO THE NEXT DIGIT
 9852  057504  003002                          BGT     8$              ;;GO TO EXIT
 9853  057506  010502                          MOV     R5,R2           ;;GET THE LSD
 9854  057510  000764                          BR      6$              ;;GO CHANGE TO ASCII
 9855  057512  105726                  8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
 9856  057514  100003                          BPL     9$              ;;BR IF NO
 9857  057516  116663  177777  177776          MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
 9858  057524  105013                  9$:     CLRB    (R3)            ;;SET THE TERMINATOR
 9859  057526  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
```

```
 9860  057530  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
 9861  057532  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
 9862  057534  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 9863  057536  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
 9864  057540  104400  057566                  TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
 9865  057544  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
 9866  057552  012616                          MOV     (SP)+,(SP)
 9867  057554  000002                          RTI                     ;;RETURN TO USER
 9868  057556  023420                  $DTBL:  10000.
 9869  057560  001750                          1000.
 9870  057562  000144                          100.
 9871  057564  000012                          10.
 9872  057566  000004                  $DBLK:  .BLKW   4
```

```
 9873                                   .SBTTL  TYPE ROUTINE
 9874
 9875                                   ;;*****************************************************************
 9876                                   ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
 9877                                   ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
 9878                                   ;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
 9879                                   ;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
 9880                                   ;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
 9881                                   ;*
 9882                                   ;*CALL:
 9883                                   ;*1) USING A TRAP INSTRUCTION
 9884                                   ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
 9885                                   ;*OR
 9886                                   ;*      TYPE
 9887                                   ;*      MESADR
 9888                                   ;*
 9889
 9890  057576  105737  001157  $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
 9891  057602  100002                   BPL     1$              ;;BR IF YES
 9892  057604  000000                   HALT                    ;;HALT HERE IF NO TERMINAL
 9893  057606  000407                   BR      3$              ;;LEAVE
 9894  057610  010046          1$:      MOV     R0,-(SP)        ;;SAVE R0
 9895  057612  017600  000002          MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
 9896  057616  112046          2$:      MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
 9897  057620  001005                   BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
 9898  057622  005726                   TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
 9899  057624  012600          60$:     MOV     (SP)+,R0        ;;RESTORE R0
 9900  057626  062716  000002  3$:      ADD     #2,(SP)         ;;ADJUST RETURN PC
 9901  057632  000002                   RTI                     ;;RETURN
 9902  057634  122716  000011  4$:      CMPB    #HT,(SP)        ;;BRANCH IF <HT>
 9903  057640  001430                   BEQ     8$
 9904  057642  122716  000200          CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
 9905  057646  001006                   BNE     5$
 9906  057650  005726                   TST     (SP)+           ;;POP  <CR><LF> EQUIV
 9907  057652  104400                   TYPE                    ;;TYPE A CR AND LF
 9908  057654  001223                   $CRLF
 9909  057656  105037  060012          CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
 9910  057662  000755                   BR      2$              ;;GET NEXT CHARACTER
 9911  057664  004737  057746  5$:      JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
 9912  057670  123726  001156  6$:      CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
 9913  057674  001350                   BNE     2$              ;;IF NO GO GET NEXT CHAR.
 9914  057676  013746  001154          MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
 9915                                                          ;;AND THE NULL CHAR.
 9916  057702  105366  000001  7$:      DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
 9917  057706  002770                   BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
 9918  057710  004737  057746          JSR     PC,$TYPEC       ;;GO TYPE A NULL
 9919  057714  105337  060012          DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
 9920  057720  000770                   BR      7$              ;;LOOP
 9921
 9922                                   ;HORIZONTAL TAB PROCESSOR
 9923
 9924  057722  112716  000040  8$:      MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
 9925  057726  004737  057746  9$:      JSR     PC,$TYPEC       ;;TYPE A SPACE
 9926  057732  132737  000007  060012   BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
```

```
 9927  057740  001372                          BNE     9$              ;;TAB STOP
 9928  057742  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
 9929  057744  000724                          BR      2$              ;;GET NEXT CHARACTER
 9930  057746  105777  121176          $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
 9931  057752  100375                          BPL     $TYPEC
 9932  057754  116677  000002  121170        MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
 9933  057762  122766  000015  000002        CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
 9934  057770  001003                          BNE     1$              ;;BRANCH IF NO
 9935  057772  105037  060012                CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
 9936  057776  000406                          BR      $TYPEX          ;;EXIT
 9937  060000  122766  000012  000002  1$:   CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
 9938  060006  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
 9939  060010  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
 9940  060012  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
 9941  060014  000207          $TYPEX: RTS     PC
 9942
```

```
 9943                                   .SBTTL  TTY INPUT ROUTINE
 9944
 9945                                   ;;*********************************************************************
 9946                                   .ENABL  LSB
 9947  060016  000000                   $TKCNT: .WORD   0               ;;NUMBER OF ITEMS IN QUEUE
 9948  060020  000000                   $TKQIN: .WORD   0               ;;INPUT POINTER
 9949  060022  000000                   $TKQOUT: .WORD  0               ;;OUTPUT POINTER
 9950  060024  000011                   $TKQSRT: .BLKB  9.              ;;TTY KEYBOARD QUEUE
 9951          060035                   $TKQEND=.
 9952          060036                   .EVEN
 9953
 9954                                   ;*TK INITIALIZE ROUTINE
 9955                                   ;*THIS ROUTINE WILL INITIALIZE THE TTY KEYBOARD INPUT QUEUE
 9956                                   ;*SETUP THE INTERRUPT VECTOR AND TURN ON THE KEYBOARD INTERRUPT
 9957                                   ;
 9958                                   ;*CALL:
 9959                                   ;*      JSR     PC,$TKINT
 9960                                   ;*      RETURN
 9961                                   ;
 9962  060036  005037  060016           $TKINT: CLR     $TKCNT          ;;CLEAR COUNT OF ITEMS IN QUEUE
 9963  060042  012737  060024  060020           MOV     #$TKQSRT,$TKQIN ;;MOVE THE STARTING ADDRESS OF THE
 9964  060050  013737  060020  060022           MOV     $TKQIN,$TKQOUT  ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
 9965  060056  012737  060106  000060           MOV     #$TKSRV,@#TKVEC ;;INITIALIZE THE KEYBOARD VECTOR
 9966  060064  012737  000200  000062           MOV     #200,@#TKVEC+2  ;;"BR" LEVEL 4
 9967  060072  005777  121050                   TST     @$TKB           ;;CLEAR DONE FLAG
 9968  060076  012777  000100  121040           MOV     #100,@$TKS      ;;ENABLE TTY KEYBOARD INTERRUPT
 9969  060104  000207                           RTS     PC              ;;RETURN TO CALLER
 9970
 9971                                   ;*TK SERVICE ROUTINE
 9972                                   ;*THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT
 9973                                   ;*BY READING THE CHARACTER FROM THE INPUT BUFFER AND PUTTING
 9974                                   ;*IT IN THE QUEUE.
 9975                                   ;*IF THE CHARACTER IS A "CONTROL-C" (↑C) $TKINT IS CALLED AND
 9976                                   ;*UPON RETURN EXIT IS MADE TO THE "CONTROL-C" RESTART ADDRESS (OPERSEL)
 9977                                   ;
 9978  060106  117746  121034           $TKSRV: MOVB    @$TKB,-(SP)     ;;PICKUP THE CHARACTER
 9979  060112  042716  177600                   BIC     #↑C177,(SP)     ;;STRIP THE JUNK
 9980  060116  021627  000003                   CMP     (SP),#3         ;;IS IT A CONTROL C?
 9981  060122  001007                           BNE     1$              ;;BRANCH IF NO
 9982  060124  104400  061075                   TYPE    ,$CNTLC         ;;TYPE A CONTROL-C (↑C)
 9983  060130  004737  060036                   JSR     PC,$TKINT       ;;INIT THE KEYBOARD
 9984  060134  005726                           TST     (SP)+           ;;CLEAN UP STACK
 9985  060136  000137  044614                   JMP     OPERSEL         ;;CONTROL C RESTART
 9986  060142  021627  000007           1$:     CMP     (SP),#7         ;;IS IT A CONTROL G?
 9987  060146  001004                           BNE     2$              ;;BRANCH IF NO
 9988  060150  022737  000176  001140           CMP     #SWREG,SWR      ;;IS SOFT-SWR SELECTED?
 9989  060156  001500                           BEQ     6$              ;;GO TO SWR CHANGE
 9990
 9991  060160                           2$:
 9992  060160  022737  000011  060016           CMP     #9.,$TKCNT      ;;IS THE QUEUE FULL?
 9993  060166  001004                           BNE     3$              ;;BRANCH IF NO
 9994  060170  104400  001216                   TYPE    ,$BELL          ;;RING THE TTY BELL
 9995  060174  005726                           TST     (SP)+           ;;CLEAN CHARACTER OFF OF STACK
 9996  060176  000451                           BR      5$              ;;EXIT
```

```
 9997  060200  021627  000023          3$:   CMP   (SP),#23        ;;IS IT A CONTROL-S?
 9998  060204  001021                        BNE   32$             ;;BRANCH IF NO
 9999  060206  005077  120732              CLR   @$TKS            ;;DISABLE TTY KEYBOARD INTERRUPTS
10000  060212  005726                        TST   (SP)+            ;;CLEAN CHAR OFF STACK
10001  060214  105777  120724          31$:  TSTB  @$TKS            ;;WAIT FOR A CHAR
10002  060220  100375                        BPL   31$              ;;LOOP UNTIL ITS THERE
10003  060222  117746  120720              MOVB  @$TKB,-(SP)      ;;GET THE CHARACTER
10004  060226  042716  177600              BIC   #^C177,(SP)      ;;MAKE IT 7-BIT ASCII
10005  060232  022627  000021              CMP   (SP)+,#21        ;;IS IT A CONTROL-Q?
10006  060236  001366                        BNE   31$              ;;BRANCH IF NO
10007  060240  012777  000100  120676      MOV   #100,@$TKS       ;;REENABLE TTY KEYBOARD INTERRUPTS
10008  060246  000002                        RTI                    ;;RETURN
10009  060250  005237  060016          32$:  INC   $TKCNT           ;;COUNT THIS CHARACTER
10010  060254  021627  000140              CMP   (SP),#140        ;;IS IT UPPER CASE?
10011  060260  002405                        BLT   4$               ;;BRANCH IF YES
10012  060262  021627  000175              CMP   (SP),#175        ;;IS IT A SPECIAL CHAR?
10013  060266  003002                        BGT   4$               ;;BRANCH IF YES
10014  060270  042716  000040              BIC   #40,(SP)         ;;MAKE IT UPPER CASE
10015  060274  112677  177520          4$:   MOVB  (SP)+,@$TKQIN    ;;AND PUT IT IN QUEUE
10016  060300  005237  060020              INC   $TKQIN           ;;UPDATE THE POINTER
10017  060304  023727  060020  060035      CMP   $TKQIN,#$TKQEND  ;;GO OFF THE END?
10018  060312  001003                        BNE   5$               ;;BRANCH IF NO
10019  060314  012737  060024  060020      MOV   #$TKQSRT,$TKQIN  ;;RESET THE POINTER
10020  060322  000002                  5$:   RTI                    ;;RETURN
10021
10022                                  ;;*****************************************************************
10023                                  ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
10024                                  ;*ROUTINE IS ENTERED  FROM THE TRAP HANDLER, AND WILL
10025                                  ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP
10026                                  ;*CALL WHEN OPERATING IN TTY INTERRUPT MODE.
10027  060324  022737  000176  001140  $CKSWR: CMP   #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED
10028  060332  001124                        BNE   15$              ;;EXIT IF NOT
10029  060334  105777  120604              TSTB  @$TKS            ;;IS A CHAR WAITING?
10030  060340  100121                        BPL   15$              ;;IF NOT, EXIT
10031  060342  117746  120600              MOVB  @$TKB,-(SP)      ;;YES
10032  060346  042716  177600              BIC   #^C177,(SP)      ;;MAKE IT  7-BIT ASCII
10033  060352  021627  000007              CMP   (SP),#7          ;;IS IT A CONTROL-G?
10034  060356  001300                        BNE   2$               ;;IF NOT, PUT IT IN THE TTY QUEUE
10035                                                               ;;AND EXIT
10036
10037                                  ;;*****************************************************************
10038                                  ;*CONTROL IS PASSED TO THIS POINT FROM EITHER THE TTY INTERRUPT SERVICE
10039                                  ;*ROUTINE OR FROM THE SOFTWARE SWITCH REGISTER TRAP CALL, AS A RESULT OF A
10040                                  ;*CONTROL-G BEING TYPED, AND THE SOFTWARE SWITCH REGISTER BEING SELECTED.
10041  060360  123727  001134  000001  6$:   CMPB  $AUTOB,#1        ;;ARE WE RUNNING IN AUTO-MODE?
10042  060366  001674                        BEQ   2$               ;;BRANCH IF YES
10043  060370  005726                        TST   (SP)+            ;;CLEAR CONTROL-G OFF STACK
10044  060372  004737  060036              JSR   PC,$TKINT        ;;FLUSH THE TTY INPUT QUEUE
10045  060376  005077  120542              CLR   @$TKS            ;;DISABLE TTY KEYBOARD INTERRUPTS
10046  060402  112737  000001  001135      MOVB  #1,$INTAG        ;;SET INTERRUPT MODE INDICATOR
10047
10048  060410  104400  061107              TYPE  ,$CNTLG          ;;ECHO THE CONTROL-G (^G)
10049  060414  104400  061114          $GTSWR: TYPE  ,$MSWR       ;;TYPE CURRENT CONTENTS
10050  060420  013746  000176              MOV   $WREG,-(SP)      ;;SAVE SWREG FOR TYPEOUT
```

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10051  060424  104401                        TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
10052  060426  104400  061125                TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
10053  060432  005046                19$:     CLR     -(SP)           ;;CLEAR COUNTER
10054  060434  005046                        CLR     -(SP)           ;;THE NEW SWR
10055  060436  105777  120502        7$:     TSTB    @$TKS           ;;CHAR THERE?
10056  060442  100375                        BPL     7$              ;;IF NOT TRY AGAIN
10057
10058  060444  117746  120476                MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
10059  060450  042716  177600                BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
10060
10061  060454  021627  000003                CMP     (SP),#3         ;;IS IT A CONTROL-C?
10062  060460  001015                        BNE     9$              ;;BRANCH IF NOT
10063  060462  104400  061075                TYPE    ,$CNTLC         ;;YES, ECHO CONTROL-C (^C)
10064  060466  062706  000006                ADD     #6,SP           ;;CLEAN UP STACK
10065  060472  123727  001135  000001        CMPB    $INTAG,#1       ;;REENABLE TTY KEYBOARD INTERRUPTS?
10066  060500  001003                        BNE     8$              ;;BRANCH IF NO
10067  060502  012777  000100  120434        MOV     #100,@$TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
10068  060510  000137  044614        8$:     JMP     OPERSEL         ;;CONTROL-C RESTART
10069
10070
10071  060514  021627  000025        9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
10072  060520  001005                        BNE     10$             ;;BRANCH IF NOT
10073  060522  104400  061102                TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
10074  060526  062706  000006        20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
10075  060532  000737                        BR      19$             ;;LET'S TRY IT AGAIN
10076
10077
10078  060534  021627  000015        10$:    CMP     (SP),#15        ;;IS IT A <CR>?
10079  060540  001022                        BNE     16$             ;;BRANCH IF NO
10080  060542  005766  000004                TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
10081  060546  001403                        BEQ     11$             ;;BRANCH IF YES
10082  060550  016677  000002  120362        MOV     2(SP),@SWR      ;;SAVE NEW SWR
10083  060556  062706  000006        11$:    ADD     #6,SP           ;;CLEAR UP STACK
10084  060562  104400  001223        14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
10085  060566  123727  001135  000001        CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
10086  060574  001003                        BNE     15$             ;;BRANCH IF NOT
10087  060576  012777  000100  120340        MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
10088  060604  000002                15$:    RTI                     ;;RETURN
10089  060606  004737  057746        16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
10090  060612  021627  000060                CMP     (SP),#60        ;;CHAR < 0?
10091  060616  002420                        BLT     18$             ;;BRANCH IF YES
10092  060620  021627  000067                CMP     (SP),#67        ;;CHAR > 7?
10093  060624  003015                        BGT     18$             ;;BRANCH IF YES
10094  060626  042726  000060                BIC     #60,(SP)+       ;;STRIP-OFF ASCII
10095  060632  005766  000002                TST     2(SP)           ;;IS THIS THE FIRST CHAR
10096  060636  001403                        BEQ     17$             ;;BRANCH IF YES
10097  060640  006316                        ASL     (SP)            ;;NO, SHIFT PRESENT
10098  060642  006316                        ASL     (SP)            ;;    CHAR OVER TO MAKE
10099  060644  006316                        ASL     (SP)            ;;    ROOM FOR NEW ONE.
10100  060646  005266  000002        17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
10101  060652  056616  177776                BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
10102  060656  000667                        BR      7$              ;;GET THE NEXT ONE
10103  060660  104400  001222        18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
10104  060664  000720                        BR      20$             ;;SIMULATE CONTROL-U
```

```
10105                                   .DSABL  LSB
10106
10107
10108                                   ;;*****************************************************************
10109                                   ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
10110                                   ;*CALL:
10111                                   ;*      RDCHR                   ;;GET A CHARACTER FROM THE QUEUE
10112                                   ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
10113                                   ;*                              ;;WITH PARITY BIT STRIPPED OFF
10114                                   ;
10115
10116  060656  011646                   $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC AND
10117  060660  016666  000004  000002           MOV     4(SP),2(SP)     ;;THE PS
10118  060666  005066  000004                   CLR     4(SP)           ;;GET READY FOR A CHARACTER
10119  060672  005046                           CLR     -(SP)           ;;PUT NEW PS ON STACK
10120  060674  012746  060702                   MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
10121  060700  000002                           RTI                     ;;POP NEW PC AND PS
10122  060702                           64$:
10123  060702  005737  060016           1$:     TST     $TKCNT          ;;WAIT ON A CHARACTER
10124  060706  001775                           BEQ     1$
10125  060710  005337  060016                   DEC     $TKCNT          ;;DECREMENT THE COUNTER
10126  060714  117766  177072  000004           MOVB    @$TKQOUT,4(SP)  ;;GET ONE CHARACTER
10127  060722  005237  060022                   INC     $TKQOUT         ;;UPDATE THE POINTER
10128  060726  023727  060022  060035           CMP     $TKQOUT,#$TKQEND ;;DID IT GO OFF OF THE END?
10129  060734  001003                           BNE     2$              ;;BRANCH IF NO
10130  060736  012737  060024  060022           MOV     #$TKQSRT,$TKQOUT ;;RESET THE POINTER
10131  060744  000002                   2$:     RTI                     ;;RETURN
10132                                   ;;*****************************************************************
10133                                   ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
10134                                   ;*CALL:
10135                                   ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
10136                                   ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
10137                                   ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
10138
10139  060746  010346                   $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
10140  060750  012703  061064           1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
10141  060754  022703  061075           2$:     CMP     #$TTYIN+9.,R3   ;;BUFFER FULL?
10142  060760  101405                           BLOS    4$              ;;BR IF YES
10143  060762  104407                           RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
10144  060764  112613                           MOVB    (SP)+,(R3)      ;;GET CHARACTER
10145  060766  122713  000177           10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
10146  061002  001003                           BNE     3$              ;;SKIP IF NOT
10147  061004  104400  001222           4$:     TYPE    ,$QUES          ;;TYPE A '?'
10148  061010  000763                           BR      1$              ;;CLEAR THE BUFFER AND LOOP
10149  061012  111337  061062           3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
10150  061016  104400  061062                   TYPE    ,9$
10151  061022  122723  000015                   CMPB    #15,(R3)+       ;;CHECK FOR RETURN
10152  061026  001356                           BNE     2$              ;;LOOP IF NOT RETURN
10153  061030  105063  177777                   CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
10154  061034  104400  001224                   TYPE    ,$LF            ;;TYPE A LINE FEED
10155  061040  012603                           MOV     (SP)+,R3        ;;RESTORE R3
10156  061042  011646                           MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
10157  061044  016666  000004  000002           MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
10158  061052  012766  061064  000004           MOV     #$TTYIN,4(SP)
```

```
10159  061060  000002                          RTI                     ;;RETURN
10160  061062     000          9$:             .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
10161  061063     000                          .BYTE   0               ;;TERMINATOR
10162  061064  000011          $TTYIN:         .BLKB   9.              ;;RESERVE 9. BYTES FOR TTY INPUT
10163  061075     136  006503  000012  $CNTLC: .ASCIZ  /↑C/<15><12>    ;;CONTROL "C"
10164  061102  052536  005015     000  $CNTLU: .ASCIZ  /↑U/<15><12>    ;;CONTROL "U"
10165  061107     136  006507  000012  $CNTLG: .ASCIZ  /↑G/<15><12>    ;;CONTROL "G"
10166  061114  005015  053523  020122  $MSWR:  .ASCIZ  <15><12>/SWR = /
10167  061122  020075     000
10168  061125     040  047040  053505  $MNEW:  .ASCIZ  /  NEW = /
10169  061132  036440  000040
10170                                                          ;FROM THE TTY
```

```
10171                                   .SBTTL  READ AN OCTAL NUMBER FROM THE TTY
10172
10173                                   ;;*****************************************************************
10174                                   ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
10175                                   ;*CHANGE IT TO BINARY.
10176                                   ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
10177                                   ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
10178                                   ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
10179                                   ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
10180                                   ;*CALL:
10181                                   ;*      RDOCT                   ;;READ AN OCTAL NUMBER
10182                                   ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
10183                                   ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT
10184
10185  061136  011646                   $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
10186  061140  016666  000004  000002           MOV     4(SP),2(SP)     ;;INPUT NUMBER
10187  061146  010046                           MOV     R0,-(SP)        ;;PUSH R0 ON STACK
10188  061150  010146                           MOV     R1,-(SP)        ;;PUSH R1 ON STACK
10189  061152  010246                           MOV     R2,-(SP)        ;;PUSH R2 ON STACK
10190  061154  104410                   1$:     RDLIN                   ;;READ AN ASCIZ LINE
10191  061156  012600                           MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
10192  061160  010037  061264                   MOV     R0,5$           ;;AND SAVE IT
10193  061164  005001                           CLR     R1              ;;CLEAR DATA WORD
10194  061166  005002                           CLR     R2
10195  061170  112046                   2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
10196  061172  001420                           BEQ     3$              ;;IF ZERO GET OUT
10197  061174  122716  000060                   CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
10198  061200  003026                           BGT     4$              ;;IS AN OCTAL DIGIT
10199  061202  122716  000067                   CMPB    #'7,(SP)
10200  061206  002423                           BLT     4$
10201  061210  006301                           ASL     R1              ;;*2
10202  061212  006102                           ROL     R2
10203  061214  006301                           ASL     R1              ;;*4
10204  061216  006102                           ROL     R2
10205  061220  006301                           ASL     R1              ;;*8
10206  061222  006102                           ROL     R2
10207  061224  042716  177770                   BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
10208  061230  062601                           ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
10209  061232  000756                           BR      2$              ;;LOOP
10210  061234  005726                   3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
10211  061236  010166  000012                   MOV     R1,12(SP)       ;;SAVE THE RESULT
10212  061242  010237  061274                   MOV     R2,$HIOCT
10213  061246  012602                           MOV     (SP)+,R2        ;;POP STACK INTO R2
10214  061250  012601                           MOV     (SP)+,R1        ;;POP STACK INTO R1
10215  061252  012600                           MOV     (SP)+,R0        ;;POP STACK INTO R0
10216  061254  000002                           RTI                     ;;RETURN
10217  061256  005726                   4$:     TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
10218  061260  105010                           CLRB    (R0)            ;;SET A TERMINATOR
10219  061262  104400                           TYPE                    ;;TYPE UP THRU THE BAD CHAR.
10220  061264  000000                   5$:     .WORD   0
10221  061266  104400  001222                   TYPE    ,$QUES          ;;"?" "CR" & "LF"
10222  061272  000730                           BR      1$              ;;TRY AGAIN
10223  061274  000000                   $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
```

```
10224                                   .SBTTL  ERROR HANDLER ROUTINE
10225
10226                                   ;;**********************************************************************
10227                                   ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
10228                                   ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
10229                                   ;*AND GO TO $ERRTYP ON ERROR
10230                                   ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
10231                                   ;*SW15=1        HALT ON ERROR
10232                                   ;*SW13=1        INHIBIT ERROR TYPEOUTS
10233                                   ;*SW10=1        BELL ON ERROR
10234                                   ;*SW09=1        LOOP ON ERROR
10235                                   ;*CALL
10236                                   ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
10237
10238  061276                           $ERROR:
10239  061276  104406                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
10240
10241  061300  012737  177777  015126          MOV     #-1,@#ERFLG$    ;SET ERROR FLAG
10242  061306                           REGSA1:
10243
10244
10245  061306  105237  001103          7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
10246  061312  001775                          BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
10247  061314  013777  001102  117620          MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
10248  061322  032777  002000  117610          BIT     #BIT10,@SWR     ;;BELL ON ERROR?
10249  061330  001402                          BEQ     1$              ;;NO - SKIP
10250  061332  104400  001216                  TYPE    ,$BELL          ;;RING BELL
10251  061336  005237  001112          1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
10252  061342  011637  001116                  MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
10253  061346  162737  000002  001116          SUB     #2,$ERRPC
10254  061354  117737  117536  001114          MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
10255  061362  032777  020000  117550          BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
10256  061370  001004                          BNE     20$             ;;SKIP TYPEOUTS
10257  061372  004737  061444                  JSR     PC,$ERRTYP      ;;GO TO USER ERROR ROUTINE
10258  061376  104400  001223                  TYPE    ,$CRLF
10259  061402                           20$:
10260  061402  005777  117532          2$:     TST     @SWR            ;;HALT ON ERROR
10261  061406  100002                          BPL     3$              ;;SKIP IF CONTINUE
10262  061410  000000                          HALT                    ;;HALT ON ERROR!
10263  061412  104406                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
10264  061414  032777  001000  117516  3$:     BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
10265  061422  001402                          BEQ     4$              ;;BR IF NO
10266  061424  013716  001110                  MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
10267  061430  005737  001214          4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
10268  061434  001402                          BEQ     5$              ;;BR IF NONE
10269  061436  013716  001214                  MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
10270  061442                           5$:
10271  061442  000002                          RTI                     ;;RETURN
```

```
10272                                   .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE
10273
10274                                   ;;*****************************************************************
10275                                   ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
10276                                   ;*ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE "ERROR TABLE" ($ERRTB),
10277                                   ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.
10278
10279  061444                           $ERRTYP:
10280  061444  104400  001223                   TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
10281  061450  010046                           MOV     R0,-(SP)        ;;SAVE R0
10282  061452  005000                           CLR     R0              ;;PICKUP THE ITEM INDEX
10283  061454  153700  001114                   BISB    @#$ITEMB,R0
10284  061460  001004                           BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
10285                                                                   ;;TYPE THE PC OF THE ERROR
10286  061462  013746  001116                   MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
10287                                                                   ;;ERROR ADDRESS
10288  061466  104401                           TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
10289  061470  000445                           BR      10$             ;;GET OUT
10290  061472  005300                   1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
10291  061474  006300                           ASL     R0              ;;      WORK FOR THE ERROR TABLE
10292  061476  006300                           ASL     R0
10293  061500  006300                           ASL     R0
10294  061502  062700  001226                   ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
10295  061506  012037  061516                   MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
10296  061512  001404                           BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
10297  061514  104400                           TYPE                    ;;TYPE THE "ERROR MESSAGE"
10298  061516  000000                   2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
10299  061520  104400  001223                   TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
10300  061524  012037  061534           3$:     MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
10301  061530  001404                           BEQ     5$              ;;SKIP TYPEOUT IF 0
10302  061532  104400                           TYPE                    ;;TYPE THE "DATA HEADER"
10303  061534  000000                   4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
10304  061536  104400  001223                   TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
10305  061542  010146                   5$:     MOV     R1,-(SP)        ;;SAVE R1
10306  061544  012001                           MOV     (R0)+,R1        ;;PICKUP "DATA TABLE" POINTER
10307  061546  001415                           BEQ     9$              ;;BR IF NO DATA TO BE TYPED
10308  061550  012000                           MOV     (R0)+,R0        ;;PICKUP "DATA FORMAT" POINTER
10309  061552  105720                   6$:     TSTB    (R0)+           ;;"OCTAL" OR "DECIMAL"
10310  061554  001003                           BNE     7$              ;;BR IF DECIMAL
10311  061556  013146                           MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
10312  061560  104401                           TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
10313  061562  000402                           BR      8$
10314  061564                           7$:
10315  061564  013146                           MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
10316  061566  104404                           TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
10317  061570  005711                   8$:     TST     (R1)            ;;IS THERE ANOTHER NUMBER?
10318  061572  001403                           BEQ     9$              ;;BR IF NO
10319  061574  104400  061614                   TYPE    ,11$            ;;TYPE TWO(2) SPACES
10320  061600  000764                           BR      6$              ;;LOOP
10321
10322  061602  012601                   9$:     MOV     (SP)+,R1        ;;RESTORE R1
10323  061604  012600                   10$:    MOV     (SP)+,R0        ;;RESTORE R0
10324  061606  104400  001223                   TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
10325  061612  000207                           RTS     PC              ;;RETURN
```

```
10326  061614  020040      000          11$:    .ASCIZ  / /          ;;TWO(2) SPACES
10327          061620                           .EVEN
```

```
10328                                   .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
10329
10330                                   ;;*****************************************************************
10331                                   ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
10332                                   ;*OCTAL (ASCII) NUMBER AND TYPE IT.
10333                                   ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
10334                                   ;*CALL:
10335                                   ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
10336                                   ;*      TYPOS                   ;;CALL FOR TYPEOUT
10337                                   ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
10338                                   ;*      .BYTE   M               ;;M=1 OR 0
10339                                   ;*                                      ;;1=TYPE LEADING ZEROS
10340                                   ;*                                      ;;0=SUPPRESS LEADING ZEROS
10341                                   ;*
10342                                   ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
10343                                   ;*$TYPOS OR $TYPOC
10344                                   ;*CALL:
10345                                   ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
10346                                   ;*      TYPON                   ;;CALL FOR TYPEOUT
10347                                   ;*
10348                                   ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
10349                                   ;*CALL:
10350                                   ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
10351                                   ;*      TYPOC                   ;;CALL FOR TYPEOUT
10352
10353  061620  017646  000000         $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
10354  061624  116637  000001  062043         MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
10355  061632  112637  062045                 MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
10356  061636  062716  000002                 ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
10357  061642  000406                         BR      $TYPON
10358  061644  112737  000001  062043 $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
10359  061652  112737  000006  062045         MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
10360  061660  112737  000005  062042 $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
10361  061666  010346                         MOV     R3,-(SP)        ;;SAVE R3
10362  061670  010446                         MOV     R4,-(SP)        ;;SAVE R4
10363  061672  010546                         MOV     R5,-(SP)        ;;SAVE R5
10364  061674  113704  062045                 MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
10365  061700  005404                         NEG     R4
10366  061702  062704  000006                 ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
10367  061706  110437  062044                 MOVB    R4,$OMODE       ;;SAVE IT FOR USE
10368  061712  113704  062043                 MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
10369  061716  016605  000012                 MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
10370  061722  005003                         CLR     R3              ;;CLEAR THE OUTPUT WORD
10371  061724  006105                 1$:     ROL     R5              ;;ROTATE MSB INTO "C"
10372  061726  000404                         BR      3$              ;;GO DO MSB
10373  061730  006105                 2$:     ROL     R5              ;;FORM THIS DIGIT
10374  061732  006105                         ROL     R5
10375  061734  006105                         ROL     R5
10376  061736  010503                         MOV     R5,R3
10377  061740  006103                 3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
10378  061742  105337  062044                 DECB    $OMODE          ;;TYPE THIS DIGIT?
10379  061746  100016                         BPL     7$              ;;BR IF NO
10380  061750  042703  177770                 BIC     #177770,R3      ;;GET RID OF JUNK
10381  061754  001002                         BNE     4$              ;;TEST FOR 0
```

```
10382  061756  005704                          TST     R4          ;;SUPPRESS THIS 0?
10383  061760  001403                          BEQ     5$          ;;BR IF YES
10384  061762  005204                  4$:     INC     R4          ;;DON'T SUPPRESS ANYMORE 0'S
10385  061764  052703  000060                  BIS     #'0,R3      ;;MAKE THIS DIGIT ASCII
10386  061770  052703  000040          5$:     BIS     #' ,R3      ;;MAKE ASCII IF NOT ALREADY
10387  061774  110337  062040                  MOVB    R3,8$       ;;SAVE FOR TYPING
10388  062000  104400  062040                  TYPE    ,8$         ;;GO TYPE THIS DIGIT
10389  062004  105337  062042          7$:     DECB    $OCNT       ;;COUNT BY 1
10390  062010  003347                          BGT     2$          ;;BR IF MORE TO DO
10391  062012  002402                          BLT     6$          ;;BR IF DONE
10392  062014  005204                          INC     R4          ;;INSURE LAST DIGIT ISN'T A BLANK
10393  062016  000744                          BR      2$          ;;GO DO THE LAST DIGIT
10394  062020  012605                  6$:     MOV     (SP)+,R5    ;;RESTORE R5
10395  062022  012604                          MOV     (SP)+,R4    ;;RESTORE R4
10396  062024  012603                          MOV     (SP)+,R3    ;;RESTORE R3
10397  062026  016666  000002  000004          MOV     2(SP),4(SP) ;;SET THE STACK FOR RETURNING
10398  062034  012616                          MOV     (SP)+,(SP)
10399  062036  000002                          RTI                 ;;RETURN
10400  062040     000                  8$:     .BYTE   0           ;;STORAGE FOR ASCII DIGIT
10401  062041     000                          .BYTE   0           ;;TERMINATOR FOR TYPE ROUTINE
10402  062042     000          $OCNT:  .BYTE   0           ;;OCTAL DIGIT COUNTER
10403  062043     000          $OFILL: .BYTE   0           ;;ZERO FILL SWITCH
10404  062044  000000          $OMODE: .WORD   0           ;;NUMBER OF DIGITS TO TYPE
```

```
10405                                   .SBTTL  TRAP DECODER
10406
10407                                   ;;**************************************************************
10408                                   ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
10409                                   ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
10410                                   ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
10411                                   ;*GO TO THAT ROUTINE.
10412
10413  062046  010046                   $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
10414  062050  016600  000002                   MOV     2(SP),R0        ;;GET TRAP ADDRESS
10415  062054  005740                           TST     -(R0)           ;;BACKUP BY 2
10416  062056  111000                           MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
10417  062060  006300                           ASL     R0              ;;POSITION FOR INDEXING
10418  062062  016000  062070                   MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
10419  062066  000200                           RTS     R0              ;;GO TO ROUTINE
10420
10421                                   .SBTTL  TRAP TABLE
10422
10423                                   ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
10424                                   ;*BY THE "TRAP" INSTRUCTION.
10425
10426                                   ;       ROUTINE
10427                                   ;       -------
10428  062070                           $TRPAD:
10429  062070  057576                           $TYPE   ;;CALL=TYPE     TRAP+0(104400)  TTY TYPEOUT ROUTINE
10430  062072  061644                           $TYPOC  ;;CALL=TYPOC    TRAP+1(104401)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
10431  062074  061620                           $TYPOS  ;;CALL=TYPOS    TRAP+2(104402)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
10432  062076  061660                           $TYPON  ;;CALL=TYPON    TRAP+3(104403)  TYPE OCTAL NUMBER (AS PER LAST CALL)
10433  062100  057352                           $TYPDS  ;;CALL=TYPDS    TRAP+4(104404)  TYPE DECIMAL NUMBER (WITH SIGN)
10434
10435  062102  060414                           $GTSWR  ;;CALL=GTSWR    TRAP+5(104405)  GET SOFT-SWR SETTING
10436
10437  062104  060324                           $CKSWR  ;;CALL=CKSWR    TRAP+6(104406)  TEST FOR CHANGE IN SOFT-SWR
10438  062106  060666                           $RDCHR  ;;CALL=RDCHR    TRAP+7(104407)  TTY TYPEIN CHARACTER ROUTINE
10439  062110  060756                           $RDLIN  ;;CALL=RDLIN    TRAP+10(104410) TTY TYPEIN STRING ROUTINE
10440  062112  061136                           $RDOCT  ;;CALL=RDOCT    TRAP+11(104411) READ AN OCTAL NUMBER FROM TTY
10441  062114  045656                           T.SCOP  ;;CALL=SCOP1    TRAP+12(104412) MY LOCAL SCOPES
10442  062116  045730                           CHECKT  ;;CALL=CHECKD   TRAP+13(104413) CHECK DVA,RDY,DPR,DRY
10443  062120  046246                           WAIT.T  ;;CALL=WAT      TRAP+14(104414) WAIT LOOP
```

```
10444                                   .SBTTL  POWER DOWN AND UP ROUTINES
10445
10446                                   ;;*****************************************************************
10447                                   ;POWER DOWN ROUTINE
10448  062122  012737  062266  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
10449  062130  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
10450  062136  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
10451  062140  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
10452  062142  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
10453  062144  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
10454  062146  010446                         MOV     R4,-(SP)        ;;PUSH R4 ON STACK
10455  062150  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
10456  062152  017746  116762                 MOV     @$WR,-(SP)      ;;PUSH @$WR ON STACK
10457  062156  010637  062272                 MOV     SP,$SAVR6       ;;SAVE SP
10458  062162  012737  062174  000024         MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
10459  062170  000000                         HALT
10460  062172  000776                         BR      .-2             ;;HANG UP
10461
10462                                   ;;*****************************************************************
10463                                   ;POWER UP ROUTINE
10464  062174  012737  062266  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
10465  062202  013706  062272                 MOV     $SAVR6,SP       ;;GET SP
10466  062206  005037  062272                 CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
10467  062212  005237  062272          1$:    INC     $SAVR6          ;;WAIT FOR THE INC
10468  062216  001375                         BNE     1$              ;;OF  WORD
10469  062220  012677  116714                 MOV     (SP)+,@$WR      ;;POP STACK INTO @$WR
10470  062224  012605                         MOV     (SP)+,R5        ;;POP STACK INTO R5
10471  062226  012604                         MOV     (SP)+,R4        ;;POP STACK INTO R4
10472  062230  012603                         MOV     (SP)+,R3        ;;POP STACK INTO R3
10473  062232  012602                         MOV     (SP)+,R2        ;;POP STACK INTO R2
10474  062234  012601                         MOV     (SP)+,R1        ;;POP STACK INTO R1
10475  062236  012600                         MOV     (SP)+,R0        ;;POP STACK INTO R0
10476  062240  012737  062122  000024         MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
10477  062246  012737  000340  000026         MOV     #340,@#PWRVEC+2 ;;PRIO:7
10478  062254  104400                         TYPE                    ;REPORT THE POWER FAILURE
10479  062256  062274          $PWRMG: .WORD   $POWER                  ;;POWER FAIL MESSAGE POINTER
10480  062260  012716                         MOV     (PC)+,(SP)      ;;RESTART AT BEGIN
10481  062262  017356          $PWRAD: .WORD   BEGIN                   ;;RESTART ADDRESS
10482  062264  000002                         RTI
10483  062266  000000          $ILLUP: HALT                            ;;THE POWER UP SEQUENCE WAS STARTED
10484  062270  000776                         BR      .-2             ;; BEFORE THE POWER DOWN WAS COMPLETE
10485  062272  000000          $SAVR6: 0                               ;;PUT THE SP HERE
10486  062274  005015  047520  042527 $POWER: .ASCIZ   <15><12>"POWER"
10487  062302  000122
10488                                           .EVEN
10489
10490           000001                  .END
```

DZRJHA.SUB CROSS REFERENCE TABLE

```
ACL    = 000040          2243#
ACU    = 100000          2196#
AOE    = 001000          2112#
AS       015052          1692    1695    2329#   4345*   4357    4536*   4547    4684*   4694
ATA    = 100000          2100#   4342    4533    4681
ATABLE   017336          2429#   2848
ATTENT   015136          2364#   2808*   2848*   4345    4536    4684
ATO    = 000001          2134#
AT1    = 000002          2135#
AT2    = 000004          2136#
AT3    = 000010          2137#
AT4    = 000020          2138#
AT5    = 000040          2139#
AT6    = 000100          2140#
AT7    = 000200          2141#
A16    = 000400          2075#   4182
A17    = 001000          2076#   4182
BA       015030          1688    2318#   4338*   4521*   4526*   4670*   4674*
BAI    = 000010          2048#   4184    8149
BASECH   051320          2600    8542#
BEGIN    017356           191    2439#  10481
BEGIN2   017346           194    2437#
BITST    045442          2632    7431#
BIT0   = 000001           151#   7886    7921    7923
BIT00  = 000001           141#    151
BIT01  = 000002           140#    150
BIT02  = 000004           139#    149
BIT03  = 000010           138#    148
BIT04  = 000020           137#    147
BIT05  = 000040           136#    146
BIT06  = 000100           135#    145
BIT07  = 000200           134#    144
BIT08  = 000400           133#    143    9773
BIT09  = 001000           132#    142    9781   10264
BIT1   = 000002           150#   7900
BIT10  = 002000           131#  10248
BIT11  = 004000           130#   9788
BIT12  = 010000           129#
BIT13  = 020000           128#   7916    7918   10255
BIT14  = 040000           127#   7893    9759
BIT15  = 100000           126#   7888    7895    7902    7911    7913
BIT2   = 000004           149#
BIT3   = 000010           148#
BIT4   = 000020           147#
BIT5   = 000040           146#
BIT6   = 000100           145#
BIT7   = 000200           144#
BIT8   = 000400           143#
BIT9   = 001000           142#
BLT1     045470          7437#   7442
BLT2     045512          7437    7438   7444#
BLT3     045522          7445    7446#
BPTVEC= 000014            158#
CA       015046          2327#
```

CROSS REFERENCE TABLE

```
CC          015072  2337#
CHECKD=     104413  10442#
CHECKE      046120  4853   4992   5173   5352   5538   5687   5869   6043   6231   6370   6545   6721   6908
                    7100   7592#
CHECKT      045730  4177   4263   4440   4610   4843   4957   5125   5308   5485   5652   5821   6000   6176
                    6336   6497   6677   6855   7045   7535#  7732   7831   8004   10442
CKSWR =     104406  9747   10239  10263  10437#
CLAREA      045612  4149   5000   5007   5696   5703   6379   6386   7479#
CLDISK      045674  2807   2929   2969   3027   4116   4170   4255   4432   4602   4734   4912   5113   5296
                    5474   5607   5809   5989   6164   6291   6485   6665   6844   7033   7159   7194   7228
                    7515#  7721   7819   8003   8190   8608
CLR    =    000040  2050#  3052   3094   3118   3148   3175   3206   3234   3277   3319   3389   3433   3472
                    3532   3579   3638   3672   3706   3742   3773   3785   3806   3818   3847   3877   3916
                    3926   3945   3955   3978   4009   4041   4080   7520
COMHD       052200  4186   4288   4464   5132   5315   5491   5828   6006   6183   6504   6684   6861   7052
                    7738   7836   8024   8703#
COMPA       053252  8859*  8909   8990#  9136*
COMPAR      046570  3003   4361   4378   4553   4699   4858   5018   5197   5390   5567   5714   5890   6069
                    6257   6397   6565   6748   6938   7127   7755#  8045   8071
COMWHD      055322  4634   4848   4967   5662   6346   9255#
COUNTD      053720  9130#  9134*  9150
CPHALT      005124  1226#  4178   4264   4441   4611   4844   4854   4958   4993   5126   5174   5309   5353
                    5486   5539   5653   5688   5822   5870   6001   6044   6177   6232   6337   6371   6498
                    6546   6678   6722   6856   6909   7046   7101   7733   7832   8005
CR     =    000015  66#    9933   9943
CRC         047102  4163   4249   4426   4596   4787   4826   4936   5104   5278   5457   5631   5800   5971
                    6146   6315   6476   6641   6825   7016   7715   7813   7871#  7974
CRLF   =    000200  67#    9904   9943
CSF    =    000002  2193#
CSU    =    000010  2185#
CSI         015034  1677   1680   1688   1695   1702   1712   1715   1719   1735   2322#  4339*  4530*  4676*
                    7177   7538   7542   7549   7595   7603
CSR         015032  1677   1680   1688   1702   1735   2319#  4522*  4527*  4528*  4677*  4678*
CYL         052340  4156*  4164   4242*  4250   4362   4419*  4427   5096*  5105   5270*  5279   5449*  5458
                    5792*  5801   5963*  5972   6138*  6147   6468*  6477   6633*  6642   6817*  6826   7008*
                    7017   7708*  7716   7805*  7814   7968*  7975   8733#
DAREAD      052414  8782   8794#
DATENV      050406  1731   4922*  5090*  5264*  5443*  5617*  5786*  5957*  6132*  6301*  6462*  6627*  6811*
                    7002*  8265#  9018*  9035*  9085*  9101*
DAWORD      052420  5102*  5276*  5455*  5798*  5969*  6144*  6474*  6639*  6823*  7014*  7713*  7810*  7973*
                    8795#
DB          015024  1688   2316#
DCK    =    100000  2118#  5333   5509   5529   6024   6201   6221   6702   6879   6899   7070   7090   8100
                    8105   8121   8124
DCL    =    000100  2244#
DCLEAR      015160  2391#
DDISR  =    177570  73#    268    2470
DENVL  =    000200  2128#  4532
DEI    =    000040  2090#
DFF20  =    000002  2086#
DF1         012520  325    444    451    1742#
DF11        012536  433    1749#
DF14        012545  464    1752#
DF15        012555  473    1755#
```

DZRJHA.SUB CROSS REFERENCE TABLE

```
DF16    012560          484   1756#
DF17    012565          497   1758#
DF2     012525         1744#
DF20    012574          510   1761#
DF21    012603          521   1765#
DF22    012610          538    552   1767#
DF24    012614          567    580   1769#
DF26    012623          593   1772#
DF27    012633          608   1775#
DF3     012531          413    420   1746#
DF30    012641          621   1777#
DF31    012647          376    384    751    759   1780#
DF32    012657          360    401   1783#
DF33    012670          343   1786#
DF34    012700          539   1789#
DF35    012707          658    730   1792#
DF36    012717          673    690   1795#
DF37    012725          713   1797#
DF40    012736          776   1800#
DF42    014732          782    789    816   2020#
DF44    014735          796    802    809    823    830    837    844    858    865    872    879    886    893
                        900    907    914    921    942   2021#
DF5   = 000001         2085#
DF54    014742          851    928    935   2023#
DH1     005452          320    439   1264#
DH11    005702          425   1292#
DH14    006057          456   1312#
DH15    006256          470   1334#
DH16    006306          478   1338#
DH17    006444          489   1355#
DH2     005570          407   1278#
DH20    006621          502   1375#
DH21    006775          515   1395#
DH22    007111          532   1409#
DH24    007205          560    573   1420#
DH26    007363          584   1440#
DH27    007561          600   1462#
DH30    007717          614   1479#
DH31    010051          366    741   1495#
DH32    010247          349    390   1517#
DH33    010464          334   1541#
DH34    010663          629   1563#
DH35    011036          649    720   1582#
DH36    011233          664    681   1604#
DH37    011371          701   1621#
DH40    011610          768   1647#
DH42    014412          780    787    814   1976#
DH44    014473          794    800    807    821    828    835    842    856    863    870    877    884    891
                        898    905    912    919    940   1986#
DH54    014605          849    926    933   2000#
DIGB  = 000004         2087#
DISK    054256         1722   4150   4199   4860   5020   5066   5239   5288*  5419   5466*  5716   5762   5932
                       5981*  6108   6156*  6399   6439   6602   6787   6835*  6837*  6978   7026*  7027*  7955
                       8073   8511   8525*  8526*  9156   9214#  9699
```

```
DISPLA  001142          268#  2470*  2478*  9802*  10247*
DISPRE  000174          174#  2478
DLT   = 100000         2060#
DL64  = 000020         2089#
DMD   = 000001         2122#  2971   3028   4117   4314   4490   4532   8156   8184   8452   8712   8864   8870
                       8998   9011   9014   9028   9031   9072   9082   9098   9264   9425   9428   9437   9448
                       9608
DPR   = 000400         2093#  7563   7566   7615
DRY   = 000200         2092#  7563   7571   7610
DST     015040         1699   2324#  4344*  4535*  4683*
DSWR  = 177570           72#   267   2469
DS1     015056         1677   1680   1692   1695   1702   1712   1715   1719   1735   2331#  4342*  4533*  4681*
                       7561   7566   7571   7610   7615
DT      015060         2332#
DTAGAP  055262         9217#
DTE   = 010000         2115#  4340   4531   4679
DTSY  = 001000         2130#  8889   8962   8966
DTi     011766          324    443    450   1670#
DT11    012030          432   1677#
DT14    012050          463   1680#
DT15    012072          472   1683#
DT16    012102          483   1685#
DT17    012120          496   1688#
DT2     012002         1672#
DT20    012140          509   1692#
DT21    012160          520   1695#
DT22    012174          537    551   1697#
DT24    012206          566    579   1699#
DT26    012226          592   1702#
DT27    012250          607   1705#
DT3     012014          412    419   1674#
DT30    012266          620   1708#
DT31    012304          375    383    750    758   1712#
DT32    012326          359    400   1715#
DT33    012352          342   1719#
DT34    012374          637   1722#
DT35    012414          656    728   1725#
DT36    012436          671    688   1728#
DT37    012454          711   1731#
DT40    012500          775   1735#
DT42    014674          781    788    815   2014#
DT44    014704          795    801    808    822    829    836    843    857    964    871    878    885    892
                        899    906    913    920    941   2016#
DT54    014720          850    927    934   2018#
DVA   = 004000         2078#  7177   7538   7542   7603
ECDATA  050366         8246#  8294   8453*  8517*  8519*  9008*  9010*  9025*  9027*  9075*  9079*  9091*  9095*
ECH   = 000100         2109#  5529   6221   6899   7090
ECI   = 004000         2209#  4260   4607   7728   7827   8021
ECORR   051012         5346   5522   6037   6214   6715   6892   7083   8447#
ECTEST  050424         8285#  8481   8520   9019   9036   9086   9102
EC1     015064         1725   1728   1731   2334#
EC2     015066         1725   1728   1731   2335#  4512*  5158   5342   5518   5854   6033   6210   6530   6711
                       6888   7079
EMTVEC= 000030          161#  2454*  2455*  2577*  2605*
```

```
EM1     002136          319     598     953#
EM11    002307          424     437     582     972#
EM14    002342          455     977#
EM15    002362          468     980#
EM16    002433          477     987#
EM17    002454          488     990#
EM2     002221          332     347     364     962#
EM20    002500          501     994#
EM21    002521          514     997#
EM22    002543          525    1001#
EM24    003144          557    1048#
EM25    003237          570    1058#
EM30    003277          613    1064#
EM31    003421          626    1079#
EM32    003544          643    1094#
EM33    004033          663    1126#
EM34    004105          676    1134#
EM35    004200          695    1144#
EM36    004477          718    1177#
EM37    004665          738    1198#
EM40    004753          765    1208#
EM42    012746          779    1805#
EM43    013031          786    1815#
EM44    013075          793    1823#
EM45    013132          799    1829#
EM46    013161          806    1834#
EM47    013210          813    1839#
EM50    013245          820    1845#
EM51    013303          827    1852#
EM52    013324          834    1856#
EM53    013364          841    1863#
EM54    013424          848    1870#
EM55    013463          855    1877#
EM56    013476          862    1880#
EM57    013513          869    1884#
EM6     002250          388     406     966#
EM60    013542          876    1889#
EM61    013631          883    1900#
EM62    013701          890    1908#
EM63    013756          897    1917#
EM64    014034          904    1926#
EM65    014070          911    1932#
EM66    014152          918    1942#
EM67    014224          925    1950#
EM70    014311          932    1960#
EM71    014363          939    1969#
ERCRC   055516         9285*   9339#   9523*
ERFLGS  015126         2353#   4185*   4196    4207    4284*   4460*   4630*   4841*   4850    4964*   4975    5013*   5131*
                       5147    5190*   5314*   5330    5374*   5490*   5506    5561*   5659*   5670    5709*   5827*   5843
                       5885*   6005*   6021    6064*   6182*   6198    6252*   6343*   6354    6392*   6503*   6519    6560*
                       6683*   6699    6743*   6860*   6876    6933*   7051*   7067    7122*   7776    8023*   8034    8778
                       9376   10241*
ERHDGP  055520         9286*   9349#   9536*
ERHEAD  055514         9284*   9325#   9509*
```

```
ERPOS   051010          8443# 8449* 8466
ERR   = 040000          2099# 4342  4533  4681
ERRVEC= 000004           154# 2467  2468* 2479* 2579* 2586* 2607* 9764  9765* 9767* 9770*
ERSTAR  052152          8608#
ERUNIT  052150          8607# 8609
ERWORD  052460          1672  1674  1712  1715  1719  3010  4201* 4206* 4386  4551  4707  7769* 7775*
                        8850# 8891* 8916* 8920* 8944* 8968* 9457* 9464* 9468* 9490* 9499* 9506* 9522*
                        9527* 9533* 9546*
ER1     015036          1677  1680  1692  1702  1712  1715  1719  1725  1735  2323# 4340* 4531* 4679*
                        5150  5333  5509  5529  5846  6024  6201  6221  6522  6702  6879  6899  7070
                        7090
ER2     015042          1692  2325#
ER3     015050          1692  2328#
EXT1  = 000001          2163#
EXT10 = 000010          2166#
EXT2  = 000002          2164#
EXT20 = 000020          2167#
EXT4  = 000004          2165#
EXT40 = 000040          2168#
E00     024114          3057  3070#
E11     025514          3371  3379#
E12     025642          3412  3419#
E44     030346          4057  4065#
FEN   = 000200          2189#
FER   = 000020          2107#
FILLEC  051164          5079  5252  5432  5775  5945  6121  6451  6615  6800  6991  9501#
FIRST   017332          2417# 2487  2537*
FMT22 = 010000          2210# 4156  4175  4242  4260  4419  4437  4590  4607  4765  4783  4820  4838
                        4930  4946  4965  5096  5119  5177  5270  5302  5356  5449  5480  5542  5625
                        5641  5660  5792  5815  5873  5963  5995  6047  6138  6170  6235  6309  6325
                        6344  6468  6491  6549  6633  6671  6725  6817  6850  6912  7008  7039  7104
                        7708  7728  7805  7827  7968  8021  8150
FNWORD  055536          4595* 4825* 4935* 5630* 6314* 9380#
FORMAT  053722          9131# 9149
FOUT    055542          9377  9383#
FSYNER  055512          9283* 9311# 9494*
FUTABL  015152          2387#
GCRC    055506          4598  4828  4938  5633  6317  9295# 9516  9521
GECC1   050370          1722  1725  1731  4920* 4982  5005  5088* 5156  5262* 5340  5441* 5516  5615*
                        5677  5701  5784* 5852  5955* 6031  6130* 6208  6299* 6360  6384  6460* 6528
                        6625* 6709  6809* 6886  7000* 7077  8250# 8292  8378* 8509* 8525
GECC2   050372          1722  1725  1731  4921* 4986  5006  5089* 5263* 5442* 5616* 5681  5702  5785*
                        5956* 6131* 6300* 6364  6385  6461* 6626* 6810* 7001* 8253# 8293  8379* 8510*
                        8526
GNS   = ****** U         173  2496  2501  2506  2510  2514  2518  2522  2526  2530  2534  2557  2594
                        2598  2673  2700  2704  2708  2712  2759  2765  2771  2851  2857  2863  2897
                        2903  2909  2935  2939  2943  2950  3333  3337  3341  3345  7233  7239  7343
                        7349  7356  7360  7364  7371  7375  8545  8551  8563  8569  8575  8579  8585
                        8591  8595  9719  10429 10430 10431 10432 10433 10435 10437 10438 10439 10440
                       10441 10442 10443
GO    = 000001          2072# 2982  8157  8185  8715  9267
GRV   = 000010          2088#
GTSWR = 104405          2544  10435#
HADTMP  050412          4919* 5087* 5261* 5440* 5614* 5783* 5954* 6129* 6299* 6459* 6624* 6809* 6999*
```

```
                        8275#   8468
HARDER  050404          4919    5087    5261    5440    5614    5783    5954    6129    6298    6459    6624    6808    6999
                        8262#
HCCRCE  047504          8001#
HCE     = 000200        2110#   8090    8094    8100    8105
HCI     = 002000        2208#
HCRC    = 000400        2111#   8112    8115    8121    8124
HDESYN  055522          9287*   9362#   9549*
HDWSYN  054254          9212#
HEADER  054230          9209#
HEDGAP  052354          8729*   8751#   8923*
HEDSYN  052356          8730*   8764#   8945*   8970*
HEGAP   054242          8914    9211#
HT      = 000011          64#   9902    9943
IAE     = 002000        2113#
IE      = 000100        2073#   3650    3683    4022    4053    4060    7164    7199
ILF     = 000001        2103#
ILLEGL  015214          2405#
ILR     = 000002        2104#
ICTVEC= 000020            159#  2452*   2453*
IR      = 000100        2051#   4522    4527    4677
IXE     = 004000        2193#
I00     024070          3061#   3067
I02     024174          3104#
I03     024270          3130#
I04     024370          3159#
I05     024470          3188#
I06     024570          3218#
I07     024670          3247#
I14     026034          3482#
I15     026236          3544#
I16     026400          3593#
I24     026764          3713#
KEY1    052344          4159*   4246*   4423*   5100*   5274*   5453*   5796*   5967*   6142*   6472*   6637*   6821*   7012*
                        7711*   7808*   7971*   8735#
KEY2    052346          4160*   4247*   4424*   5101*   5275*   5454*   5797*   5968*   6143*   6473*   6638*   6822*   7013*
                        7712*   7809*   7972*   8736#
KIPAR0= 172340            229#
KIPAR1= 172342            230#
KIPAR2= 172344            231#
KIPAR3= 172346            232#
KIPAR4= 172350            233#
KIPAR5= 172352            234#
KIPAR6= 172354            235#
KIPAR7= 172356            236#
KIPDR0= 172300            218#
KIPDR1= 172302            219#
KIPDR2= 172304            220#
KIPDR3= 172306            221#
KIPDR4= 172310            222#
KIPDR5= 172312            223#
KIPDR6= 172314            224#
KIPDR7= 172316            225#
LA      015070          2336#   4343*   4534*   4682*
```

```
LAD     045654          7445*   7497#   7501
LERR    045436          7428#   7434*   7457
LF    = 000012            65#   9937    9943
LST   = 002000          2095#
LST14A  026064          3478    3492#
LST15A  026266          3538    3557#
LST16A  026436          3585    3610#
L00     024064          3059#
L02     024172          3102#
L03     024264          3126#
L04     024362          3156#
L05     024460          3183#
L06     024562          3214#
L07     024660          3242#
L10     025014          3293#
L11     025452          3363#
L12     025600          3404#
L13     025712          3442#
L14     026030          3480#   3490
L15     026230          3540#   3553
L16     026370          3587#   3606
L21     026562          3650#
L22     026646          3678#
L30     027074          3750#
L31     027174          3781#
L34     027300          3814#
L35     027414          3854#
L36     027530          3888#
L40     027644          3924#
L41     027746          3953#
L42     030056          3988#
L43     030172          4019#
L44     030302          4050#
L45     030424          4089#
MAKECY  050246          3029    4118    8176#
MASK    045434          7427#   7431*   7447*   7448    7449*   7452*   7453    7454*
MCLK  = 000002          2123#   4315    4316    4318    4319    4491    4492    4494    4495    5169    5170    5865    5866
                        6541    6542    8479    8480    8487    8488    8866    8867    8870    8871    8874    8875    9003
                        9020    9072    9088    9428    9439    9634    9636    9637    9638    9639    9654    9655    9656
                        9657
MCPE  = 020000          2079#
MHS   = 001000          2191#
MID     050236          8152*   8159#
MIDDLE  050134          8141#
MINX  = 000004          2124#   8713    8714    9265    9266    9616    9617
MMVEC = 000250           207#
MOL   = 010000          2097#   2930    2946
MPE   = 000400          2053#
MR      015054          1728    2330#   4341*   4532*   4680*
MRD   = 000020          2126#   9001    9006    9014    9023    9031
MSE   = 000020          2186#
MSTCK = 000010          2125#   4315    4316    4328    4329    4491    4492    4504    4505    4658    4659    8865    8867
                        8870    8871    9003    9072    9427    9428    9609    9610    9611    9612    9616    9617    9633
                        9636    9637    9654    9655    9667    9668
```

```
MWR    = 000040          2127#   9073    9089    9430    9440
MXF    = 001000          2054#   3711    3713    3717
NCODE    050376          4918    5086    5260    5439    5613    5782    5953    6128    6297    6458    6623    6807    6998
                         8259#
NCOUNT   050400          4918*   5086*   5260*   5439*   5613*   5782*   5953*   6128*   6297*   6458*   6623*   6807*   6998*
                         8260#   8459*
NED    = 010000          2057#   3359    3368    3409    3453    4101    8611
NEM    = 004000          2056#
NHS    = 002000          2192#
NOPERA   015152          2388#
NOSYNC   052454          7381*   8783    8847#   8932    8960    9748*
NOUNIT   015116          2346#   2728*   2778*   2785    2830*   7255*
NOWORD   052406          4161*   8790#
NUNIT    015120          2348#   2785*   2786*
N11      025502          3356    3373#
N12      025630          3398    3414#
N14      026056          3486    3489#
N36      027570          3887    3901#
OCYL   = 100000          2246#
OF       015044          2326#
OFREV  = 000200          2207#
OFSETC   015204          2401#
OF100  = 000004          2202#
OF200  = 000010          2203#
OF25   = 000001          2200#
OF400  = 000020          2204#
OF50   = 000002          2201#
OF800  = 000040          2205#
OPERSE   044614          7339#   9985    10068
OPI    = 020000          2116#
OR     = 000200          2052#   4522    4528    4678
OUT      052424          8779    8787    8792    8798#
000      024116          3068    3072#
010      025024          3291    3299#
021      026600          3648    3657#
043      030220          4017    4029#
044      030324          4048    4059#
PAR    = 000010          2106#
PAT    = 000020          2049#
PC     =%000007            85#   2486*   2636*   2667*   2807*   2929*   2969*   3017*   3027*   4116*   4170*   4177*   4186*
                         4195*   4255*   4263*   4288*   4294*   4371*   4392*   4432*   4440*   4464*   4470*   4567*   4602*
                         4610*   4634*   4640*   4713*   4734*   4843*   4848*   4853*   4866*   4868*   4912*   4957*   4967*
                         4992*   5028*   5037*   5079*   5113*   5125*   5132*   5149*   5173*   5191*   5207*   5211*   5252*
                         5296*   5308*   5315*   5332*   5352*   5375*   5390*   5394*   5432*   5474*   5485*   5491*   5508*
                         5528*   5538*   5562*   5577*   5581*   5607*   5652*   5662*   5687*   5724*   5733*   5775*   5809*
                         5821*   5828*   5845*   5869*   5886*   5900*   5904*   5945*   5989*   6000*   6006*   6023*   6043*
                         6063*   6079*   6083*   6121*   6164*   6176*   6183*   6200*   6218*   6231*   6251*   6267*   6271*
                         6291*   6336*   6346*   6370*   6407*   6416*   6451*   6485*   6497*   6504*   6521*   6545*   6561*
                         6575*   6579*   6615*   6665*   6677*   6684*   6701*   6721*   6742*   6758*   6762*   6800*   6844*
                         6855*   6861*   6878*   6898*   6908*   6932*   6948*   6952*   6991*   7033*   7045*   7052*   7069*
                         7089*   7100*   7123*   7137*   7141*   7159*   7170*   7176*   7194*   7208*   7228*   7286*   7289*
                         7299*   7304    7418*   7437*   7438*   7457*   7459*   7523*   7537*   7580*   7583*   7594*   7619*
                         7622*   7721*   7732*   7738*   7741*   7778*   7780*   7819*   7831*   7836*   7839*   7980*   8003*
                         8004*   8024*   8033*   8053*   8061*   8079*   8084*   8162*   8190*   8399*   8405*   8432*   8474*
```

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                    8481*  8520*  8533*  8553*  8608*  8805*  8883*  8888*  8897*  8899*  8901*  8903*  8905*
                    8917*  8929*  8955*  8959*  9019*  9036*  9043*  9086*  9102*  9113*  9157*  9164*  9170*
                    9174*  9177*  9390*  9465*  9485*  9500*  9514*  9528*  9541*  9701*  9709*  9911*  9918*
                    9925*  9939*  9941*  9969*  9983*  10044*  10089*  10257*  10325*  10480
PCJSR   015134      1702   1705   1708   1715   1719   1728   2362*  7535*  7536*  7592*  7593*  8001*  8002*
                    8178*  8179*  8447*  8448*  8703*  8704*  9255*  9256*
PGE   = 002000      2055#
PIE1  = 100000      8213#  8362   8377
PIE10 = 000100      8222#
PIE11 = 000040      8223#  8329
PIE12 = 000020      8224#  8362
PIE13 = 000010      8225#
PIE14 = 000004      8226#
PIE15 = 000002      8227#
PIE16 = 000001      8228#
PIE17 = 100000      8229#
PIE18 = 040000      8230#
PIE19 = 020000      8231#
PIE2  = 040000      8214#  8320
PIE20 = 010000      8232#
PIE21 = 004000      8233#  8337
PIE22 = 002000      8234#  8368
PIE23 = 001000      8235#  8345
PIE24 = 000400      8236#  8368
PIE25 = 000200      8237#
PIE26 = 000100      8238#
PIE27 = 000040      8239#
PIE28 = 000020      8240#
PIE29 = 000010      8241#
PIE3  = 020000      8215#  8362
PIE30 = 000004      8242#
PIE31 = 000002      8243#
PIE32 = 000001      8244#  8301   8309
PIE4  = 010000      8216#
PIE5  = 004000      8217#
PIE6  = 002000      8218#
PIE7  = 001000      8219#
PIE8  = 000400      8220#
PIE9  = 000200      8221#
PIP   = 020000      2098#
PIRQ  = 177772        71#
PIRQVE= 000240       165#
PKACK   015210      2403#  2973
PLU   = 020000      2195#
POSITI  050402      1725   1731   4917*  5085*  5259*  5438*  5612*  5781*  5952*  6127*  6296*  6457*  6622*
                    6806*  6997*  8261#  8402   8457   8465*  8466   8468   8508*
PRE   = 000020      2242#
PROG  = 001000      2094#  7562
PR0   = 000000        88#
PR1   = 000040        89#
PR2   = 000100        90#
PR3   = 000140        91#
PR4   = 000200        92#
PR5   = 000240        93#
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DZRJHA.SUB CROSS REFERENCE TABLE

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PR6    = 000300          94#
PR7    = 000340          95#
PS     = 177776          68#    69   2484*  3986*  4020*  4051*  7163*  7198*  7230*  7340*
PSEL   = 002000        2077#  3679   3924   3929
PSU    = 000001        2239#
PSW    = 177776          69#
PUTREG  045374         4195   4294   4470   4640   5149   5191   5332   5375   5508   5528   5562   5845   5886
                       6023   6063   6200   6218   6251   6521   6561   6701   6742   6878   6898   6932   7069
                       7089   7123   7170   7176   7208   7405#  7537   7594   8033   8399   8405   8474
PWRVEC= 000024          160#  2458*  2459*  10448*  10449*  10458*  10464*  10476*  10477*
P12     050416         8277#  8331*  8332*  8361
P22     050420         8278#  8339*  8340*  8366
P24     050422         8279#  8347*  8348*  8367
P3      050414         8276#  8322*  8323*  8360
RCOM    056660         9687#  9692*
RCYL    052444         8817#  8855*  8896
RDCHR = 104407        10143  10438#
RDHEAD  052462         8731   8855#
RDLIN = 104410        10190  10439#
RDOCT = 104411         2559   7366   7377   8554   8571  10440#
RDY    = 000200        2074#  4022   7164   7177   7199   7538   7549   7595
READ    053254         8883   8888   8897   8899   8901   8903   8905   8955   8959  8995#  9701   9709
READAT  015176         2398#
READIN  015212         2404#
RECALI  015156         2390#
REDATA  056662         8794   9691#
REFOR   015200         2399#  4267   5130   5313   5489   5826   6004   6181   6502  6682   6859   7050
REGADR  045440         1670   1705   1708   2014   2016   2018  2656*  3012*  3062* 3099*  3123*  3153*  3180*
                       3211*  3239*  3286*  3351*  3394*  3450*  3477*  3537*  3584* 3643*  3675*  3710*  3747*
                       3778*  3811*  3857*  3891*  3921*  3950*  3983*  4012*  4044* 4098*  4388*  4563*  4709*
                       7429*  7433*  8093*  8104*  8114*  8125*  8195*
REGSA1  061306         2577  10242#
REINTO  016264         2413#  2978   2985*  2998   3004   4257   4338   4363   4543  4547*  4555   4690   4694*
                       4701   5001   5002   5005*  5006*  5008   5009   5019   5115  5199   5298   5382   5476
                       5569   5697   5698   5701*  5702*  5704   5705   5715   5811  5892   5991   6071   6166
                       6259   6380   6381   6384*  6385*  6387   6388   6398   6487  6567   6667   6750   6846
                       6940   7035   7129   7724   7823   8047   8072
RELEAS  015162         2392#
RESVEC= 000010          155#
RETCL   015206         2402#
RHAS    014776         2296#  2650   2675   3444   4091
RHBA    014754         2280#  3476   3536   3583  4172*  4257*  4434*  4604*  4833*  4944*  5115*  5298*  5476*
                       5639*  5811*  5991*  6166*  6323*  6487*  6667*  6846*  7035*  7724*  7823*  8018*  8147*
RHBAE   015022         2309#
RHCA    014772         2294#  4176*  4262*  4439*  4609*  4839*  4966*  5123*  5306*  5484*  5661*  5819*  5999*
                       6174*  6345*  6495*  6675*  6854*  7043*  7731*  7830*  8010*  8151*  8181*
RHCC    015016         2304#  7411   8191   8195
RHCS1   014760         2289#  2973*  2982*  3054   3361   3402   3440   3642   3674   3856   3890   3920   3949
                       3982   4011   4043   4087   4291   4467   4637  4835*  7515  8144*  8157*  8183*  8185*
                       8547   8581  8715*  9267*
RHCS2   014756         2281#  2631   2676   2734*  3052*  3094*  3118*  3148*  3175*  3206*  3234*  3277*  3319*
                       3350   3389*  3393   3433*  3437   3449  3472*  3532*  3579*  3638*  3672*  3706*  3709
                       3742*  3746   3773*  3777   3806*  3810  3847*  3851   3877*  3881   3916*  3926*  3945*
                       3955*  3978*  4009*  4041*  4080*  4084   4097  4184*  7516  8149*
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DZRJHA.SUB CROSS REFERENCE TABLE

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RHCS3   015020          2308# 3281
RHDB    014750          2278# 2581  8555
RHDST   014764          2291# 4174* 4258* 4435* 4605* 4834* 4955* 5118* 5301* 5479* 5650* 5814* 5994*
                        6169* 6334* 6490* 6670* 6849* 7038* 7727* 7826* 8015* 8148* 8182*
RHDS1   015002          2298# 7517
RHDT    015004          2299# 2735  2737  2742  2744  2747  2749  2767  2865  2673  2875  2878  2880
                        2883  2885  2914  2916
RHEC1   015010          2301# 8402
RHEC2   015012          2302# 3066  3284  4512  8396
RHER1   014762          2290# 2679  7518  8089  8093  8099  8104  8111  8114  8119  8125
RHER2   014766          2292#
RHER3   014774          2295#
RHLA    015014          2303#
RHMR    015000          2297# 2971* 3028* 4117* 4313  4489  5169* 5170* 5865* 5866* 6541* 6542* 8156*
                        8184* 8451  8712* 8713* 8714* 8862  9148  9264* 9265* 9266* 9424  9605
RHOF    014770          2293# 4175* 4260* 4437* 4607* 4838* 4965* 5119* 5302* 5480* 5660* 5815* 5995*
                        6170* 6344* 6491* 6671* 6850* 7039* 7728* 7827* 8021* 8150*
RHSN    015006          2300# 2859  2913  2915
RHWC    014752          2279# 2977  2991  3012  3098  3122  3152  3179  3210  3238  4171* 4256* 4272
                        4352  4388  4433* 4449  4542  4563  4603* 4619  4689  4709  4832* 4942* 5114*
                        5297* 5475* 5637* 5810* 5990* 6165* 6321* 6486* 6666* 6845* 7034* 7409  7411
                        7723* 7822* 8016* 8146*
RH70    017334          2420# 2551* 2626  3279  3702  3737  3842  4144  4517  4666
RH70CK  020720          2549#
RKEY1   052450          8819# 8857* 8900
RKEY2   052452          8820# 8858* 8902
RMR     = 000004        2105#
RNCTR1  055320          9253# 9269* 9271*
RNO     056656          9686# 9691*
RNWAT1  055400          9269#
RPTRP1  044124          7161  7175#
RPTRP2  044230          7196  7207#
RPVEC   014746          2268# 2485* 3647  3648* 3657* 4016  4017* 4029* 4047  4048* 4067* 7160  7195
                        8565  8572* 8587  9722*
RPVECT  056772          2485  9716# 9722
RSETR   052446          8818# 8856* 8898
RSYNC   052442          4782  4798  4805  8816# 8887  8892  8930  8942  8958  8969  9488  9492  9543
                        9548
RUNCTR  052176          8702# 8717* 8718*
RUNWAT  052256          8717#
R0      =%000000          76# 2580* 2583* 2678* 2683* 2721* 2724* 2729* 2781* 2814* 2815  2824* 2825
                        2827  2829  2831* 2848  2976* 2990* 3003* 3029* 3353* 3355* 3395* 3397* 3884*
                        3886* 4118* 4149* 4198* 4202  4271* 4313* 4314* 4315* 4316* 4318* 4319* 4328*
                        4329* 4351* 4361* 4378* 4448* 4489* 4490* 4491* 4492* 4494* 4495* 4504* 4505*
                        4541* 4553* 4618* 4658* 4659* 4688* 4699* 4754* 4756* 4762* 4765* 4767* 4768*
                        4769* 4779* 4782* 4783* 4784* 4785* 4786* 4791  4794* 4798* 4801* 4805* 4807*
                        4814* 4858* 4907* 4909* 4943* 4944  4946* 4948* 4949* 4950* 4952* 5000* 5007*
                        5018* 5066* 5067* 5071  5074* 5168* 5171* 5176* 5177* 5180* 5181* 5182* 5185*
                        5197* 5239* 5240* 5244  5247* 5346* 5355* 5356* 5359* 5360* 5361* 5364* 5380*
                        5419* 5420* 5424  5427* 5522* 5541* 5542* 5545* 5546* 5547* 5550* 5567* 5602*
                        5604* 5638* 5639  5641* 5643* 5644* 5645* 5647* 5696* 5703* 5714* 5762* 5763*
                        5767  5770* 5864* 5867* 5872* 5873* 5876* 5877* 5878* 5882* 5890* 5932* 5933*
                        5937  5940* 6037* 6046* 6047* 6050* 6051* 6052* 6055* 6069* 6108* 6109* 6113
                        6116* 6214* 6234* 6235* 6238* 6239* 6240* 6243* 6257* 6286* 6288* 6322* 6323
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                    6325*  6327*  6328*  6329*  6331*  6379*  6386*  6397*  6439*  6440*  6444   6447*  6540*
                    6543*  6548*  6549*  6552*  6553*  6554*  6557*  6565*  6602*  6603*  6607   6610*  6715*
                    6724*  6725*  6728*  6729*  6730*  6733*  6748*  6787*  6788*  6792   6795*  6892*  6911*
                    6912*  6915*  6916*  6917*  6920*  6938*  6978*  6979*  6983   6986*  7083*  7103*  7104*
                    7107*  7108*  7109*  7112*  7127*  7160*  7161*  7162*  7195*  7196*  7197*  7257*  7259
                    7296*  7299   7406   7409*  7412   7417*  7483   7484   7485   7495*  7634   7635*  7636
                    7638   7639   7640   7641*  7685   7686   7687   7694*  7761   7762   7763   7764   7765
                    7766*  7794*  7872   7873*  7881   7933*  7950   7953*  7956   7979*  8001   8008   8009
                    8010   8011   8012   8013   8014   8016   8018   8019   8045*  8071*  8085   8129*  8142
                    9161*  8178   8180   8200*  8286   8303*  8310*  8313*  8314*  8315   8360*  8361*  8363
                    8365*  8366*  8367*  8369   8431*  8447   8449   8492*  8502   8532*  8555*  8557*  8558*
                    8705   8804*  8862*  8864*  8865*  8866*  8867*  8870*  8871*  8874*  8875*  8889   8962
                    8966   8998*  9001*  9003*  9006   9015*  9020*  9023   9032*  9065   9070*  9072*  9073
                    9082*  9088*  9089   9098*  9112*  9137   9148*  9185*  9257   9389*  9424*  9425*  9427*
                    9428*  9430   9437*  9439*  9440   9448*  9599   9605*  9608*  9609*  9610*  9611*  9612*
                    9616*  9617*  9633*  9634*  9636*  9637*  9638*  9639*  9654*  9655*  9656*  9657*  9667*
                    9668*  9678*  9819   9829*  9833   9849   9850   9863*  9894   9895*  9896   9899*  10187
                   10191*  10192  10195  10215*  10218*  10281  10282*  10283*  10290*  10291*  10292*  10293*  10294*
                   10295   10300  10306  10308*  10309  10323*  10413  10414*  10415  10416*  10417*  10418*  10419*
                   10450   10475*
R1      =%000001     77#   2581*  2582   2588   2650*  2651*  2652   2656   2675*  2685   2688   2730   3354*
                    3358   3363   3373*  3374   3396*  3400   3404   3414*  3415   3885*  3888   3901*  3902
                    4183*  4199*  4202   4205   4215   4267*  4312*  4322*  4327*  4330*  4444*  4488*  4498*
                    4503*  4506*  4614*  4657*  4660*  4755*  4757*  4908*  4910*  4962*  5130*  5183*  5186*
                    5313*  5362*  5365*  5489*  5548*  5551*  5603*  5605*  5657*  5826*  5879*  5883*  6004*
                    6053*  6056*  6181*  6241*  6244*  6287*  6289*  6341*  6502*  6555*  6558*  6682*  6731*
                    6734*  6859*  6918*  6921*  7050*  7110*  7113*  7164*  7199*  7258*  7259   7262   7407
                    7410*  7412*  7416*  7480   7483*  7486   7488*  7494*  7515*  7522*  7544   7551   7555
                    7598   7606   7682   7685*  7688   7693*  7736*  7756   7761*  7770   7773   7781   7793*
                    7835*  7874   7878*  7886   7893   7900   7908*  7911*  7913*  7916*  7918*  7921*  7923*
                    7928   7932*  7951   7954*  7957*  7959*  7963*  7978*  8009*  8143   8158*  8160*  8287
                    8292*  8300   8308   8336   8344   8359*  8368*  8369*  8376*  8378   8394   8430*  8450
                    8451*  8452*  8471   8479*  8480*  8487*  8488*  8491*  8503   8511*  8514   8531*  8556*
                    8559*  8706   8724*  8727*  8728   8729   8730   8731*  8789*  8794*  8803*  8855   8856
                    8857   8858.  8859   8860   8972*  8973*  9134   9135   9136   9138   9142*  9145*  9169*
                    9172*  9176*  9179*  9184*  9186*  9258   9277*  9281*  9282   9283   9284   9285   9286
                    9287   9289*  9378*  9388*  9416   9417   9418   9419   9420   9421   9423*  9453*  9466*
                    9487*  9488   9493   9501*  9502   9508   9515*  9516   9520   9529*  9535   9542*  9543
                    9547   9552*  9553*  9598   9600   9651*  9664*  9677*  9679*  9691   9692   9693   9713*
                    9714*  9820   9833*  9834   9838   9862*  10188  10193*  10201*  10203*  10205*  10208*  10211
                   10214*  10305  10306*  10311  10315  10317  10322*  10451  10474*
R11       025434    3358#
R15       026260    3548   3552#
R16       026430    3601   3605#
R2      =%000002     79#   2582*  2676*  2677*  2682*  3061*  3062   3063   3098*  3099   3102*  3104*  3105
                    3122*  3123   3126*  3128*  3130*  3132*  3134   3152*  3153   3156*  3158*  3159*  3161
                    3179*  3180   3183*  3185*  3187*  3188*  3190*  3192   3210*  3211   3214*  3216*  3218*
                    3220   3238*  3239   3242*  3244*  3246*  3247*  3249*  3251   3281*  3284*  3285*  3286
                    3295   3350*  3351   3363*  3367   3393*  3394   3404*  3408   3437*  3442*  3444*  3446
                    3448*  3449*  3450   3452   3476*  3477   3482*  3483   3536*  3537   3540*  3544*  3545
                    3583*  3584   3587*  3591*  3593*  3595*  3597   3642*  3643   3650*  3653   3674*  3675
                    3679*  3682   3709*  3710   3713*  3715   3746*  3747   3750*  3754   3777*  3778   3781*
                    3785*  3787   3810*  3811   3814*  3818*  3820   3851*  3854*  3856*  3857   3859   3881*
                    3888*  3890*  3891   3893   3920*  3921   3924*  3928   3949*  3950   3953*  3957   3982*
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                    3983    3988*   3990    3992    4011*   4012    4022*   4026    4043*   4044    4053*   4059    4084*
                    4089*   4091*   4093*   4095*   4097*   4098    4100    4200*   4206    4220*   4317*   4320*   4493*
                    4496*   5184*   5185    5363*   5364    5549*   5550    5880*   5882    6054*   6055    6242*   6243
                    6556*   6557    6732*   6733    6919*   6920    7111*   7112    7408    7411*   7413*   7415*   7481
                    7484*   7486*   7487*   7489*   7490*   7493*   7516*   7520*   7521*   7683    7686*   7688*   7692*
                    7757    7762*   7770    7774    7781    7792*   7875    7895*   7897*   7898*   7914    7931*   7952
                    7955*   7956*   7961*   7977*   8288    8293*   8319    8328    8358*   8362*   8363*   8375*   8377*
                    8379    8429*   8504    8512*   8523*   8530*   8609*   8611    8707    8802*   8873*   8876*   8881*
                    8884*   8915*   8920    8927*   8953*   8956*   8996    9002*   9038*   9042*   9066    9071*   9104*
                    9111*   9135*   9139    9159*   9183*   9259    9387*   9438*   9449*   9463*   9468    9473*   9497*
                    9506    9512*   9526*   9533    9539*   9601    9631*   9640*   9643*   9653*   9658*   9676*   9697*
                    9702*   9707*   9710*   9821    9832*   9836*   9839    9846*   9847*   9848    9853*   9861*   10189
                    10194*  10202*  10204*  10206*  10212   10213*  10452   10473*
R3      =%000003      79#   2722*   2723*   2726*   2774*   2930    2946    7436*   7440*   7441    7444*   7446    7482
                    7485*   7488    7492*   7517*   7568    7573    7576    7612    7617    7684    7687*   7689*   7691*
                    7758    7763*   7767    7775    7786*   7791*   7876    7888*   7890*   7891*   7898    7905    7909
                    7930*   8289    8300*   8301*   8302*   8303    8308*   8309*   8310    8319*   8320*   8321*   8322
                    8328*   8329*   8330*   8331    8336*   8337*   8338*   8339    8344*   8345*   8346*   8347    8428*
                    8505    8513*   8521*   8529*   8708    8801*   9067    9077*   9081*   9093*   9097*   9108    9110*
                    9140    9143*   9144*   9156*   9158*   9165*   9171*   9175*   9178*   9182*   9260    9386*   9433*
                    9436*   9444*   9447*   9453    9454    9459    9498*   9502    9507    9602    9606*   9618    9669*
                    9675*   9699*   9700    9708    9822    9830*   9831*   9845*   9848*   9857*   9858*   9860*   10139
                    10140*  10141   10144*  10145   10149   10151   10153*  10155*  10361   10370*  10376*  10377*  10380*
                    10385*  10386*  10387   10396*  10453   10472*
R4      =%000004      80#   2679*   2681*   7432*   7433    7450*   7451    7518*   7759    7767*   7768*   7769    7790*
                    7877    7902*   7904*   7905*   7919    7929*   8290    8427*   8506    8514*   8515*   8528*   8610
                    8709    8800*   9141    9152*   9161    9166*   9181*   9261    9385*   9603    9674*   10362   10364*
                    10365*  10366*  10367   10368*  10382   10384*  10392*  10395*  10454   10471*
R44       030350    4063    4067#
R5      =%000005      81#   2632*   2727*   2734    2761    2774    2776    2780*   3010*   3011*   3012    3054*   3061
                    3065*   3066    3361*   3365    3402*   3406    3440*   3478*   3480    3489    3538*   3542    3552
                    3585*   3589    3605    4087*   4163*   4249*   4386*   4387*   4388    4426*   4561*   4562*   4563
                    4596*   4707*   4708*   4709    4778*   4780*   4787*   4793*   4795*   4800*   4802*   4806*   4808*
                    4813*   4815*   4826*   4936*   4951*   4953*   5065*   5068*   5072*   5075*   5104*   5238*   5241*
                    5245*   5248*   5278*   5418*   5421*   5425*   5428*   5457*   5631*   5646*   5648*   5761*   5764*
                    5768*   5771*   5800*   5931*   5934*   5938*   5941*   5971*   6107*   6110*   6114*   6117*   6146*
                    6315*   6330*   6332*   6438*   6441*   6445*   6448*   6476*   6601*   6604*   6608*   6611*   6641*
                    6786*   6789*   6793*   6796*   6825*   6977*   6980*   6984*   6987*   7016*   7431    7432    7434
                    7435*   7443*   7715*   7760    7789*   7813*   7873    7928*   7934*   7974*   8177    8180*   8181
                    8192    8194    8199*   8291    8426*   8507    8527*   8710    8799*   8863*   8878*   8914*   8926*
                    8948*   8997*   9040*   9068    9069*   9106*   9109*   9262    9384*   9426*   9451*   9604    9632*
                    9644*   9652*   9661*   9673*   9823    9825*   9827*   9834*   9838*   9853    9859*   10363   10369*
                    10371*  10373*  10374*  10375*  10376   10394*  10455   10470*
R6      =%000006      82#     84    2446*   2447*   2448
R7      =%000007      83#     85
SAVDT     015130    2355#   2916*
SAVER     046366    2976    2990    4271    4351    4448    4541    4618    4688    7681#
SAVSN     015132    2358#   2915*
SC      = 100000    2081#   4292    4339    4468    4530    4638    4676
SCOP1   = 104412    7458   10441#
SCRC      055570    9413#   9420*
SCYL      055560    9409#   9416*   9498
SC1     = 000100    2169#
SC10    = 001000    2172#
```

DZRJHA.SUB CROSS REFERENCE TABLE

```
SC2    = 000200          2170#
SC20   = 002000          2173#
SC4    = 000400          2171#
SEARCH   056406          8158    8724    9277    9598#
SECGAP   054160          4754    4907    5602    6286    9207#   9423
SECOTR   052342          4158*   4244*   4421*   5098*   5099*   5272*   5273*   5451*   5452*   5794*   5795*   5965*   5966*
                         6140*   6141*   6470*   6471*   6635*   6636*   6819*   6820*   7010*   7011*   7709*   7710*   7806*
                         7807*   7969*   7970*   8721    8734#
SECTR    056404          9596#   9598*   9606
SEECOM   015202          2400#   8183
SEGPER   055510          9282*   9300#   9460*   9471*
SELECT   015122          2350#   2437*   2439*   2553    2789    2817    7245
SELTST   022540          2694    2789#
SERCH    015164          2393#
SETCK1   031244          4291#
SETCK2   031740          4467#
SETCK3   032464          4637#
SETDSK   047356          7949#
SILOTB   054256          9213#
SKEY1    055564          9411#   9419*
SKEY2    055566          9412#   9419*
SKI    = 040000          2245#
SN       015062          2333#
SND1     020662          2491    2537#
SP     =%000006            84#   2450*   2467*   2475*   2479    2560*   2561    2562    2575*   2587    2600*   2621*   2761*
                         2767*   2776*   2853*   2859*   2865*   2966*   3025*   3059*   3096*   3120*   3150*   3177*   3208*
                         3236*   3293*   3348*   3391*   3435*   3474*   3534*   3581*   3640*   3678*   3708*   3744*   3775*
                         3808*   3849*   3879*   3918*   3947*   3980*   4019*   4050*   4082*   4114*   4139*   4181*   4182*
                         4183    4216*   4217*   4218    4237*   4415*   4585*   4732*   4904*   5056*   5064*   5067    5070
                         5116*   5117*   5118    5156*   5157*   5158    5178*   5179*   5180    5229*   5237*   5240    5243
                         5299*   5300*   5301    5340*   5341*   5342    5357*   5358*   5359    5409*   5417*   5420    5423
                         5477*   5478*   5479    5516*   5517*   5518    5543*   5544*   5545    5599*   5752*   5760*   5763
                         5766    5812*   5813*   5814    5852*   5853*   5854    5874*   5875*   5876    5922*   5930*   5933
                         5936    5992*   5993*   5994    6031*   6032*   6033    6048*   6049*   6050    6098*   6106*   6109
                         6112    6167*   6168*   6169    6208*   6209*   6210    6236*   6237*   6238    6283*   6430*   6437*
                         6440    6443    6488*   6489*   6490    6528*   6529*   6530    6550*   6551*   6552    6594*   6600*
                         6603    6606    6652*   6653*   6654*   6656    6668*   6669*   6670    6709*   6710*   6711    6726*
                         6727*   6728    6778*   6785*   6788    6791    6847*   6848*   6849    6886*   6887*   6888    6913*
                         6914*   6915    6968*   6976*   6979    6982    7036*   7037*   7038    7077*   7078*   7079    7105*
                         7106*   7107    7157*   7175    7192*   7207    7235*   7241*   7250*   7293*   7345*   7351*   7367*
                         7368    7378    7379*   7406*   7407*   7408*   7415    7416    7417    7480*   7481*   7482*   7492
                         7493    7494    7501*   7535    7561*   7562*   7563    7582*   7592    7621*   7634*   7635    7640*
                         7641    7682*   7683*   7684*   7691    7692    7693    7725*   7726*   7727    7756*   7757*   7758*
                         7759*   7760*   7782*   7783*   7784    7789    7790    7791    7792    7793    7824*   7825*   7826
                         7872*   7874*   7875*   7876*   7877*   7929    7930    7931    7932    7933    7950*   7951*   7952*
                         7977    7978    7979    8011*   8013*   8015    8142*   8143*   8160    8161    8177*   8199    8286*
                         8287*   8288*   8289*   8290*   8291*   8394*   8395*   8396    8426    8427    8428    8429    8430
                         8431    8450*   8491    8502*   8503*   8504*   8505*   8506*   8507*   8527    8528    8529    8530
                         8531    8532    8547*   8558    8565*   8572    8581*   8587*   8703    8705*   8706*   8707*   8708*
                         8709*   8710*   8721*   8722*   8723    8799    8800    8801    8802    8803    8804    8860*   8972
                         8996*   9011*   9014*   9015    9028*   9031*   9032    9042    9065*   9066*   9067*   9068*   9109
                         9110    9111    9112    9137*   9138*   9139*   9140*   9141*   9149*   9150*   9151    9152    9181
                         9182    9183    9184    9185    9255    9257*   9258*   9259*   9260*   9261*   9262*   9274*   9275*
                         9276    9384    9385    9386    9387    9388    9389    9421*   9552    9599*   9600*   9601*   9602*
```

```
SW10  = 002000          103#
SW11  = 004000          102#
SW12  = 010000          101#  2549
SW13  = 020000          100#  2590    2669    2692
SW14  = 040000           99#
SW15  = 100000           98#
SW2   = 000004          121#
SW3   = 000010          120#
SW4   = 000020          119#
SW5   = 000040          118#
SW6   = 000100          117#  8389
SW7   = 000200          116#
SW8   = 000400          115#  8387
SW9   = 001000          114#
S11     025430         3355#  3377
S12     025564         3397#  3418
S36     027524         3886#  3903
TAGDTE  015150         2377#  4736*  4883*
TBITVE= 000014          156#
TDF   = 000040         2187#
TESDTE  015146         2373#  4283*  4459*  4629*  7390*  8907   9482   9757*
TESTAD  044612         7337#
TIMCNT  046244         7165   7200   7632#  7642   7648
TIMOT = 000004         3037#  3056   3057*  3072*  3290   3291*  3299*
TKVEC = 000060          163#  9965*  9966*
TMPILL  015142         2367#  4173*  4198   4204
TOLGAP  055264         4151   9143   9218#
TOTALA  015140         2365#  2685*  2687*  3321   3353   3395   3884
TPVEC = 000064          164#
TRAPVE= 000034          162#  2456*  2457*
TRE   = 040000         2080#  3852   3860   3882   3894   4339   4530   4676
TRK     052312         8723*  8726#
TRK1  = 004000         2174#
TRK10 = 040000         2177#
TRK2  = 010000         2175#
TRK20 = 100000         2178#
TRK4  = 020000         2176#
TRTVEC= 000014          157#
TSECC   015144         2369#  4916*  5084*  5258*  5437*  5611*  5780*  5951*  6126*  6295*  6456*  6621*  6805*
                       6996*  7382*  9153   9694   9704   9749*
TSECCG  050374         7386*  8256#  8380   9004   9016   9021   9033   9083   9099   9155*  9168*  9696*  9706*
                       9753*
TSTNM   017330         1670   1672   1674   1677   1680   1683   1685   1688   1692   1695   1697   1699   1702
                       1705   1708   1712   1715   1719   1722   1725   1728   1731   1735   2014   2016   2018
                       2416#  2576*  2622*  2648*  2928*  2967*  3026*  3051*  3093*  3117*  3147*  3174*  3205*
                       3233*  3276*  3318*  3388*  3432*  3471*  3531*  3578*  3637*  3671*  3698*  3733*  3772*
                       3805*  3838*  3876*  3915*  3944*  3977*  4008*  4040*  4079*  4115*  4140*  4238*  4416*
                       4586*  4733*  4906*  5058*  5231*  5411*  5601*  5754*  5924*  6100*  6285*  6431*  6595*
                       6779*  6970*  7156*  7191*  7345
TST1    021034         2554   2573#  7305
TST10   023764         3024#
TST11   024020         3049#
TST12   024124         3091#
TST13   024216         3108   3115#
```

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TST14   024314          3137    3145#
TST15   024412          3164    3172#
TST16   024514          3195    3203#
TST17   024612          3223    3231#
TST2    021310          2619#
TST20   024714          3254    3274#
TST21   025032          3316#
TST22   025516          3376    3386#
TST23   025644          3416    3430#
TST24   025764          3456    3469#
TST25   026164          3491    3529#
TST26   026324          3554    3576#
TST27   026476          3607    3635#
TST3    021366          2628    2646#
TST30   026606          3669#
TST31   026704          3686    3696#
TST32   027014          3704    3720    3731#
TST33   027130          3739    3758    3770#
TST34   027234          3791    3803#
TST35   027340          3824    3836#
TST36   027454          3844    3863    3874#
TST37   027600          3897    3899    3913#
TST4    021440          2654    2664#
TST40   027702          3932    3942#
TST41   030004          3961    3975#
TST42   030112          3996    4006#
TST43   030226          4038#
TST44   030356          4077#
TST45   030476          4104    4113#
TST46   030532          4137#
TST47   031064          4146    4197    4219    4236#
TST5    022554          2790    2803#   7253    7263
TST50   031556          4297    4414#
TST51   032302          4474    4584#
TST52   032742          4643    4731#
TST53   033516          4851    4885    4903#
TST54   034144          4977    5025    5055#
TST55   034662          5148    5204    5228#
TST56   035406          5331    5387    5408#
TST57   036150          5507    5574    5598#
TST6    023260          2927#
TST60   036574          5672    5721    5751#
TST61   037312          5844    5897    5921#
TST62   040036          6022    6076    6097#
TST63   040600          6199    6264    6282#
TST64   041224          6356    6404    6429#
TST65   041742          6520    6572    6593#
TST66   042476          6700    6755    6777#
TST67   043254          6877    6945    6967#
TST7    023622          2931    2965#
TST70   044032          7068    7134    7154#
TST71   044144          7173    7178    7189#
TST72   044240          7205    7226#
TTNO  = 000071          2576#   2622#   2648#   2928#   2967#   3026#   3051#   3093#   3117#   3147#   3174#   3205#   3233#
```

DZRJHA.SUB CROSS REFERENCE TABLE

```
                    3276#  3318#  3388#  3432#  3471#  3531#  3578#  3637#  3671#  3698#  3733#  3772#  3805#
                    3838#  3876#  3915#  3944#  3977#  4008#  4040#  4079#  4115#  4140#  4238#  4416#  4586#
                    4733#  4906#  5058#  5231#  5411#  5601#  5754#  5924#  6100#  6285#  6431#  6595#  6779#
                    6970#  7156#  7191#
TUF    = 000100     2188#
TY       052456     8849#
TYPDS  = 104404     2762   2777   2854   7236   7242   7251   7294  10316  10433#
TYPE   = 104400     2494   2499   2504   2508   2512   2516   2520   2524   2528   2532   2555   2592   2596
                    2671   2698   2702   2706   2710   2757   2763   2769   2775   2849   2855   2861   2895
                    2901   2907   2933   2937   2941   2948   3331   3335   3339   3343   4178   4264   4441
                    4611   4844   4854   4958   4993   5126   5174   5309   5353   5486   5539   5653   5688
                    5822   5870   6001   6044   6177   6232   6337   6371   6498   6546   6678   6722   6856
                    6909   7046   7101   7231   7237   7249   7252   7292   7295   7341   7347   7353   7354
                    7358   7362   7369   7373   7733   7832   8005   8543   8549   8561   8567   8573   8577
                    8583   8589   8593   9717   9864   9907   9982   9994  10048  10049  10052  10063  10073
                   10084  10103  10147  10150  10154  10219  10221  10250  10258  10280  10297  10299  10302
                   10304  10319  10324  10388  10429#  10478
TYPOC  = 104401     2602   2768   2860   2866   7346   7352   8548   8566   8592   8588   9721  10051  10288
                   10312  10430#
TYPON  = 104403    10432#
TYPOS  = 104402    10431#
T.SCOP   045656     7499#  10441
UN       021356     2631*  2633#
UNIT     015114     2345#  2561*  2784*  2791*  2812   2829*  2831   2853   7235   7257   7262*  7521
UNITS    015074     2344#  2722   2726   2784   2824   7258
UNITSL   015124     2351#  2562*  2791
UNLOAD   015154     2389#
UNS    = 040000     2117#
UPE    = 020000     2058#  3748   3755   3781   3788   3854
US1    = 000001     2045#  3368   3409   3438   3442   3453   3814   3821   4085   4089   4101
US2    = 000002     2046#  3368   3409   3438   3442   3453   3814   3821   4085   4089   4101
US4    = 000004     2047#  3368   3409   3438   3442   3453   3814   3821   4085   4089   4101
UWR    = 000010     2241#
U11      025406     3322   3348#
VUF    = 000002     2240#
VU30   = 010000     2194#
VV     = 000100     2091#  2985   7562
WAIT.T   046246     7634#  10443
WAT    = 104414    10443#
WC       015026     1668   2317#  4273   4337*  4379   4450   4520*  4525*  4554   4620   4669*  4673*  4700
                    7410
WCE    = 040000     2059#
WCF    = 000040     2108#
WCRC     054240     4165   4251   4428   5106   5280   5459   5802   5973   6148   6478   6643   6827   7018
                    7717   7815   7976   8904   9210#
WCU    = 000001     2182#
WCYL     055476     4590*  4597   4820*  4827   4930*  4937   5625*  5632   6309*  6316   9291#
WECC1    055256     1722   4982   5677   6360   9215#
WECC2    055260     1722   4986   5681   6364   6652   6655*  6656*  9216#
WKEY1    055502     4593*  4823*  4933*  5628*  6312*  9293#
WKEY2    055504     4594*  4824*  4934*  5629*  6313*  9294#
WLE    = 004000     2114#
WORD     053250     8882*  8887*  8896*  8898*  8900*  8902*  8904*  8954*  8958*  8989#  8999*  9012*  9029*
                    9700*  9708*
```

DZRJHA.SUB CROSS REFERENCE TABLE

```
WRCHDA  046732          7805#
WRCHDT  015170          2395#   7736
WRCHEK  015166          2394#   7835
WRCHHD  046420          7708#
WRDATA  053726          8789    9133#   9378
WRFROM  015220          2412#   2992    2998#   3005    4353    4357#   4380    4434    4521    4526    4604    4670    4674
                        4762    4788    4789    4833    4859    4943    5176    5198    5355    5370#   5381    5541    5557#
                        5568    5638    5872    5891    6046    6062#   6070    6234    6250#   6258    6322    6548    6566
                        6724    6749    6911    6927#   6929#   6939    7103    7119#   7120#   7128    8046    8147
WRHEAD  055572          9289    9416#
WRIDAT  015172          2396#   4181    4444
WRIFOR  015174          2397#   4614    4835    4962    5657    6341    8144
WRITE   053506          8917    8929    9064#   9157    9164    9170    9174    9177    9465    9485    9500    9514    9528
                        9541
WRL   = 004000          2096#
WRU   = 000400          2190#
WSECTR  055500          4592#   4822#   4932#   5627#   6311#   9274    9292#
WSSYNC  054226          9208#
WSU   = 000004          2184#
WTRK    055434          9276#   9280#
WWORD   053504          8918    8922    8926    8930    8938    8943    8948    9059#   9108#   9158    9165    9171    9175
                        9178    9466    9470    9487    9501    9515    9529    9542
X       052350          4162#   4248#   4425#   5103#   5277#   5456#   5799#   5970#   6145#   6475#   6640#   6824#   7015#
                        7714#   7811#   8019#   8036    8737#   8781
XE2     022202          2690    2720#
X11     025510          3328    3375#
Y       052410          8791#
Y11     025102          3327    3330#
ZCODE   050410          1731    4923#   5091#   5265#   5444#   5618#   5787#   5958#   6133#   6302#   6463#   6628#   6812#
                        7003#   8268#   8462#
ZER   = 000400          2129#   8471
ZWORDS  053724          9132#   9151#
$AUTOB  001134           264#   2546#  10041   10170
$BDADR  001122           259#   1677    1680    1702    1735    7544#   7551#   7555#   7568#   7573#   7576#   7598#   7606#
                        7612#   7617#
$BDDAT  001126           261#   1670    1674    1680    1685    1697    1699    1705    1708    1712    1715    2016    2652#
                        2653    3105#   3107    3134#   3136    3161#   3163    3192#   3194    3220#   3222    3251#   3253
                        3287#   3367#   3368#   3370    3408#   3409#   3411    3452#   3453#   3455    3483#   3485    3545#
                        3547    3597#   3600    3644#   3682#   3683#   3685    3715#   3717#   3719    3754#   3755#   3757
                        3787#   3788#   3790    3820#   3821#   3823    3859#   3860#   3862    3893#   3894#   3896    3928#
                        3929#   3931    3957#   3958#   3960    3992#   3993#   3995    4013#   4059#   4060#   4062    4100#
                        4101#   4103    4205#   7451#   7453#   7455    7653#   7774#   8089#   8090    8099#   8100    8111#
                        8112    8119#   8121    8191#   8192    8922#   8943#   9459#   9470#   9493#   9508#   9520#   9535#
                        9547#
$BELL   001216           293#   9994   10163   10250   10272
$CHARC  060012          9909#   9919#   9926    9935#   9940#
$CKSWR  060324         10027#  10437
$CMTAG  001100           247#   2445    2446    2454    2460    2461
$CM1  = 000006           279#    280#    281#    282#    283#    284#    285#
$CM2  = 000014           279#    280#    281#    282#    283#    284#    285#
$CM3  = 000006           277#    279
$CM4  = 000006           285#    286#    287#    288#    289#    290#    291#
$CNTLC  061075          9982   10063   10163#
$CNTLG  061107         10048   10165#
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$CNTLU  061102          10073  10164#
$CRLF   001223            295#  2775   7353   9908   9943  10084  10163  10224  10258  10272  10280  10299  10304
                        10324
$DBLK   057566           9830   9864   9872#
$DOAGN  044566           7288   7297   7303#
$DTBL   057556           9833   9868#
$ENDAD  044556            183   7299#
$ENDCT  044524           7290#
$ENDMG  044575           7249   7292   7307#
$ENULL  044572           7252   7295   7306#
$EOP    044470           2603   2715   7256   7280#
$ECPCT  044516           7287#  7291
$ERFLG  001103            250#  9737   9777   9779   9785*  9806  10245*  10272
$ERMAX  001115            256#  2462*  9779   9801*  9806
$ERROR  061276           2454   2605  10238#
$ERRPC  001116            257#  1670   1672   1674   1677   1680   1683   1685   1688   1692   1695   1697   1699
                         1702  1705   1708   1712   1715   1719   1722   1725   1728   1731   1735   2014   2016
                         2018  10252*  10253*  10254  10272  10286
$ERRTB  001226            312#  10294
$ERRTY  061444          10257  10279#
$ERTTL  001112            254#  7241   7243*  10251*  10272
$ESCAP  001214            292#  2461*  9800*  10267  10269  10272
$FILLC  001156            275#  9912   9943
$FILLS  001155            274#  9943
$GDADR  001120            258#
$GDDAT  001124            260#  1670   1672   1674   1697   1705   1708   1712   1715   1719   2016   2018   2655*
                         3100*  3107   3124*  3136   3154*  3163   3181*  3194   3212*  3222   3240*  3253   3288*
                         3358*  3359*  3370   3400*  3411   3438*  3455   3480*  3482   3485   3542*  3544   3547
                         3589*  3593   3598*  3600   3645*  3653*  3676*  3685   3711*  3719   3748*  3750   3757
                         3779*  3790   3812*  3823   3852*  3862   3882*  3896   3922*  3931   3951*  3960   3984*
                         3995   4014*  4026*  4045*  4062   4085*  4103   4204*  7446*  7448*  7450   7455   7773*
                         8094*  8105*  8115*  8124*  8194*  8892*  8921*  8940*  8942*  8969*  9458*  9469*  9492*
                         9507*  9521*  9534*  9548*
$GET42  044546           7296#
$GTSWR  060414          10049#  10435
$HD   = 000000             12
$HIOCT  061274          10212*  10223#
$ICNT   001104            251#  9792*  9793   9795*  9805
$ILLUP  062266          10448  10464  10483#
$INTAG  001135            265#  10046*  10065  10085  10170
$ITEMB  001114            255#  10254*  10272  10283
$LF     001224            296#  9943   10154  10163  10224  10272
$LPADR  001106            252#  2463*  2805*  7368*  7379  9783*  9798*  9803  9805
$LPERR  001110            253#  2464*  7351  7378*  9783  9799*  9805  10266
$MAIL = ****** U         2481  2542   9798   9896  10260
$MNEW   061125          10052  10168#
$MSWR   061114          10049  10166#
$MXCNT  057350           9796   9805#
$NULL   001154            273#  9914   9943
$NWTST= 000001           2567#  2569   2612#  2614   2643#  2661#  2794#  2796   2919#  2921   2956#  2958   3021#
                         3046#  3088#  3112#  3142#  3169#  3200#  3228#  3271#  3313#  3383#  3427#  3466#  3526#
                         3573#  3632#  3666#  3693#  3728#  3767#  3800#  3833#  3871#  3910#  3939#  3972#  4003#
                         4035#  4074#  4110#  4128#  4130   4223#  4225   4398#  4400   4573#  4575   4718#  4720
                         4894#  4896   5044#  5046   5217#  5219   5397#  5399   5589#  5591   5740#  5742   5910#
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DZRJHA.SUB CROSS REFERENCE TABLE

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                      5912    6086#   6088    6273#   6275    6418#   6420    6581#   6583    6765#   6767    6955#   6957
                      7146#   7148    7183#   7185    7217#   7219
$OCNT   062042       10360*  10389*  10402#
$OMODE  062044       10355*  10359*  10364   10367*  10378*  10404#
$OVER   057334        9760    9776    9784    9794    9802#
$PASS   001100         248#   3324    7248*   7250    7284*   7285*   7293    7306    9790    9806
$PCWER  062274       10479   10486#
$PWRAD  062262       10481#
$PWRDN  062122        2458   10448#  10476
$PWRMG  062256       10479#
$PWRUP  062174       10458   10464#
$QUES   001222         294#   9943   10103   10147   10163   10221   10224   10272
$RDCHR  060666       10116#  10438
$RDDEC= ****** U     10441
$RDLIN  060756       10139#  10439
$RDOCT  061136       10185#  10440
$RDSZ = 000011       10132#
$REGAD  001160         277#
$REG0   001162         279#
$REG1   001164         280#
$REG2   001166         281#
$REG3   001170         282#
$REG4   001172         283#
$REG5   001174         284#
$RTNAD  044570        7305#
$R2A  = ****** U     10441
$SAVRE= ****** U     10441
$SAVR6  062272       10457*  10465   10466*  10467*  10485#
$SCOPE  057060        2452    9746#
$SETUP= 000117        2443#   2451    2452    2454    2456    2458    2460    2461    2463    2539    7282    9747    9986
                      9991    9992   10022   10170   10239   10263   10271
$SS1  = 000000        2482#
$STUP = 177777        2443#
$SVLAD  057306        9768    9797#
$SVPC = 000200         181#    186
$SWR  = 167770           2#     12      44      45      46      47      48      49      50      51     291     292     293
                      2460    2461    2463    2464    2574    2620    2647    2665    2804    2928    2966    3025    3050
                      3092    3116    3146    3173    3204    3232    3275    3317    3387    3431    3470    3530    3577
                      3636    3670    3697    3732    3771    3804    3837    3875    3914    3943    3976    4007    4039
                      4078    4114    4138    4237    4415    4585    4732    4904    5056    5229    5409    5599    5752
                      5922    6098    6283    6430    6594    6778    6968    7155    7190    7227    7277    7283    7298
                      7304    7306    9738    9739    9740    9741    9742    9759    9771    9773    9774    9777    9778
                      9779    9786    9787    9788    9799    9802    9805   10230   10231   10232   10233   10234   10248
                     10255   10260   10264   10272   10482
$SWRMK= 000000          51      52    9742    9743    9775
$TIMES  001212         291#   2460*   2574*   2620*   2647*   2665*   2804*   3050*   3092*   3116*   3146*   3173*   3204*
                      3232*   3275*   3317*   3387*   3431*   3470*   3530*   3577*   3636*   3670*   3697*   3732*   3771*
                      3804*   3837*   3875*   3914*   3943*   3976*   4007*   4039*   4078*   7227*   7283*   9786*   9793
                      9796*   9805
$TKB    001146         270#   9946    9967    9978   10003   10031   10058
$TKCNT  060016        9947#   9962*   9992   10009*  10123   10125*
$TKINT  060036        2486    2667    8553    9962#   9983   10044
$TKQEN= 060035        9951#  10017   10128
$TKQIN  060020        9948#   9963*   9964   10015*  10016*  10017   10019*
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$TKQSR  060024          9950#  9963   10019  10130
$TKS    001144           269#  4172    4173   9946   9968*  9999*  10001  10007*  10029  10045*  10055  10067*  10087*
$TKSRV  060106          9965   9978#
$TMP0   001176           285#  1685    2730*  2731*  3056*  3072   3290*  3299   3365*  3406*  3446*  3647*  3657
                        3990*  4016*   4029   4047*  4067   4291*  4292   4467*  4468   4637*  4638   7638*  7644
                        7649   7653    7764*  7778   7880*  7926*
$TMP1   001200           286#  1683    1685   1699   2588*  7165*  7166*  7200*  7201*  7639*  7644   7649   7765*
                        7780
$TMP2   001202           287#  1699    7642*  7646*  7648*  7651*  7882*  7924*
$TMP3   001204           288#  1685    1699   7636*  7637*  7881*  7883   7884*
$TMP4   001206           289#  7883*   7907*
$TMP5   001210           290#  7879*   7885*  7891   8008*  8087   8109
$TN   = 000073             2#    12    2554   2567   2574#  2576   2612   2620#  2622   2628   2643   2647#  2648
                        2654   2661    2665#  2790   2794   2804#  2919   2928#  2931   2956   2966#  2967   3021
                        3025#  3026    3046   3050#  3088   3092#  3093   3108   3112   3116#  3117   3137   3142
                        3146#  3147    3164   3169   3173#  3174   3195   3200   3204#  3205   3223   3228   3232#
                        3233   3254    3271   3275#  3276   3313   3317#  3318   3375   3383   3387#  3388   3416
                        3427   3431#   3432   3456   3466   3470#  3471   3491   3526   3530#  3531   3554   3573
                        3577#  3578    3607   3632   3636#  3637   3666   3670#  3671   3686   3693   3697#  3698
                        3704   3720    3728   3732#  3733   3739   3758   3767   3771#  3772   3791   3800   3804#
                        3805   3824    3833   3837#  3838   3844   3863   3871   3875#  3876   3897   3899   3910
                        3914#  3915    3932   3939   3943#  3944   3961   3972   3976#  3977   3996   4003   4007#
                        4008   4035    4039#  4040   4074   4078#  4079   4104   4110   4114#  4115   4128   4138#
                        4140   4146    4197   4219   4223   4237#  4238   4297   4398   4415#  4416   4474   4573
                        4585#  4586    4643   4718   4732#  4733   4851   4885   4894   4904#  4906   4977   5024
                        5044   5056#   5058   5148   5203   5217   5229#  5231   5331   5386   5397   5409#  5411
                        5507   5573    5589   5599#  5601   5672   5720   5740   5752#  5754   5844   5896   5910
                        5922#  5924    6022   6075   6086   6098#  6100   6199   6263   6273   6283#  6285   6356
                        6403   6418    6430#  6431   6520   6571   6581   6594#  6595   6700   6754   6765   6778#
                        6779   6877    6944   6955   6968#  6970   7068   7133   7146   7155#  7156   7173   7178
                        7183   7190#   7191   7205   7217   7227#
$TPB    001152           272#  9932*   9943
$TPFLG  001157           276#  9890    9943
$TPS    001150           271#  9930    9943
$TRAP   062046          2456   10413#
$TRP  = 000015         10421#  10430#  10431#  10432#  10433#  10434#  10435  10436#  10437  10438#  10439#  10440#  10441#
                       10442#  10443#  10444#
$TRPAD  062070         10418   10428#
$TSTNM  001102           249#  7244*   7282*  9737   9775   9797*  9802   9806   10247  10272
$TTYIN  061064         10140   10141   10158  10162#
$TYPBN= ****** U       10434
$TYPDS  057352          9818#  10433
$TYPE   057576          9890#  10421   10429
$TYPEC  057746          9911   9918    9925   9930#  9931   10089
$TYPEX  060014          9936   9938    9941#
$TYPOC  061644         10358#  10430
$TYPON  061660         10357   10360#  10432
$TYPOS  061620         10353#  10431
$XTSTR  057112          9762#
$$GET4= 000000          7298#
$OFILL  062043         10354*  10358*  10368  10403#
$40CAT= ****** U        9759   10257
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DZRJHA.SUB CROSS REFERENCE TABLE

2012#	2344#	2411#	2412#	2413#	2449	2463	2464	2497#	2502#	2511#	2515#	2527#
2595#	2674#	2701#	2705#	2760#	2766#	2772#	2852#	2898#	2904#	2910#	2936#	2940#
2951#	3342#	7234#	7240#	7306	7310	7357#	7365#	7372#	7376#	8564#	9207#	9208#
9209#	9210#	9211#	9212#	9214#	9215#	9216#	9217#	9218#	9720#	9805	9806	9872#
9943	9946	9950#	9951	9952#	10162#	10163	10170	10224	10272	10327#	10460	10484

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CHECKA      39#  4853  4991  5173  5352  5537  5686  5869  6043  6230  6369  6545  6721  6907  7099
CHECKB      39#  4177  4263  4440  4610  4843  4957  5125  5308  5485  5652  5821  6000  6175  6336
          6497  6677  6855  7045  7732  7831  8004
COMMEN      14   166#
ENDCOM      21   166#
ERROR       60#  2589  2635  2657  3014  3070  3109  3138  3165  3196  3224  3255  3297  3379  3419
          3457  3487  3550  3603  3655  3687  3721  3759  3792  3825  3864  3898  3933  3962  3997
          4027  4065  4105  4209  4212  4296  4368  4389  4472  4564  4641  4710  4865  4867  4984
          4988  5027  5029  5152  5160  5206  5208  5335  5344  5389  5391  5511  5520  5532  5576
          5578  5679  5683  5723  5725  5848  5856  5899  5901  6026  6035  6078  6080  6203  6212
          6224  6266  6268  6362  6366  6406  6408  6524  6532  6574  6576  6704  6713  6757  6759
          6881  6890  6902  6947  6949  7072  7081  7093  7136  7138  7171  7179  7209  7545  7552
          7556  7569  7574  7577  7599  7607  7613  7618  7654  8052  8054  8078  8080  8095  8106
          8116  8126  8196  8400  8406  8475
ESCAPE     166#
GETPRI     166#
GETSWR       2#   166#  2539
HCOMPR      39#
HCOMPW      39#
MAKECL      39#  3021  4110
MSG       2566#  2569  2611#  2614  2793#  2796  2919#  2921  2955#  2958  4128#  4130  4222#  4225  4397#
          4400  4572#  4575  4718#  4720  4893#  4896  5043#  5046  5216#  5219  5396#  5399  5588#  5591
          5739#  5742  5909#  5912  6085#  6088  6272#  6275  6417#  6420  6580#  6583  6764#  6767  6954#
          6957  7145#  7148  7182#  7185  7217#  7219
MULT       166#
NEWTST     166#  2567  2612  2643  2661  2794  2919  2956  3021  3046  3088  3112  3142  3169  3200
          3228  3271  3313  3383  3427  3466  3526  3573  3632  3666  3693  3728  3767  3800  3833
          3871  3910  3939  3972  4003  4035  4074  4110  4128  4223  4398  4573  4718  4894  5044
          5217  5397  5589  5740  5910  6086  6273  6418  6581  6765  6955  7146  7183  7217
POP        166#  7415  7492  7691  7788  7929  7977  8160  8198  8425  8490  8527  8798  8971  9042
          9109  9181  9383  9551  9672  9712  9859 10213 10469 10470
PUSH       166#  7405  7479  7681  7755  7871  7874  7949  8141  8176  8285  8450  8501  8705  8860
          8995  9064  9137  9257  9421  9599  9693  9818 10187 10450 10456
REPORT     166#
RFORGC      39#  5024  5203  5386  5573  5720  5896  6075  6263  6403  6571  6754  6944  7133
RH70CK      39#  2623  3699  3734  3839  4141
SAVE        39# 10240
SAVTST      39#  2576  2622  2648  2928  2967  3026  3051  3093  3117  3147  3174  3205  3233  3276
          3318  3388  3432  3471  3531  3578  3637  3671  3698  3733  3772  3805  3838  3876  3915
          3944  3977  4008  4040  4079  4115  4140  4238  4416  4586  4733  4906  5058  5231  5411
          5601  5754  5924  6100  6285  6431  6595  6779  6970  7156  7191
SCOPE       61#  2573  2619  2646  2664  2803  2927  2965  3024  3049  3091  3115  3145  3172  3203
          3231  3274  3316  3386  3430  3469  3529  3576  3635  3669  3696  3731  3770  3803  3836
          3874  3913  3942  3975  4006  4038  4077  4113  4137  4236  4414  4584  4731  4903  5055
          5228  5408  5598  5751  5921  6097  6282  6429  6593  6777  6967  7154  7189  7226  7281
SETPRI     166# 10119
SETTRA   10421# 10430 10431 10432 10433 10435 10437 10438 10439 10440 10441 10442 10443
SETUP      166#  2444
SKIP        39#   166#  2554  2654  2790  2931  3108  3137  3164  3195  3223  3254  3375  3416  3456
          3491  3554  3607  3686  3720  3758  3791  3824  3863  3897  3899  3932  3961  3996  4104
          4197  4219  4851  4885  4977  5148  5331  5507  5672  5844  6022  6199  6356  6520  6700
          6877  7068  7173  7178  7205
SLASH      166#
SMORE       39#  9748
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SPACE     166#
STARS      31     37    166#   179    242    297   2028   2030   2064   2066   2567   2572   2612   2618   2643
         2645   2661   2663   2741   2751   2794   2802   2835   2845   2872   2911   2919   2926   2956   2964
         3021   3023   3046   3048   3088   3090   3112   3114   3142   3144   3169   3171   3200   3202   3228
         3230   3271   3273   3313   3315   3383   3385   3427   3429   3466   3468   3526   3528   3573   3575
         3632   3634   3666   3668   3693   3695   3728   3730   3767   3769   3800   3602   3833   3835   3871
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         4128   4136   4223   4235   4398   4413   4573   4583   4718   4730   4894   4902   5044   5054   5217
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TYPOCT    166#  2859   2865  10050  10286  10311
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DZRJHA.SUB CROSS REFERENCE TABLE

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DZRJHA.SUB CROSS REFERENCE TABLE

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DZRJHA.SUB CROSS REFERENCE TABLE

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ERRORS DETECTED: 0

*DZRJHA,DZRJHA/SOL/CRF←DZRJHA.MAC,DZRJHA.ITM,FLTINS.ITM,DZRJHA.ERR,FLTINS.ERR,DZRJHA.DEF,DZRJHA.SET,FLTIN1.P11,DZRJHA.TST,DZRJH
RUN-TIME: 120 104 16 SECONDS
CORE USED: 29K

L10

Spooler runtime 34 Seconds, 209 KCS, 1130 disk reads, 0 disk writes, 338 pages printed