RP04/5/6

FUNCTIONAL CONTROL 2
CZRJJB0

AH-9225B-MC

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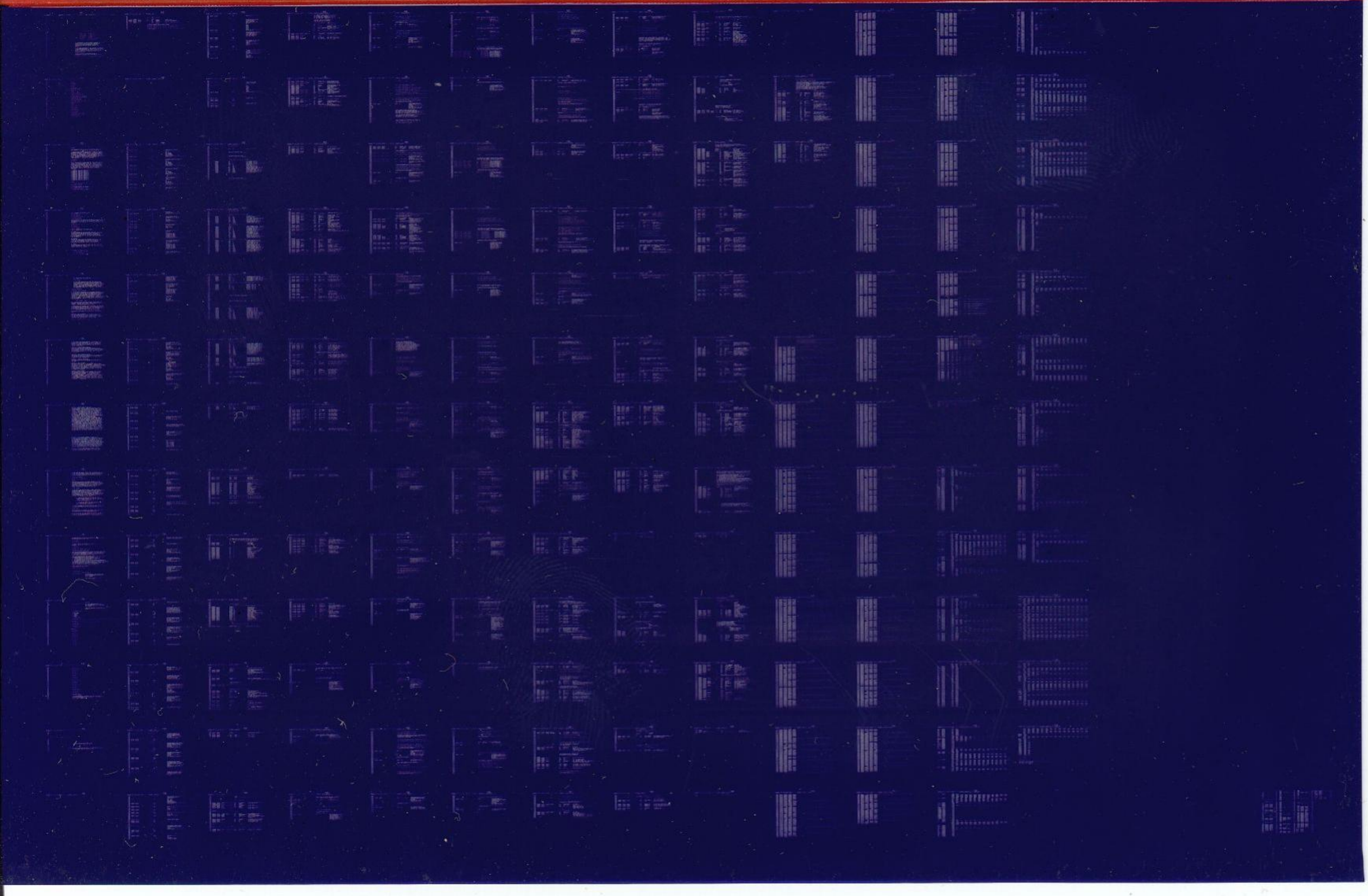

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IDENTIFICATION

PRODUCT CODE: AC-9223B-MC
PRODUCT NAME: CZRJJB0 RP04/5/6 FUNCTIONAL CONTROLLER TEST PART II
DATE CREATED: DECEMBER 1977
MAINTAINER: DIAGNOSTIC ENGINEERING
AUTHOR: PETE BLACKSTONE

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1.0 ABSTRACT

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

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

2.0 REQUIREMENTS

2.1 EQUIPMENT

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

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

2.2 STORAGE

THIS PROGRAM REQUIRES 16K WORDS OF MEMORY

2.3 PRELIMINARY PROGRAMS

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

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

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

3.0 LOADING PROCEDURE

USE STANDARD PROCEDURE FOR LOADING .ABS TAPES

4.0 STARTING PROCEDURE

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

4.1 CONTROL SWITCH SETTINGS

SEE SECTION 5.1

4.2 STARTING ADDRESS

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

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

204 RESTART
SAME AS 200 START, WITH THE FOLLOWING EXCEPTIONS: THE
PROGRAM WILL INTERROGATE THE OPERATOR FOR THE NON-DEFAULT
C.S.R. AND VECTOR ADDRESS FOR THE RHXX CONTROLLER.
WHEN THESE QUESTIONS HAVE CORRECTLY BEEN ANSWERED, THE
PROGRAM WILL AUTOMATICALLY RESTART FROM ADDRESS 200.

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

4.3 PROGRAM AND/OR OPERATOR ACTION

1. LOAD THE PROGRAM INTO MEMORY.

2. SET STARTING ADDRESS ON THE SWITCH REGISTER

3. PRESS "LOAD ADDRESS".

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

5. PRESS "START".

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

5.0 OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

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

        'SWR = NNNNNN   NEW ='

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

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

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

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

SWITCH 14 - LOOP ON TEST
WHEN THIS SWITCH IS SET THE PROGRAM WILL BEGIN TO LOOP

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

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

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

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

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

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

NOTE: SEE SECTION 8.3

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SWITCH 8 - LOOP ON TEST IN SWR <7:0>
THIS IS A SPECIAL SWITCH. WHEN SET SWITCHES 0 THRU 7
HAVE ONE MEANING AND WHEN RESET SWITCHES 0 THRU 7 HAVE
ANOTHER MEANING. THIS MEANS THAT ANY SETTING OF SWITCH
0 THRU 7 MUST BE DONE WITH SWITCH 8 IN THE APPROPIATE
POSITION. WHEN THIS SWITCH IS SET THEN SWITCHES 0 THRU
7 GIVE THE TEST NUMBER TO BE LOOPED ON. FOR EXAMPLE
WITH SWITCH 8 SET AND SWITCH 3 SET THE PROGRAM WILL LOOP
ON TEST 10. HOWEVER THIS SETTING MUST BE DONE AT THE
BEGINNING OF THE PROGRAM THEN ALL THE TESTS FROM 1 TO 10
WILL BE EXECUTED AND THEN TEST 10 WILL BE REPEATED OVER
AND OVER AGAIN. WHEN THIS SWITCH IS NOT SET THEN SWITCHES
0 THRU 7 HAVE THE MEAING ITS NAME INDICATES.
FOR EXAMPLE SWITCH 7 IS "STOP FURTHER COMPARES: THAT IS
IF SWITCH 8 IS NOT SET AND SWITCH 7 IS SET THEN WHEN A
DATA ERROR IS DETECTED NO FURTHER COMPARES WILL BE DONE.
FOR EXAMPLE IN A 256 WORD BUFFER IF ALL THE WORDS ARE IN
ERROR THEN AFTER SEEING THE PRINTOUT FOR THE FIRST FEW
WORDS SETTING SWITCH 7 ONLY WILL STOP FURTHER PRINTOUTS
OF THIS ERROR AND GO ON WITH THE TEST RATHER THAN PRINT
ALL THE 256 WORDS. HOWEVER IF THIS WAS DONE WITH SWITCH 11
THEN THE NEXT ERROR THAT THE PROGRAM DETECTS IN A SUB-
SEQUENT TEST WILL ALSO BE LOST. BUT WITH SWITCH 7, ONLY
THIS GROUP OF DATA ERRORS ARE NOT PRINTED OUT. ANOTHER
EXAMPLE OF SWITCH 8 BEING LOW IS WITH SWITCH 6, WHICH
IS "ECC TEST-COMPARE END RESULT ONLY". THAT IS IF SWITCH
8 IS NOT SET AND SWITCH 6 IS SET THEN ON ECC TESTS (TEST
120 THRU TEST 134) INSTEAD OF COMPARING CONTENTS OF THE
POSITION REGISTER AND PATTERN REGISTER AFTER EVERY CLOCK,
COMPARES WILL ONLY BE DONE AT THE END OF ALL THE CLOCKS.

NOTE: SEE SECTION 8.3

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

SWITCH 6 - TYPE ALL REGISTERS WITH ERROR IF SWO8 IS LOW
IF SWITCH 8 IS SET AND THIS SWITCH IS ALSO SET THEN
THIS SWITCH GIVES THE TEST NUMBER TO BE LOOPED ON AS
INDICATED IN THE DESCRIPTION OF SWITCH 8. IF SWITCH 8 IS

NOT SET AND THIS SWITCH IS SET THEN THE PROGRAM WILL DO
AS THE NAME INDICATES. THAT IS ON FINDING AN ERROR INSTEAD
OF ONLY GIVING THE ERROR MESSAGE AND RELEVANT REGISTERS
AS WILL BE DONE IF SWITCH 11 IS NOT SET BUT WILL ALSO
GIVE ALL THE REGISTER CONTENTS (EXCEPT "DATA BUFFER" RHDB).

5.2 SUB-ROUTINE ABSTRACTS

SEE SECTION 9 "SUBROUTINES".

6.0 ERRORS

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

6.1 'FATAL' ERRORS

IN THE EVENT THAT THE DISK DRIVE ECOMES UNAVAILABLE TO THE
CONTROLLER, POWERS DOWN, OR CERTAIN CRITICAL STATUS BITS
CANOT BE CLEARED PRIOR TO THE START OF ATEST SEQUENCE - THIS
INFORMATION WILL BE COMMUNICATED TO THE OPERATOR. IN
ADDITION, THE TTY BELL WILL RING AND THE PROGRAM WILL HALT.
IT IS SUGGESTED THAT IF THIS HAPPENS, THE OPERATOR LOAD
ADDRESS 200 (210) AND RESTART THE PROGRAM AS A FIRST ATTEMPT
TO SOLVE THE PROBLEM. IF THE FILURE CONTINUES TO OCCUR,
THERE ARE TWO OPTIONS FOR THE OPERATOR:

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

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

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

7.0 RESTRICTIONS

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

SWITCH 12 MUST BE SET WHEN RUNNING ON AN RH70 CONTROLLER AND
IT MUST NOT BE SET WHEN RUNNING ON AN RH11 CONTROLLER.
BECAUSE OF THE REQUIREMENT FOR IT TO BE SET WHEN USING AN
RH70, THE PROGRAM CANNOT BE RUN IN CHAIN MODE WHEN USING THE

SOFTWARE REGISTER FEATURE WHILE RUNNING ON AN RH70. THIS IS
BECAUSE THE ROUTINE WHICH GETS SOFTWARE SWITCH SETTINGS IS
NOT OPERABLE WHEN IN CHAIN MODE.

8. MISCELLANEOUS

8.1 EXECUTION TIME

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

8.2 STACK POINTER

THE STACK IS INITIALLY SET TO 1000

8.3 OPERATOR SELECTABLE SCOPE LOOPS

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

WHEN THIS OPERATOR SELECTABLE SCOPE LOOP IS USED THEN THE POINT
THE PROGRAM GOES BACK TO CAN BE CHANGED.
THE RESTRICTIONS TO THE POINT WHERE THE PROGRAM CAN GO ARE: -
1. IT MUST BE WITHIN THE TEST UNDER CONSIDERATION
2. LOOP ON ERROR SWITCH MUST BE SET
3. THE ERROR MUST OCCUR WITHIN THE TEST UNDER CONSIDERATION
IF THE ERROR DOES NOT OCCUR WITHIN THE TEST UNDER CONSIDERATION
THE PROGRAM WILL REVERT TO NORMAL OPERATION. HOWEVER, IF LOOP ON
TEST SWITCH IS SET AND THIS OPERATOR SELECTABLE SCOPE LOOP IS USED
THEN THE PROGRAM WILL LOOP BACK TO THE SELECTED POINT WHEN IT
COMES TO THE END OF THE TEST UNDER CONSIDERATION.

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

8.4 PROGRAM REVISION HISTORY

9.0 PROGRAM DESCRIPTION

9.1 LOGIC DIVISION IN HARDWARE MODULES

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

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

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

HANDLING.

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

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

9.2 DISK SURFACE USAGE

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

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

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

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

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

C1, T18, S21
TT31-W

C2, T0, S0
TT31-W,R

C2, T18, S21
TT31-W

C3, T0, S0
TT31-W,R

C3, T18, S21
TT31-W

C4, T0, S0
TT31-W,R

C4, T18, S21
TT31-W

C5, T0, S0
TT31-W,R

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

                                        C5, T18, S21
                                        TT31-W

                                        C6, T0, S0
                                        TT31-W,R

                                        C6, T18, S21
                                        TT31-W

                                        C7, T0, S0
                                        TT31-W,R

                                        C7, T18, S18
                                        TT31-W

                                        C8, T0, S0
                                        TT31-W,R

                                        C8, T18, S21
                                        TT31-W

                                        C9, T0, S0
                                        TT31-W

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

                                        C10, T0, S0
                                        TT31-W,R

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


                9.3     THE FOLLOWING SECTION DESCRIBES EACH TEST AND SUBROUTINES
                        IN DETAIL AND CAN BE USED AS AN INDEX TO THE LISTING.
                        THE LEFT MOST COLUMN IS THE LINE NUMBER WITHIN THE LISTING
                        WHERE THAT ITEM WILL BE FOUND.
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;DRIVE MUST BE LOCKED ON PORT A OR PORT B


                                        ;*INTERNAL PROGRAM MACROS BEGIN HERE
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                                ;*
                                ;*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.
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                                        .SBTTL  STARTING ADDRESS

                000200                          .=200
000200  000137  004710          RA:     JMP     @#BEGIN         ;NORMAL START
000204  000137  035232          ADDMOD: JMP     @#BASECH        ;GET DEVICE PARAMETERS
000210  000137  004674                  JMP     @#BEGIN2        ;JUMP TO SELECT DRIVE START
                000220                  .=220
000220  000137  004660                  JMP     @#BEGIN1        ;JUMP TO NO OPERATOR TESTS START

                                        ;*STARTING ADDRESS 200 FOR NORMAL STARTS
                                        ;*THIS WILL TEST ALL RP04'S ON THE SYSTEM A SINGLE DRIVE AT A TIME
                                        ;*
                                        ;*STARTING ADDRESS 210 WILL TEST ONLY ONE SPECIFIED DRIVE
                                        ;*
                                        ;*STARTING ADDRESS 220 WILL JUMP OVER THE TESTS REQUIRING AN OPERATOR
                                        ;*AT THE DRIVE
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641          001110                          .=1110                  ; ?
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                                ;ITEM1
001226  042566                          EM1             ;RP04 DID NOT INTERRUPT
                                                        ;WAITED ON BIT DID NOT OCCUR
001230  057444                          DH1             ;PC
                                                        ;WAT PC
                                                        ;BIT WAITED
                                                        ;REG ADDRESS
                                                        ;REG CONTENTS
                                                        ;RHCS1 CONTENTS
001232  061714                          DT1             ;$ERRPC,WAITPC,WAITBT,WAITRE,$BDDAT,CS1
001234  062234                          DF1             ;0,0,0,0,0,0

                                ;ITEM2
001236  042615                          EM2             ;INTERRUPT ENABLE BIT DOWN BUT
                                                        ;WAITED ON BIT DID NOT OCCUR
001240  057444                          DH1             ;PC
                                                        ;WAT PC
                                                        ;BIT WAITED
                                                        ;REG ADDRESS
                                                        ;REG CONTENTS
                                                        ;RHCS1 CONTENTS
001242  061714                          DT1             ;$ERRPC,WAITPC,WAITBT,WAITRE,$BDDAT,CS1
001244  062234                          DF1             ;0,0,0,0,0,0

                                ;ITEM3
001246  042704                          EM3             ;RP04 DID NOT INTERRUPT WHEN
                                                        ;WAITED ON BIT DID SET
001250  057444                          DH1             ;PC
                                                        ;WAT PC
                                                        ;BIT WAITED
                                                        ;REG ADDRESS
                                                        ;RHCS1 CONTENTS
001252  061714                          DT1             ;$ERRPC,WAITPC,WAITBT,WAITRE,$BDDAT,CS1
001254  062234                          DF1             ;0,0,0,0,0,0

                                ;ITEM4
001256  042765                          EM4             ;WAITED ON BIT DID SET BUT
                                                        ;TIME IS IN ERROR
                                                        ;TIME IS GIVEN IN 10 MICRO SEC.
                                                        ;(DECIMAL)
001260  057624                          DH4             ;PC
                                                        ;WAT PC
                                                        ;BIT WAITED
                                                        ;REG ADDRESS
                                                        ;TIME IN 10 MSEC
001262  061734                          DT4             ;$ERRPC,WAITPC,WAITBT,WAITRE,$BDDAT,WAITIM
001264  062243                          DF4             ;0,0,0,0,0,1

                                ;ITEM5
001266  043076                          EM5             ;RHAS DOES NOT CLEAR BY
                                                        ;MOVING IN ALL ONES
001270  057765                          DH5             ;PC
                                                        ;REG. ADDR.
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                                                                        ;GOOD DATA
                                                                        ;RECEIVED DATA
001272  061756                                DT5                       ;$ERRPC,REGADR,$GDDAT,$BDDAT
001274  062252                                DF5                       ;0,0,0,0
                                ;ITEM6
001276  043150                                EM6                       ;LOADING RHER1 FOR ALL
                                                                        ;UNITS DID NOT SET ANY BITS
                                                                        ;IN RHAS-NO UNITS PRESENT
001300  060104                                DH6                       ;PC
                                                                        ;REG ADDR
                                                                        ;RECEIVED DATA
001302  061772                                DT6                       ;$ERRPC,REGADR,$BDDAT
001304  062257                                DF6                       ;0,0,0
                                ;ITEM7
001306  043236                                EM7                       ;SPECIFIED REGISTER NONEXISTANT
                                                                        ;SO ABORT PROGRAM
001310  060203                                DH7                       ;PC
                                                                        ;ADDR. OF REG.
001312  062004                                DT7                       ;$ERRPC,TEMP1
001314  062263                                DF7                       ;0,0
                                ;ITEM10
001316  043306                                EM10                      ;STOPED DRIVE HAS MOL BIT
                                                                        ;IN RHDS1 = 1
001320  060243                                DH10                      ;PC
                                                                        ;TEST NO
                                                                        ;FAILING REG ADDR
                                                                        ;CONTENTS OF RHCS1
                                                                        ;CONTENTS OF RHCS2
                                                                        ;CONTENTS OF RHDS1
                                                                        ;CONTENTS OF RHER1
001322  062014                                DT10                      ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001324  062266                                DF10                      ;0,0,0,0,0,0,0
                                ;ITEM11
001326  043355                                EM11                      ;WITH SPINDLE POWERED DOWN
                                                                        ;RHCS2 SHOULD HAVE ONLY
                                                                        ;UNIT NUMBER AND IR HIGH
001330  060243                                DH10                      ;PC
                                                                        ;TEST NO
                                                                        ;FAILING REG. ADR
                                                                        ;CONTENTS OF RHCS1
                                                                        ;CONTENTS OF RHCS2
                                                                        ;CONTENTS OF RHDS1
                                                                        ;CONTENTS OF RHER1
001332  062014                                DT10                      ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001334  062266                                DF10                      ;0,0,0,0,0,0,0
                                ;ITEM12
001336  043462                                EM12                      ;AFTER A POWER UP WITH
                                                                        ;NO PACK ACKNOWLEDGE COMMAND
                                                                        ;RHDS1 SHOULD HAVE MOL=1, VV=0
001340  060243                                DH10                      ;PC
                                                                        ;TEST NO
```

```
                                                        ;FAILING REGISTER ADDR.
                                                        ;CONTENTS OF RHCS1
                                                        ;CONTENTS OF RHCS2
                                                        ;CONTENTS OF RHDS1
                                                        ;CONTENTS OF RHER1
001342  062014                    DT10                  ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001344  062266                    DF10                  ;0,0,0,0,0,0,0

                        ;ITEM13
001346  043570                    EM13                  ;AFTER A POWER UP WITHOUT
                                                        ;ANY INIT RHCS1 SHOULD
                                                        ;HAVE GO=0, DVA=1, RDY=1
                                                        ;IE=0, DISREGARD
                                                        ;ALL OTHER BITS
001350  060243                    DH10                  ;PC
                                                        ;TEST NO
                                                        ;FAILING REGISTER ADDR.
                                                        ;CONTENTS OF RHCS1
                                                        ;CONTENTS OF RHCS2
                                                        ;CONTENTS OF RHDS1
                                                        ;CONTENTS OF RHER1
001352  062014                    DT10                  ;$ERRPC,$TSTNM,$BDADR,CS1,CS2,DS1,ER1
001354  062266                    DF10                  ;0,0,0,0,0,0,0

                        ;ITEM14
001356  043707                    EM14                  ;AFTER POWER UP RHCC
                                                        ;SHOULD BE=0
001360  057765                    DH5                   ;PC
                                                        ;REG. ADDR.
                                                        ;GOOD DATA
                                                        ;RECEIVED DATA
001362  061756                    DT5                   ;$ERRPC,REGADR,$GDDAT,$BDDAT
001364  062252                    DF5                   ;0,0,0,0
```

```
                                ;ITEM15
001366  043761                          EM15                    ;PACK ACKNOWLEDGE CAUSED
                                                                ;AN ERROR
                                                                ;GOOD DATA IS BEFORE COMMAND
                                                                ;RECEIVED DATA IS AFTER COMMAND
001370  057765                          DH5                     ;PC
                                                                ;REG. ADDR.
                                                                ;GOOD DATA
                                                                ;RECEIVED DATA
001372  061756                          DT5                     ;$ERRPC,REGADR,$GDDAT,$BDDAT
001374  062252                          DF5                     ;0,0,0,0

                                ;ITEM16
001376  044122                          EM16                    ;GIVING A NO-OP COMMAND CAUSED
                                                                ;AN ERROR
                                                                ;GOOD DATA GIVES REGISTER
                                                                ;CONTENTS BEFORE COMMAND
                                                                ;RECEIVED DATA GIVES REGISTER
                                                                ;CONTENTS AFTER COMMAND
001400  057765                          DH5                     ;PC
                                                                ;REG. ADDR.
                                                                ;GOOD DATA
                                                                ;RECEIVED DATA
001402  061756                          DT5                     ;$ERRPC,REGADR,$GDDAT,$BDDAT
001404  062252                          DF5                     ;0,0,0,0

                                ;ITEM17
001406  044250                          EM17                    ;DRIVE CLEAR COMMAND
                                                                ;CAUSED AN ERROR
                                                                ;GOOD DATA GIVES WHAT SHOULD
                                                                ;BE THERE
                                                                ;RECEIVED DATA GIVES WHAT WAS
                                                                ;THERE AFTER COMMAND
001410  057765                          DH5                     ;PC
                                                                ;REG. ADDR.
                                                                ;GOOD DATA
                                                                ;RECEIVED DATA
001412  061756                          DT5                     ;$ERRPC,REGADR,$GDDAT,$BDDAT
001414  062252                          DF5                     ;0,0,0,0

                                ;ITEM20
001416  044405                          EM20                    ;READ-IN COMMAND GAVE AN ERROR
                                                                ;GOOD DATA HAS WHAT SHOULD BE THERE
                                                                ;RECEIVED DATA HAS WHAT WAS
                                                                ;AFTER COMMAND
001420  057765                          DH5                     ;PC
                                                                ;REG. ADDR.
                                                                ;GOOD DATA
                                                                ;RECEIVED DATA
001422  061756                          DT5                     ;$ERRPC,REGADR,$GDDAT,$BDDAT
001424  062252                          DF5                     ;0,0,0,0

                                ;ITEM 21
001426  044554                          EM21                    ;RHCS1 CONTENTS DURING
                                                                ;COMMAND WAS IN ERROR
```

```
                                        DH5
                                        DT5
                                        DF5

                                ;ITEM 22
001436  044627                          EM22            ;RHDS1 CONTENTS DURING
                                                        ;COMM ANS WAS IN ERROR
001440  057765                          DH5
001442  061756                          DT5
001444  062252                          DF5

                                ;ITEM 23
001446  044702                          EM23            ;UNLOAD COMMAND GAVE AN ERROR
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;THERE AFTER COMMAND
001450  057765                          DH5
001452  061756                          DT5
001454  062252                          DF5

                                ;ITEM 24
001456  045051                          EM24            ;OFFSET COMMAND CAUSED AN ERROR
                                                        ;GOOD DATA IS WHAT SHOULD BE THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS THERE
                                                        ;AFTER AN OFFSET COMMAND
001460  057765                          DH5
001462  061756                          DT5
001464  062252                          DF5

                                ;ITEM 25
001466  045214                          EM25            ;RETURN TO CENTER LINE COMMAND
                                                        ;CAUSED AN ERROR
                                                        ;GOOD DATA GIVES WHAT SHOULD BE
                                                        ;THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;THERE AFTER COMMAND
001470  057765                          DH5
001472  061756                          DT5
001474  062252                          DF5

                                ;ITEM 26
001476  045376                          EM26            ;500 OFFSETS CAUSED AN ERROR
001500  060422                          DH26            ;PC
                                                        ;CONT. OF RHCS1
                                                        ;CONT. OF RHCS2
                                                        ;CONT. OF RHDS1
                                                        ;CONT. OF RHER1
                                                        ;CONT. OF RHER2
                                                        ;CONT. OF RHER3
001502  062034                          DT26            ;$ERRPC,CS1,CS2,DS1,ER1,ER2,ER3
001504  062275                          DF26            ;0,0,0,0,0,0,0

                                ;ITEM 27
001506  045466                          EM27            ;WRITE HEADER AND DATA
                                                        ;CAUSED IMPROPER REGISTER CHANGE
```

```
                                                                ;GOOD DATA GIVES WHAT
                                                                ;SHOULD BE THERE
                                                                ;RECEIVED DATA GIVES WHAT
                                                                ;WAS THERE AFTER COMMAND
001510  057765                          DH5
001512  061756                          DT5
001514  062252                          DF5

                        ;ITEM 30
001516  045704                  EM30    ;WRITE HEADER AND DATA
                                        ;CHANGED WRITE FROM BUFFER
001520  060622                  DH30    ;PC
                                        ;WORD NO
                                        ;GOOD DATA
                                        ;BAD DATA
001522  062056                  DT30    ;$ERRPC,ERWORD,$GDDAT,$BDDAT
001524  062305                  DF30    ;0,0,0,0

                        ;ITEM 31
001526  045764                  EM31    ;READ HEADER AND DATA CAUSED
                                        ;IMPROPER REGISTER CHANGE
                                        ;GOOD DATA HAS WHAT SHOULD
                                        ;BE THERE
                                        ;RECEIVED DATA GIVES WHAT
                                        ;WAS THERE AFTER COMMAND

001530  057765                          DH5
001532  061756                          DT5
001534  062252                          DF5

                        ;ITEM 32
001536  046201                  EM32    ;WRITE HEADER AND DATA FOLLOWED
                                        ;BY A READ HEADER AND DATA
                                        ;CAUSED A READ/WRITE ERROR

001540  060622                          DH30
001542  062056                          DT30
001544  062305                          DF30

                        ;ITEM 33
001546  046306                  EM33    ;READ DATA CAUSED IMPROPER REGISTER
                                        ;CHANGE
                                        ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                        ;RECEIVED DATA GIVES WHAT WAS THERE AFTER
                                        ;COMMAND

001550  057765                          DH5
001552  061756                          DT5
001554  062252                          DF5

                        ;ITEM 34
001556  046510                  EM34    ;READ DATA INCORRECT
001560  060622                  DH30
001562  062056                  DT30
001564  062305                  DF30

                        ;ITEM 35
001566  046534                  EM35    ;WRITE DATA COMMAND CAUSED
                                        ;IMPROPER REGISTER CHANGE
```

```
                                                                ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                                                ;RECEIVED DATA GIVES REGISTER
                                                                ;CONTENTS AFTER WRITE DATA
001570  057765                          DH5
001572  061756                          DT5
001574  062252                          DF5

                                ;ITEM 36
001576  046752                          EM36                  ;WRITE DATA COMMAND CHANGED
                                                              ;WRITE FROM BUFFER
001600  060622                          DH30
001602  062056                          DT30
001604  062305                          DF30

                                ;ITEM 37
001606  047027                          EM37                  ;SEEK COMMAND CAUSED AN
                                                              ;ERROR
                                                              ;GOOD DATA GIVES WHAT SHOULD
                                                              ;BE THERE
                                                              ;RECFIVED DATA GIVES WHAT
                                                              ;WAS THERE AFTER SEEK COMMAND
001610  057765                          DH5                   ;
001612  061756                          DT5                   ;
001614  062252                          DF5                   ;

                                ;ITEM 40
001616  047244                          EM40                  ;WRITE CHECK CAUSED AN
                                                              ;IMPROPER REGISTER CHANGE
                                                              ;GOOD DATA GIVES WHAT SHOULD
                                                              ;BE THERE
                                                              ;RECEIVED DATA GIVES WHAT WAS
                                                              ;THERE AFTER COMMAND
001620  057765                          DH5
001622  061756                          DT5
001624  062252                          DF5

                                ;ITEM 41
001626  047453                          EM41                  ;LOCKING OUT WRITES BY WRITE
                                                              ;LOCK BUTTON CAUSED IMPROPER
                                                              ;REGISTER CHANGE
                                                              ;GOOD DATA GIVES WHAT SHOULD
                                                              ;BE THERE
                                                              ;RECEIVED DATA GIVES WHAT
                                                              ;WAS THERE AFTER WRITES
                                                              ;WERE LOCKED OUT BY
                                                              ;BUTTON
001630  057765                          DH5
001632  061756                          DT5
001634  062252                          DF5

                                ;ITEM 42
001636  047734                          EM42                  ;ATTEMPTING TO WRITE WITH WRITE
                                                              ;LOCKED OUT CAUSED IMPROPER
                                                              ;REGISTER CHANGE
                                                              ;GOOD DATA GIVES WHAT SHOULD
                                                              ;BE THERE
```

```
1012
1013                                                    ;RECEIVED DATA GIVES WHAT WAS
1014  001640  057765                    DH5             ;THERE AFTER ATTEMPT
1015  001642  061756                    DT5
1016  001644  062252                    DF5
1017
1018                            ;ITEM 43
1019  001646  050212                    EM43            ;WRITING WITH WRITE LOCKED
1020                                                    ;OUT CHANGED DISK DATA
1021                                                    ;GOOD DATA GIVES WHAT WAS
1022                                                    ;ON DISK BEFORE WRITE WITH
1023                                                    ;WRITE LOCK WAS ATTEMPTED
1024                                                    ;RECEIVED DATA GIVES WHAT WAS
1025                                                    ;READ BACK AFTER WRITE WITH
1026                                                    ;WRITE LOCK WAS ATTEMPTED
1027  001650  060622                    DH30
1028  001652  062056                    DT30
1029  001654  062305                    DF30
1030
1031                            ;ITEM 44
1032  001656  050550                    EM44            ;ENABLING WRITES BY WRITE LOCK
1033                                                    ;BUTTON CAUSED AN ERROR
1034                                                    ;GOOD DATA GIVES WHAT SHOULD
1035                                                    ;BE THERE
1036                                                    ;RECEIVED DATA GIVES WHAT WAS
1037                                                    ;THERE AFTER WRITE LOCK
1038                                                    ;BUTTON ENABLED WRITES
1039  001660  057765                    DH5             ;
1040  001662  061756                    DT5             ;
1041  001664  062252                    DF5             ;
1042
1043                            ;ITEM 45
1044  001666  051042                    EM45            ;TRANSFERRING ON LAST BLOCK IE. CYLINDER
1045                                                    ;410, SECTOR 21, TRACK 18
1046                                                    ;CAUSED IMPROPER REGISTER
1047                                                    ;CHANGE
1048                                                    ;GOOD DATA GIVES WHAT SHOULD
1049                                                    ;BE THERE
1050                                                    ;RECEIVED DATA GIVES WHAT WAS
1051                                                    ;THERE AFTER TRANSFER
1052  001670  057765                    DH5
1053  001672  061756                    DT5
1054  001674  062252                    DF5
1055
1056                            ;ITEM 46
1057  001676  051350                    EM46            ;DATA READ FROM LAST
1058                                                    ;BLOCK IE. CYLINDER 410
1059                                                    ;SECTOR 21, TRACK 18 IS IN
1060                                                    ;ERROR
1061  001700  060622                    DH30
1062  001702  062056                    DT30
1063  001704  062305                    DF30
1064
1065                            ;ITEM 47
1066  001706  051474                    EM47            ;TRANSFERRING FROM NONEXISTANT
1067                                                    ;SECTOR CAUSED IMPROPER
```

```
1068                                                    ;REGISTER CHANGE
1069                                                    ;GOOD DATA GIVES WHAT SHOULD
1070                                                    ;BE THERE
1071                                                    ;RECEIVED DATA GIVES WHAT WAS
1072                                                    ;THERE AFTER ATTEMPTED
1073                                                    ;TRANSFER
1074  001710  057765                    DH5
1075  001712  061756                    DT5
1076  001714  062252                    DF5
1077
1078                              ;ITEM 50
1079  001716  051756                    EM50           ;TRANSFERRING FROM NONEXISTANT
1080                                                    ;SECTOR CAUSED DATA ERROR
1081                                                    ;GOOD DATA GIVES WHAT
1082                                                    ;SHOULD BE IN BUFFER
1083                                                    ;RECEIVED DATA GIVES WHAT WAS
1084                                                    ;IN BUFFER AFTER TRANSFER
1085  001720  060622                    DH30
1086  001722  062056                    DT30
1087  001724  062305                    DF30
1088
1089                              ;ITEM 51
1090  001726  052175                    EM51           ;GIVING ILLEGAL FUNCTION CAUSED
1091                                                    ;IMPROPER REGISTER CHANGE
1092                                                    ;GOOD DATA GIVES WHAT SHOULD BE
1093                                                    ;THERE
1094                                                    ;RECEIVED DATA GIVES REGISTER
1095                                                    ;CONTENTS AFTER ILLEGAL FUNCTION
1096  001730  060734                    DH51           ;PC
1097                                                    ;REG. ADDR.
1098                                                    ;GOOD DATA
1099                                                    ;RECEIVED DATA
1100                                                    ;ILLEGAL FUNCTION
1101  001732  062072                    DT51           ;$ERRPC,REGADR,$GDDAT,$BDDAT,ILLEGL
1102  001734  062312                    DF51           ;0,0,0,0,0
1103
1104
1105                              ;ITEM 52
1106  001736  052442                    EM52           ;WRITE DATA ON NONEXISTANT
1107                                                    ;SECTOR CAUSED IMPROPER
1108                                                    ;REGISTER CHANGE
1109                                                    ;GOOD DATA GIVES WHAT SHOULD
1110                                                    ;BE THERE
1111                                                    ;RECEIVED DATA GIVES WHAT
1112                                                    ;WAS THERE AFTER ATTEMPTED
1113                                                    ;WRITE DATA
1114  001740  057765                    DH5
1115  001742  061756                    DT5
1116  001744  062252                    DF5
1117
1118                              ;ITEM 53
1119  001746  052713                    EM53           ;READ HEADER AND DATA AFTER
1120                                                    ;A SEARCH CAUSED AN ERROR
1121  001750  060622                    DH30
1122  001752  062056                    DT30
1123  001754  062305                    DF30
```

```
                                ;ITEM 54
001756  053001                          EM54          ;ATTEMPTED OPERATION WITH
                                                      ;INVALID ADDRESS CAUSED
                                                      ;IMPROPER REGISTER CHANGE
                                                      ;GOOD DATA GIVES WHAT SHOULD
                                                      ;BE THERE
                                                      ;RECEIVED DATA GIVES WHAT WAS
                                                      ;THERE AFTER OPERATION
001760  057765                            DH5
001762  061756                            DT5
001764  062252                            DF5

                                ;ITEM 55
001766  053246                          EM55          ;WRITING/READING WITH EXPECTED
                                                      ;ADDRESS OVERFLOW ERROR CAUSED
                                                      ;IMPROPER REGISTER CHANGE
                                                      ;GOOD DATA GIVES WHAT SHOULD
                                                      ;BE THERE
                                                      ;RECEIVED DATA GIVES WHAT
                                                      ;WAS THERE AFTER OPERATION
001770  057765                            DH5
001772  061756                            DT5
001774  062252                            DF5

                                ;ITEM 56
001776  053534                          EM56          ;DATA READ WITH AN EXPECTED
                                                      ;ADDRESS OVERFLOW ERROR IS
                                                      ;INCORRECT
                                                      ;WORD NO 1 TO 260 SHOULD
                                                      ;BE READ
                                                      ;WORD NOS 261 TO 266 SHOULD
                                                      ;NOT CHANGE DUE TO READ
002000  060622                            DH30
002002  062056                            DT30
002004  062305                            DF30

                                ;ITEM 57
002006  053744                          EM57          ;ATTEMPTING DATA COMMAND
                                                      ;WITH WRONG FORMAT BIT CAUSED
                                                      ;IMPROPER REGISTER CHANGE
                                                      ;GOOD DATA GIVES WHAT SHOULD BE
                                                      ;THERE
                                                      ;RECEIVED DATA GIVES WHAT WAS
                                                      ;THERE AFTER ATTEMPTED DATA
                                                      ;TRANSFER
002010  057765                            DH5
002012  061756                            DT5
002014  062252                            DF5

                                ;ITEM 60
002016  054236                          EM60          ;ATTEMPTING TO MODIFY REGISTER
                                                      ;DURING AN OPERATION CAUSED
                                                      ;IMPROPER REGISTER CHANGE
                                                      ;GOOD DATA GIVES WHAT SHOULD
                                                      ;BE THERE
```

```
1180
1181
1182
1183  002020  061073                        DH60                ;RECEIVED DATA GIVES WHAT WAS
1184                                                              ;THERE AFTER OPERATION
1185                                                              ;WAS COMPLETE
1186                                                              ;PC
1187                                                              ;REG. ADDR.
1188  002022  062110                        DT60                ;GOOD DATA
1189  002024  062320                        DF60                ;RECEIVED DATA
1190                                                              ;MODFING REGISTER
1191                                  ;ITEM 61                    ;$ERRPC,REGADR,$GDDAT,$BDDAT,$BDADR
1192  002026  054645                        EM61                ;0,0,0,C,0
1193  002030  061230                        DH61
1194
1195                                                              ;DEVICE NOT AVAIBLE BEFOR COMMAND WAS TO BE GIVEN
1196  002032  062126                        DT61                ;PC
1197  002034  062326                        DF61                ;PC OF JSR
1198                                                              ;RHDS1
1199                                  ;ITEM 62                    ;$ERRPC,PCJSR,$BDADR
1200  002036  054645                        EM61                ;0,0,0
1201  002040  061322                        DH62
1202
1203                                                              ;DEVICE NOT AVAIBLE BEFOR COMMAND WAS TO BE GIVEN
1204  002042  062140                        DT62                ;PC
1205  002044  062332                        DF62                ;PC OF JSR
1206                                                              ;RHCS1 WAS
1207                                                              ;$ERRPC,PCJSR,$BDADR
1208                                  ;ITEM 63                    ;0,0,0
1209  002046  054731                        EM63
1210
1211  002050  057765                        DH5                 ;RHDS1 CONTENTS DURING
1212  002052  061756                        DT5                 ;COMMAND WAS IN ERROR
1213  002054  062252                        DF5
1214
1215
1216                                  ;ITEM 64
1217  002056  055004                        EM64                ;RECALIBRATE COMMAND CAUSED
1218                                                              ;IMPROPER REGISTER CHANGE.
1219                                                              ;GOOD DATA GIVES WHAT SHOULD BE
1220                                                              ;THERE.
1221                                                              ;RECEIVED DATA GIVES WHAT WAS THERE
1222                                                              ;AFTER COMMAND
1223  002060  057765                        DH5
1224  002062  061756                        DT5
1225  002064  062252                        DF5
1226
1227
1228                                  ;ITEM65
1229
1230  002066  055223                        EM65                ;INTERRUPT FAILING
1231  002070  061375                        DH65                ;PC
1232                                                              ;TEST NO
1233                                                              ;CONTENTS OF RHCS1
1234                                                              ;CONTENTS OF RHAS
1235                                                              ;CONTENTS OF RHDS1
```

```
1236  002072  062152                        DT65                    ;$ERRPC,TSTNM,CS1,AS,DS1
1237  002074  062336                        DF65                    ;0,0,0,0,0
1238
1239
1240                                ;ITEM66
1241  002076  055245                        EM66                    ;HEADER AND DATA COMMAND
1242                                                                  ;FOR HEAD SELECTION TEST
1243                                                                  ;CAUSED AN ERROR
1244                                                                  ;RHDST GIVES WHAT TRACK
1245                                                                  ;WAS BEING WRITTEN ON CYLINDER 0
1246                                                                  ;SECTOR 0
1247  002100  061511                        DH66                    ;PC
1248                                                                  ;RHDST
1249                                                                  ;RHER1
1250                                                                  ;RHER2
1251                                                                  ;RHER3
1252                                                                  ;RHCS1
1253                                                                  ;RHCS2
1254  002102  062166                        DT66                    ;$ERRPC,DST,ER1,ER2,ER3,CS1,CS2
1255  002104  062343                        DF66                    ;0,0,0,0,0,0,0
1256                                ;ITEM67
1257  002106  055456                        EM67                    ;READ HEADER AND DATA ERROR
1258                                                                  ;IN HEAD SELECTION TEST
1259                                                                  ;FIRST FOUR WORDS GIVE HEADER
1260                                                                  ;NEXT WORDS ARE DATA
1261                                                                  ;GOOD DATA WORDS GIVE
1262                                                                  ;THE TRACK NUMBER IN
1263                                                                  ;BITS 4,5,6,7,8
1264  002110  060622                        DH30
1265  002112  062056                        DT30
1266  002114  062305                        DF30
1267                                ;ITEM70
1268  002116  055732                        EM70                    ;READ HEADER AND DATA ERROR
1269                                                                  ;IN DIFFERENCE LINE TEST
1270                                                                  ;WORD NOS. 1-4 GIVE
1271                                                                  ;HEADER
1272                                                                  ;WORD NOS. 5-260 GIVE DATA
1273                                                                  ;WHICH IS THE CYLINDER
1274                                                                  ;ADDRESS
1275  002120  060622                        DH30
1276  002122  062056                        DT30
1277  002124  062305                        DF30
1278
1279                                ;ITEM 71
1280  002126  056140                        EM71                    ;FORCING OPI CAUSED IMPROPER REGISTER
1281                                                                  ;  CHANGE
1282                                                                  ;GOOD DATA GIVES WHAT SHOULD
1283                                                                  ;BE THERE
1284                                                                  ;RECEIVED DATA GIVES WHAT WAS
1285                                                                  ;THERE AFTER 3 INDEX PULSES
1286  002130  057765                        DH5                     ;PC
1287                                                                  ;REG. ADDR.
1288                                                                  ;GOOD DATA
1289                                                                  ;RECEIVED DATA
1290  002132  061756                        DT5                     ;$ERRPC,REGADR,$GDDAT,$BDDAT
1291  002134  062252                        DF5                     ;0,0,0,0
```

```
                                ;ITEM72
002136  056401                          EM72            ;THERE WAS AN ERROR
                                                        ;AFTER A WRITE HEADER
                                                        ;AND DATA COMMAND

002140  061607                          DH72            ;PC
                                                        ;RHCS1
                                                        ;RHCS2
                                                        ;RHDS1
                                                        ;RHDST
                                                        ;RHCA
                                                        ;RHER1
                                                        ;RHWC
002142  062210                          DT72            ;$ERRPC,CS1,CS2,DS1,DST,CA,ER1,WC
002144  062354                          DF72            ;0,0,0,0,0,0,0,0

                                ;ITEM73
002146  056647                          EM73            ;READING OVER 3 INDEX
                                                        ;PULSES CAUSED SC
002150  061607                          DH72
002152  062210                          DT72
002154  062354                          DF72

                                ;ITEM74
002156  057017                          EM74            ;READING OVER 3 INDEX
                                                        ;PULSES CAUSED OPI
002160  061607                          DH72
002162  062210                          DT72
002164  062354                          DF72
```

```
                                ;RH11 REGISTER BITS


002166  000254                  RPVEC:  254                     ;RP04 VECTOR ADDRESS


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


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


                                ;CONTROL AND STATUS REGISTER 2 (RHCS2)

000001                          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                          UNIB=   20              ;UNIBUS B DC LO (BIT #4)
000040                          CLR=    40              ;CLEAR (BIT #5)
000100                          IR=     100             ;INPUT READY (BIT #6)
000200                          OR=     200             ;OUTPUT READY (BIT #7)
000400                          MPE=    400             ;MASS BUS PARITY ERROR (BIT #8)
001000                          MXF=    1000            ;MISSED TRANSFER ERROR (BIT #9)
002000                          PGE=    2000            ;PROGRAM ERROR (BIT #10)
004000                          NEM=    4000            ;NON EXISTANT MEMORY (BIT #11)
010000                          NED=    10000           ;NON EXISTANT DRIVE (BIT #12)
020000                          UPE=    20000           ;UNIBUS PARITY ERROR (BIT #13)
040000                          WCE=    40000           ;WRITE CHECK ERROR (BIT #14)
100000                          DLT=    100000          ;DATA LATE (BIT #15)


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

```
                                ;RP04 REGISTER BITS


                                ;CONTROL AND STATUS 1 REGISTER. (#00)

000001                          GO=     1                       ;GO (BIT #0)
000100                          IE=     100                     ;INTERRUPT ENABLE (BIT #6)
000200                          RDY=    200                     ;READY (BIT #7)
000400                          A16=    400                     ;HIGH ORDER UNIBUS BITS (BIT #8)
001000                          A17=    1000                    ;HIGH ORDER UNIBUS BITS (BIT #9)
002000                          PSEL=   2000                    ;FORT 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                          DFFS=   1                       ;DRIVE FORWARD 5"/SEC.  (BIT #0)
000002                          DFF20=  2                       ;DRIVE FORWARD 20"/SEC.  (BIT #1)
000004                          DIGB=   4                       ;DRIVE TO INNER GAVRD BAND (BIT #2)
000010                          GRV=    10                      ;GO REVERSE (BIT #3)
000020                          DL64=   20                      ;DIFFERENCE LESS THAN 64 (BIT #4)
000040                          DE1=    40                      ;DIFFERENCE EQUALS 1 (BIT #5)
000100                          VV=     100                     ;VOLUME VALID (BIT #6)
000200                          DRY=    200                     ;DRIVE READY (BIT #7)
000400                          DPR=    400                     ;DRIVE PRESENT (BIT #8)
001000                          PROG=   1000                    ;PROGRAMABLE (BIT #9)
002000                          LBT=    2000                    ;LAST SECTOR TRANSFERRED (BIT #10)
004000                          WRL=    4000                    ;WRITE LOCK (BIT #11)
010000                          MOL=    10000                   ;MEDIUM ON-LINE (BIT #12)
020000                          PIP=    20000                   ;POSITIONING OPERATION IN PROGRESS (BIT #13)
040000                          ERR=    40000                   ;COMPOSIT ERROR. (BIT #14)
100000                          ATA=    100000                  ;ATTENTION ACTIVE (BIT #15)

                                ;ERROR REGISTER #01 (RHER1) (#02)
000001                          ILF=    1                       ;ILLEGAL FUNCTION (BIT #0)
000002                          ILR=    2                       ;ILLEGAL REGISTER (BIT #1)
000004                          RMR=    4                       ;REGISTER MODIFICATION REFUSED (BIT #2)
000010                          PAR=    10                      ;PARITY ERROR (BIT #3)
000020                          FER=    20                      ;FORMAT ERROR (BIT #4)
000040                          WCF=    40                      ;WRITE CLOCK FAIL (BIT #5)
000100                          ECH=    100                     ;ECC HARD ERROR (BIT #6)
000200                          HCE=    200                     ;HEADER COMPARE ERROR (BIT #7)
000400                          HCRC=   400                     ;HEADER CRC ERROR (BIT #8)
001000                          AOE=    1000                    ;ADDRESS OVERFLOW ERROR (BIT #9)
002000                          IAE=    2000                    ;INVALID ADDRESS ERROR (BIT #10)
004000                          WLE=    4000                    ;WRITE LOCK ERROR (BIT #11)
010000                          DTE=    10000                   ;DRIVE TIMING ERROR (BIT #12)
020000                          OPI=    20000                   ;OPERATION INCOMPLETE (BIT #13)
040000                          UNS=    40000                   ;DRIVE UNSAFE (BIT #14)
100000                          DCK=    100000                  ;DATA CHECK ERROR (BIT 15)

                                ;MAINTAINABILITY REGISTER (RHMR)(#03)
```

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

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

                        AT0=    1               ;DEVICE 0 (BIT #0)
                        AT1=    2               ;DEVICE 1 (BIT #1)
                        AT2=    4               ;DEVICE 2 (BIT #2)
                        AT3=    10              ;DEVICE 3 (BIT #3)
                        AT4=    20              ;DEVICE 4 (BIT #4)
                        AT5=    40              ;DEVICE 5 (BIT #5)
                        AT6=    100             ;DEVICE 6 (BIT #6)
                        AT7=    200             ;DEVICE 7 (BIT #7)



                        ;DESIRED SECTOR/TRACK ADDRESS REGISTER (RHDST) (#1)
                        ;EACH BIT IS CALLED BY BIT NUMBER



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



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

                        EXT1=   1               ;EXTENSION 1 (BIT #0)
                        EXT2=   2               ;EXTENSION 2 (BIT #1)
                        EXT4=   4               ;EXTENSION 3 (BIT #2)
                        EXT10=  10              ;EXTENSION 4 (BIT #3)
                        EXT20=  20              ;EXTENSION 5 (BIT #4)
                        EXT40=  40              ;EXTENSION 6 (BIT #5)
                        SC1=    100             ;SECTOR COUNT FIELD 0 (BIT #6)
                        SC2=    200             ;SECTOR COUNT FIELD 1 (BIT #7)
                        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)
```

```
1484
1485                                    ;ERROR REGISTER #2 (RHER2) (#10)
1486
1487            000001                  WCU=    1                       ;WRITE CURRENT UNSAFE (BIT #0)
1488            000002                  CSF=    2                       ;CURRENT SINK FAILURE (BIT #1)
1489            000004                  WSU=    4                       ;WRITE SELECT UNSAFE (BIT #2)
1490            000010                  CSU=    10                      ;CURRENT SWITCH UNSAFE (BIT #3)
1491            000020                  MSE=    20                      ;MOTOR SEQUENCE ERROR (BIT #4)
1492            000040                  TDF=    40                      ;TRANSITIONS DETECTOR FAILURE (BIT #5)
1493            000100                  TUF=    100                     ;TRANSITIONS UNSAFE (BIT #6)
1494            000200                  FEN=    200                     ;FAILSAFE ENABLED (BIT #7)
1495            000400                  WRU=    400                     ;WRITE READY UNSAFE (BIT #8)
1496            001000                  MHS=    1000                    ;MULTIPLE HEAD SELECT (BIT #9)
1497            002000                  NHS=    2000                    ;NO HEAD SELECTION (BIT #10)
1498            004000                  IXE=    4000                    ;INDEX ERROR (BIT #11)
1499            010000                  VU30=   10000                   ;30VOLT UNSAFE (BIT #12)
1500            020000                  PLU=    20000                   ;PLO UNSAFE (BIT #13)
1501            100000                  ACU=    100000                  ;ACUNSAFE (BIT #15)
1502
1503                                    ;OFFSET REGISTER (RHOF) (#11)
1504
1505            000001                  OF25=   1                       ;OFFSET 25 MICRO INCHES (BIT #0)
1506            000002                  OF50=   2                       ;OFFSET 50 MICRO INCHES (BIT #1)
1507            000004                  OF100=  4                       ;OFFSET 100 MICRO INCHES (BIT #2)
1508            000010                  OF200=  10                      ;OFFSET 200 MICRO INCHES (BIT #3)
1509            000020                  OF400=  20                      ;OFFSET 400 MICRO INCHES (BIT #4)
1510            000040                  OF800=  40                      ;OFFSET 800 MICRO INCHES (BIT #5)
1511
1512            000200                  OFREV=  200                     ;OFFSET NEGATIVE (REVERSE) (BIT #5)
1513            002000                  HCI=    2000                    ;HEADER COMPARE INHIBIT (BIT #10)
1514            004000                  ECI=    4000                    ;ERROR CORRECTION CODE INHIBIT (BIT #11.
1515            010000                  FMT22=  10000                   ;FORMAT BIT (BIT #12
1516
1517                                    ;DESIRED CYLINDER ADDRESS (RHCA) (#12)
1518                                    ;EACH BIT IS CALLED BY BIT NUMBER.
1519
1520
1521
1522
1523                                    ;CURRENT CYLINDER ADDRESS (RHCC) (#13)
1524                                    ;EACH BIT IS CALLED BY BIT NUMBER
1525
1526
1527
1528
1529                                    ;SERIAL NUMBER REGISTER (RHSN) (#14)
1530                                    ;EACH IS CALLED BY BIT NUMBER
1531
1532
1533
1534
1535                                    ;ERROR REGISTER #03 (RHER3) (#15)
1536
1537            000001                  PSU=    1                       ;PACK SPEED UNSAFE (BIT #0)
1538            000002                  VUF=    2                       ;VELOCITY UNSAFE (BIT #1)
1539            000010                  UWR=    10                      ;ANY UNSAFE EXCEPT READ WRITE (BIT #3)
```

```
1540            000020                  PRE=    20                      ;DISK PACK ROTATION ERROR (BIT #4)
1541            000040                  ACL=    40                      ;AC LOW (BIT #5)
1542            000100                  DCL=    100                     ;DC LOW (BIT #6)
1543            040000                  SKI=    40000                   ;SEEK INCOMPLETE (BIT #14)
1544            100000                  OCYL=   100000                  ;OFF CYLINDER (BIT #15)
1545
1546
1547
1548                                    ;ECC POSITION REGISTER (RHEC1) (#16)
1549                                    ;EACH BIT IS CALLED BY BIT NUMBER
1550
1551
1552
1553
1554                                    ;ECC PATTERN REGISTER (RHEC2) (#17)
1555                                    ;EACH BIT IS CALLED BY BIT NUMBER
1556
```

```
1557                                    .SBTTL  REGISTER ADDRESSES
1558
1559
1560
1561
1562                                    ;RP04/5/6 DISK I/O REGISTERS LOCATED IN THE RH11 CONTROLLER
1563
1564  002170  176722                    RHDB:   176722                  ;DATA BUFFER
1565  002172  176702                    RHWC:   176702                  ;WORD COUNT
1566  002174  176704                    RHBA:   176704                  ;BUS ADDRESS
1567  002176  176710                    RHCS2:  176710                  ;CONTROL AND STATUS 2
1568
1569                                    ;RP04/5/6 DISK I/O REGISTERS LOCATED IN THE DEVICE CONTROL LOGIC (DCL)
1570
1571  002200  176700                    RHCS1:  176700                  ;CONTROL AND STATUS 1
1572  002202  176714                    RHER1:  176714                  ;ERROR #1
1573  002204  176706                    RHDST:  176706                  ;DESIRED SECTOR/TRACK ADDRESS
1574  002206  176740                    RHER2:  176740                  ;ERROR #2
1575  002210  176732                    RHOF:   176732                  ;OFFSET
1576  002212  176734                    RHCA:   176734                  ;DESIRED CYLINDER ADDRESS
1577  002214  176742                    RHER3:  176742                  ;ERROR #3
1578  002216  176716                    RHAS:   176716                  ;ATTENTION SUMMARY
1579  002220  176724                    RHMR:   176724                  ;MAINTAINABILITY
1580  002222  176712                    RHDS1:  176712                  ;DRIVE STATUS
1581  002224  176726                    RHDT:   176726                  ;DRIVE TYPE
1582  002226  176730                    RHSN:   176730                  ;SERIAL NUMBER
1583  002230  176744                    RHEC1:  176744                  ;ECC POSITION
1584  002232  176746                    RHEC2:  176746                  ;ECC PATTERN
1585  002234  176736                    RHCC:   176736                  ;CURRENT CYLINDER ADDRESS
1586  002236  176720                    RHLA:   176720                  ;LOOK-AHEAD
1587
1588                                    ;ADDITIONAL REGISTERS LOCATED IN THE RH70 CONTROLLER LOGIC
1589
1590  002240  176750                    RHBAE:  176750                  ;BUS ADDRESS EXTENSION REGISTER
1591  002242  176752                    RHCS3:  176752                  ;CONTROL AND STATUS REGISTER #3
1592
1593
1594                                    ;P-CLOCK (KW11-P) I/O REGISTERS
1595
1596  002244  172540                    PCLCSR: 172540                  ;CONTROL AND STATUS REGISTERS
1597  002246  172542                    PCLBUF: 172542                  ;COUNT SET BUFFER
1598  002250  172544                    PCLCTR: 172544                  ;COUNTER
1599
```

```
1600
1601
1602                                    ;THE FOLLOWING LOCATIONS ARE RESERVED FOR REGISTER SAVES
1603                                    ;ANY TIME THERE IS AN ERROR ALL THESE WILL BE FILLED
1604                                    ;ONLY SOME MAY BE PRINTED BUT ALL WILL BE FILLED TRUE
1605                                    ;FOR THE TIME JUST AFTER THE "ERROR" ERROR COMMAND
1606
1607   002252  000000                   DB:     0                       ;DATA BUFFER
1608   002254  000000                   WC:     0                       ;WORD COUNT
1609   002256  000000                   BA:     0                       ;BUS ADDRESS
1610   002260  000000                   CS2:    0                       ;CONTROL AND STATUS 2
1611
1612
1613   002262  000000                   CS1:    0                       ;CONTROL AND STATUS 1
1614   002264  000000                   ER1:    0                       ;ERROR #1
1615   002266  000000                   DST:    0                       ;DESIRED SECTOR/TRACK ADDRESS
1616   002270  000000                   ER2:    0                       ;ERROR #2
1617   002272  000000                   OF:     0                       ;OFFSET
1618   002274  000000                   CA:     0                       ;DESIRED CYLINDER ADDRESS
1619   002276  000000                   ER3:    0                       ;ERROR #3
1620   002300  000000                   AS:     0                       ;ATTENTION SUMMARY
1621   002302  000000                   MR:     0                       ;MAINTAINABILITY
1622   002304  000000                   DS1:    0                       ;DRIVE STATUS
1623   002306  000000                   DT:     0                       ;DRIVE TYPE
1624   002310  000000                   SN:     0                       ;SERIAL NUMBER
1625   002312  000000                   EC1:    0                       ;ECC POSITION
1626   002314  000000                   EC2:    0                       ;ECC PATTERN
1627   002316  000000                   CC:     0                       ;CURRENT CYLINDER ADDRESS
1628   002320  000000                   LA:     0                       ;LOOK-AHEAD
1629
1630
1631
```

```
1632
1633
1634
1635                                    ;FUNCTION EQUATES
1636
1637                                            ;*TABLE OF FUNCTIONS FOR RHCS1 THEN "GO" BIT HAS TO BE SET
1638   002322                           FUTABL:
1639   002322   000000                  NOPERA: 0                       ;NO OPERATION
1640   002324   000002                  UNLOAD: 2                       ;UNLOAD (STAND BY)
1641   002326   000006                  RECALI: 6                       ;RECALIBRATE
1642   002330   000010                  DCLEAR: 10                      ;DRIVE CLEAR
1643   002332   000012                  RELEAS: 12                      ;RELEASE (DUAL-PORT OPERATION)
1644   002334   000030                  SERCH:  30                      ;SEARCH COMMAND
1645   002336   000050                  WRCHEK: 50                      ;WRITE CHECK DATA
1646   002340   000052                  WRCHDT: 52                      ;WRITE CHECK HEADER AND DATA
1647   002342   000060                  WRIDAT: 60                      ;WRITE DATA
1648   002344   000062                  WRIFOR: 62                      ;WRITE HEADER AND DATA (FORMAT)
1649   002346   000070                  READAT: 70                      ;READ DATA
1650   002350   000072                  REFOR:  72                      ;READ HEADER AND DATA
1651   002352   000004                  SEECOM: 4                       ;SEEK COMMAND
1652   002354   000014                  OFSETC: 14                      ;OFFSET COMMAND
1653   002356   000016                  RETCL:  16                      ;RETURNTO CENTERLINE
1654   002360   000022                  PKACK:  22                      ;PACK ACKNOWLEDGE
1655   002362   000020                  READIN: 20                      ;READ IN
1656   002364   000000                  ILLEGL: .WORD   0               ;COMPUTED ILLEGAL FUNCTION
1657
1658
1659
1660                                            ;*DATA BUFFER FOR READ WRITE
1661
1662
1663   002370   000422                  WRFROM: .BLKW   274.            ;WRITE FROM THIS BUFFER
1664   003434   000422                  REINTO: .BLKW   274.            ;READ INTO THIS BUFFER
1665
```

```
1666
1667
1668                                    ;RESERVED LOCATIONS FOR FLAGS AND INTERNAL PROGRAM CONTROL WORDS
1669
1670  004500  000000                    REGADR: 0                       ;SAVE REGISTER ADDRESS HERE
1671  004502  000000                    ERWORD: 0                       ;SAVE ERROR WORD NUMBER HERE
1672  004504  000000                    TSTNM:  0                       ;TEST NUMBER
1673  004506  000000                    RP4VEC: 0                       ;CONTAINS ADDRESS OF LOCATION
1674                                                                    ;WHERE AN RP04 INTERRUPT IS TO VECTOR TO
1675                                                                    ;THIS MUST BE MOVED INTO 'RPVEC' TO BE
1676                                                                    ;EFFECTIVE.
1677
1678  004510  000000                    OFSTVL: 0                       ;OFFSET VALUE USED IN OFFSET TEST
1679
1680
1681  004512  000024                    SAVERE: .BLKW   20.             ;BLOCK TO SAVE REGISTERS
1682  004562  000000                    FINALA: 0                       ;SAVE LOOK AHEAD REGISTER AT END OF OPERATION
1683  004564  000000                    FINACC: 0                       ;SAVE CURRENT CYLINDER REGISTER AT END OF OPERATION
1684
1685
1686                                    ;TABLE FOR ATTENTION BITS
1687                                    ;ATTENTION TABLE
1688
1689  004566    001     002     004     ATABLE: .BYTE   1,2,4,10,20,40,100,200
1690  004571    010     020     040
1691  004574    100     200
1692
1693
1694
1695                                    ;RESERVED LOCATIONS FOR UNIT SELECT
1696
1697  004576  000010                    UNITS:  .BLKW   8.              ;THIS IS FILLED WITH -1
1698  004616  000000                    UNIT:   .WORD   0               ;UNIT UNDER TEST
1699  004620  000000                    NOUNIT: .WORD   0               ;NUMBER OF UNITS PRESENT
1700                                                                    ;USED TO KEEP TRACK OF UNIT UNDER TEST
1701  004622  000000                    NUNIT:  .WORD   0               ;USED TO DETERMIN IF THERE ARE MORE
1702                                                                    ;THAN ONE UNIT
1703  004624  000000                    NOPUSH: 0                       ;ALL ONES INDICATE NONE OF THE OPERATOR
1704                                                                    ;INTERVENTION TESTE WILL BE PERFORMED
1705  004626  000000                    SELECT: .WORD   0               ;ALL ONES INDICATE UNIT TO BE SELECTED
1706  004630  000000                    UNITSL: .WORD   0               ;UNIT NO. SELECTED
1707
1708
1709
1710  004632  000000                    ERFLGS: 0                       ;ERROR FLAG
1711
1712  004634  000000                    FIRST:  0                       ;IF ZERO WILL TYPE HEADER
1713                                                                    ;IF ONES WILL NOT TYPE HEADER
1714
1715  004636  000000                    RP06:   0                       ;DEVICE TYPE FLAG
1716
1717  004640  000000                    RH70:   0                       ;IF 1, PROGRAM IS RUNNING ON AN RH70
1718                                                                    ;IF 0, PROGRAM IS ON AN RH11
1719
1720  004642  000000                    RUNCTR: .WORD   0               ;'RUN' LINE DELAY COUNTER TO BE USED
1721                                                                    ;WHILE THE SILO IS FILLING
```

```
 1722
 1723  004644  000000                  ATTENT: 0                       ;ATTENTION BIT FOR PRESENT UNIT
 1724  004646  000000                  TOTALAT:        0               ;TOTAL ATTENTION BITS
 1725
 1726  004650  000000                  TMP0:   .WORD   0               ;TEMP STORAGE
 1727  004652  000000                  TMP1:   .WORD   0
 1728  004654  000000                  TMP4:   .WORD   0               ;TEMP STORAGE
 1729  004656  000000                  TMP5:   .WORD   0               ;TEMP STORAGE
```

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


                                        .SBTTL  SETUP TESTS


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

004720                          START:
004720  000005                          RESET

005142  012737  000000  177776          MOV     #0,PS           ;SET PROCESSOR STATUS TO 0
005150  012737  000200  000036          MOV     #200,@#TRAPVEC+2 ;TRAP PRIORITY = 4
005156  013700  002166                  MOV     @#RPVEC,R0      ;GET RP VECTOR ADDRESS
005162  012720  036306                  MOV     #RPVECT,(R0)+   ;THIS IS FOR UNTIMELY INTERRUPTS
005166  012710  000340                  MOV     #340,(R0)       ;RP04 INTERRUPT SERVICE ROUTINE
                                                                ;PRIORITY = 7

005172  004737  037334                  JSR     PC,@#$TKINT     ;INITIALIZE THE TTY KEYBOARD
005176  005737  004634                  TST     @#FIRST         ;IS THIS FIRST TIME ROUND ?
005202  001001                          BNE     1$              ;DO NOT GIVE HEADER IF NOT
005204  000402                          BR      2$              ;GIVE HEADER IF SO
005206  000137  005774          1$:     JMP     @#SND1          ;SKIP OVERALL PROGRAM HEADER

005212                          2$:


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

006032  032777  010000  173100  RH70CK: BIT     #SW12,@SWR      ;LOOK TO SEE IF USING RH70
006040  001403                          BEQ     3$              ;IF SW12 = 0, SKIP NEXT
006042  012737  000001  004640          MOV     #1,@#RH70       ;IF SW12 = 1, CU IS AN RH70
006050                          3$:
```

```
1776                                            ;*IS THERE A P-CLOCK (KW11-P) ON THE SYSTEM ?
1777                                            ;*IF SO MAKE 'WAT" TRAPS GO TO 'WAIT.P'
1778                                            ;*IF SO MAKE RP04 INTERRUPTS GO TO 'TIME 1'
1779                                            ;*IF NOT MAKE 'WAT' TRAPS GO TO 'WAIT.T'
1780                                            ;*IF NOT MAKE RP04 INTERRUPTS GO TO 'TIME 2'
1781
1782                                            ;*THE NEXT LINE IS TO BE ADDED LATER
1783                                            ;*AND THE JUMP AND NOP REMOVED
1784                                            ;*FOR NOW NO CLOCK WILL BE USED
1785
1786                                            ;*MOV   @#1$,@#ERRVEC   ;SET TIME-OUT VECTOR
1787
1788                                    ;       JMP     @#1$            ;DO NOT USE CLOCK
1789                                    ;       NOP
1790                                    ;       TST     @#PCLCSR        ;REFERENCE P-CLOCK STATUS REGISTER
1791                                    ;                               ;ADDRESS = 172540
1792                                    ;       MOV     #WAIT.P,@#$TRPAD+20 ;THERE IS A P-CLOCK
1793                                    ;       MOV     #TIME1,@#RP4VEC ;THERE IS A P CLOCK SO
1794                                    ;                               ;VECTOR TO TIME1
1795                                    ;       BR      2$
1796                                    ;1$:    MOV     #WAIT.T,@#$TRPAD+20 ;THERE IS NO P-CLOCK
1797
1798
1799  006050  012737  033300  004506          MOV     #TIME2,@#RP4VEC ;MAKE RP04/5/6 INTERRUPTS GO TO 'TIME 2'
1800  006056  012737  177777  040742  2$:     MOV     #-1,@#PRITEM    ;CLEAR PREVIOUS ITEM NUMBER
1801
1802  006064  005737  004626                  TST     @#SELECT        ;WAS IT A 200 START
1803  006150  104412                          RDOCT
1804  006152  042716  177770                  BIC     #177770,(SP)    ;ONLY KEEP LAST 3 BITS
1805  006156  011637  004616                  MOV     (SP),@#UNIT     ;SAVE UNIT TO BE TESTED
1806  006162  012637  004630                  MOV     (SP)+,@#UNITSL  ;SAVE UNIT TO BE TESTED
1807  006170  013737  004630  004616          MOV     @#UNITSL,@#UNIT ;SET UNIT NUMBER
1808
```

```
1809
1810  006214  012706  001000                      MOV     #STACK, SP      ;SET UP STACK POINTER
1811  006220  012737  040604  000030              MOV     #REGSAI,@#EMTVEC;ERROR VECTOR SO THAT
1812                                                                        ;NO REGISTERS ARE SAVED
1813  006226  012737  006254  000004              MOV     #2$,@#ERRVEC    ;SET UP FOR BUS TIMEOUT
1814
1815  006234  012700  000024                      MOV     #24,R0          ;THERE ARE 24 REG TO TEST
1816  006240  012701  002170                      MOV     #RHDB,R1        ;R1 NOW HAS ADDR OF ADDR OF FIRST REG.
1817  006244  013102                  1$:         MOV     @(R1)+, R2      ;READ HARDWARE REG.
1818  006246  005300                              DEC     R0              ;COUNT DOWN
1819  006250  001375                              BNE     1$              ;BRANCH IF 24 NOT DONE
1820  006252  000454                              BR      3$              ;BRANCH IF 24 DONE
1821  006254  012737  000006  000004  2$:         MOV     #ERRVEC+2,@#ERRVEC ;RESTORE TRAP CATCHER
1822  006262  022626                              CMP     (SP)+,(SP)+     ;CLEAN STACK
1823  006264  016137  177776  001200              MOV     -2(R1), $TMP1   ;STORE FAILING REG ADDR
1824  006272  104007                              ERROR   7               ;REGISTER NON EXISTANT
1825  006274  032777  020000  172636              BIT     #SW13,@SWR      ;INHIBIT ERROR PRINTOUT ?
1826  006302  001036                              BNE     4$              ;BRANCH IF YES
1827
1828
1829  006370  012746  000204                      MOV     #ADDMOD,-(SP)   ;GET READY TO TYPE STARTING ADDRESS
1830                                                                        ;OF "CHANGE OF BASE ADDRESS" ROUTINE
1831  006374  104402                              TYPOC
1832  006376  000000                              HALT
1833  006400  000137  032570                  4$: JMP     @#$EOP          ;GO TO END OF PROGRAM ----------,
1834
1835  006404  012737  006460  000004  3$:         MOV     #TRP,@#4        ;INITIALIZE VECTOR
1836  006412  005737  002240                      TST     @#RHBAE         ;ADDRESS RPBAE(RH11/RH70?)
1837  006416  005237  004640                      INC     @#RH70          ;FOUND AN RH70-SET MASK
1838  006456  000417                              BR      RTN             ;GET OUT
1839  006460  022626                  TRP:        CMP     (SP)+,(SP)+     ;SET UP THE
1840  006516  012737  040574  000030  RTN:        MOV     #$ERROR,@#EMTVEC;RESTORE ERROR VECTOR
1841                                                                        ;SO THAT REGISTERS ARE SAVED
1842  006524  012737  000006  000004              MOV     #ERRVEC+2,@#ERRVEC ;RESTORE TRAP CATCHER
1843
```

```
1844
1845  006542  012706  001000                    MOV     #STACK,SP       ;SET STACK POINTER
1846
1847  006546  013701  002216                    MOV     @#RHAS,R1       ;R1 HAS ADDRESS OF RHAS
1848  006552  012711  177777                    MOV     #-1,@R1         ;WRITE ALL ONES INTO RHAS
1849  006556  105711                            TSTB    @R1             ;TEST IT FOR ALL 0'S
1850  006562  011137  001126                    MOV     @R1,@#$BDDAT    ;BAD DATA
1851  006566  005037  001124                    CLR     @#$GDDAT        ;GOOD DATA
1852  006572  010137  004500                    MOV     R1,@#REGADR     ;FAILING REG. RHAS
1853  006576  104005                            ERROR   5               ;RHAS DOES NOT CLEAR BY WRITING ALL
1854                                                                    ;ONES INTO IT
1855
```

```
1856
1857
1858  006616  000005                          RESET                   ;START WITH AN INIT
1859  006620  004737  037334                  JSR     PC,@#$TKINT     ;INITILIZE THE TTY KEYBOARD
1860
1861  006624  032777  020000  172306          BIT     #SW13,@SWR      ;INHIBIT ERROR TYPEOUT?
1862  006632  001026                          BNE     4$              ;BRANCH IF YES
1863  006710  013701  002216          4$:     MOV     @#RHAS,R1       ;R1 HAS ADDR. OF RHAS
1864  006714  013702  002176                  MOV     @#RHCS2,R2      ;R2 HAS ADDR. OF RHCS2
1865  006720  005012                          CLR     @R2             ;CLEAR RHCS2
1866  006722  012700  000010                  MOV     #8.,R0          ;COUNT
1867  006726  013704  002202                  MOV     @#RHER1,R4      ;R4 HAS ADDR. OF RHER1
1868  006732  012714  177777          1$:     MOV     #-1,@R4         ;MOVE ERRORS INTO RHER1
1869  006736  005212                          INC     @R2             ;INCREMENT UNIT NO.
1870  006740  005300                          DEC     R0              ;COUNT
1871  006742  001373                          BNE     1$              ;BRANCH IF 8 NOT DONE
1872  006744  111137  004646                  MOVB    @R1,@#TOTALAT   ;SAVE TOTAL ATTENTION
1873                                                                  ;USED IN DRIVE CLEAR TEST
1874  006750  105037  004647                  CLRB    @#TOTALAT+1     ;CLEAR UPPER BYTE
1875  006754  105711                          TSTB    @R1             ;TEST FOR ANY DRIVES PRESENT
1876  006756  001402                          BEQ     2$              ;IF NONE THERE - SAY SO
1877  006760  000137  007342                  JMP     XE2             ;SOME THERE - LOAD TABLE
1878
1879  006764  032777  020000  172146  2$:     BIT     #SW13,@SWR      ;INHIBIT ERROR TYPE OUT?
1880  006772  001402                          BEQ     3$              ;BRANCH IF NO
1881  006774  000137  007700                  JMP     SELTST          ;CHECK FOR SELECTED UNIT START AND LOAD
1882                                                                  ;"UNITS" TABLE WITH DESIRED DRIVE IF SO
1883
1884  007000                          3$:
1885
1886  007336  000137  032570                  JMP     @#$EOP          ;GO OUT ------------------------>
1887
1888
1889                                          ;*SET UP THE UNITS TABLE
1890
1891  007342                          XE2:
1892  007342  012700  000010          2$:     MOV     #8.,R0          ;COUNTER
1893  007346  012703  004576                  MOV     #UNITS,R3       ;POINTER
1894  007352  012723  177777          3$:     MOV     #-1,(R3)+       ;PRESET BLOCK TO ALL ONES
1895  007356  005300                          DEC     R0              ;COUNT
1896  007360  001374                          BNE     3$              ;BRANCH IF 8 NOT DONE
1897  007362  012703  004576                  MOV     #UNITS,R3       ;POINTER
1898  007366  005005                          CLR     R5
1899  007370  005037  004620                  CLR     @#NOUNIT        ;NO. OF UNITS PRESENT
1900  007374  012700  000010                  MOV     #8.,R0          ;COUNTER
1901  007400  011137  001176                  MOV     @R1,@#$TMP0     ;TEMPORARY STORAGE
1902  007404  006037  001176          4$:     ROR     @#$TMP0         ;SET CARRY IF ONE IN  0 BIT
1903  007410  103120                          BCC     5$              ;CHECK NEXT UNIT IF ONE NOT IN BIT 0
1904
1905  007412  010577  172560                  MOV     R5,@RHCS2       ;INSERT UNIT NUMBER INTO UA BITS
1906  007416  022777  024020  172600          CMP     #24020,@RHDT    ;IS THIS A DUAL PORT RP04 ?
1907  007424  001503                          BEQ     6$              ;TYPE DRIVE NO. IF SO
1908  007426  022777  020020  172570          CMP     #20020,@RHDT    ;IS THIS A SINGLE PORT RP04 ?
1909  007434  001477                          BEQ     6$              ;TYPE NO. IF SO
1910
1911  007436  022777  024021  172560          CMP     #24021,@RHDT    ;IS THIS A DUAL PORT RP05 ?
```

```
1912  007444  001473                          BEQ     6$                      ;TYPE DRIVE NO. IF SO
1913  007446  022777  020021  172550          CMP     #20021,@RHDT            ;IS THIS A SINGLE PORT RP05 ?
1914  007454  001467                          BEQ     6$                      ;TYPE THE NO. IF SO
1915
1916  007456  022777  024022  172540          CMP     #24022,@RHDT            ;IS THIS A DUAL PORT RP06 ?
1917  007464  001463                          BEQ     6$                      ;TYPE DRIVE NO. IF SO
1918  007466  022777  020022  172530          CMP     #20022,@RHDT            ;IS THIS A SINGLE PORT RP06 ?
1919  007474  001457                          BEQ     6$                      ;TYPE DRIVE NO. IF SO
1920
1921
1922  007524  010546                          MOV     R5,-(SP)                ;GET READY TO TYPE UNIT NUMBER
1923  007526  104405                          TYPDS
1924  007552  017746  172446                  MOV     @RHDT,-(SP)             ;GET READY TO TYPE RHDT
1925  007556  104402                          TYPOC
1926  007632  000407                          BR      5$                      ;NO RP04/RP05/RP06 FOUND SO INCR TABLE
1927
1928  007634  010523                  6$:     MOV     R5,(R3)+
1929  007636  104401  001223                  TYPE    ,$CRLF
1930  007642  010546                          MOV     R5,-(SP)
1931  007644  104405                          TYPDS                           ;TYPE DRIVE NO.
1932  007646  005237  004620                  INC     @#NOUNIT                ;NUMBER OF DRIVES
1933
1934  007652  005205                  5$:     INC     R5                      ;INCR UNIT NUMBER
1935  007654  005300                          DEC     R0                      ;DECR NO. OF UNITS LOOKED AT
1936  007656  001252                          BNE     4$                      ;TEST THE NEXT UNIT
1937
1938  007660  013737  004576  004616          MOV     @#UNITS,@#UNIT          ;SET UNIT NO. TO FIRST ONE FOUND/OR 0
1939  007666  013737  004620  004622          MOV     @#NOUNIT,@#NUNIT        ;SAVE NO. OF UNITS
1940  007674  005337  004622                  DEC     @#NUNIT                 ;IF NUNIT = 0 THEN ONLY ONE UNIT
1941                                                                          ;IF NUNIT > 0 THEN MORE THAN ONE UNIT
1942
1943  007700  005737  004626          SELTST: TST     @#SELECT                ;STARTING ADDRESS 200 ?
1944  007706  013737  004630  004616          MOV     @#UNITSL,@#UNIT         ;SET UNIT NUMBER
```

```
1945
1946
1947
1948  007750  005037  004644                  CLR     @#ATTENT        ;CLEAR UNIT UNDER TEST ATTENTION
1949
1950  007754  005737  004616                  TST     @#UNIT          ;IS THE "UNIT" = 0 ?
1951  007760  001107                          BNE     20$             ;IF NOT, SKIP NEXT MODS
1952  007762  012700  000041                  MOV     #41,R0          ;IF SO, CHECK THE LOAD MEDIA LOCATION
1953  007766  122710  000011                  CMPB    #11,(R0)        ;WAS IT AN RP04/5/6 ?
1954  007772  001102                          BNE     20$             ;IF NOT, GO AHEAD AND TEST UNIT #0
1955  007774  005737  004626                  TST     @#SELECT        ;WAS UNIT #0 SELECTED ?
1956                                                                  ;(IE. 210 START ?)
1957  010000  001006                          BNE     19$             ;IF SO, CHANGE PACK
1958
1959                                          ;*INCREMENT THE UNITS TABLE TO NEXT DRIVE (IF ANY)
1960                                          ;*& DECREMENT "NOUNITS" PRESENT TO BE TESTED
1961
1962  010002  012700  004576                  MOV     #UNITS,R0       ;IF NOT, LOAD THE UNITS TABLE POINTER
1963  010006  005720                          TST     (R0)+           ;SELECT THE NEXT UNIT IN TABLE
1964                                                                  ;(DOUBLE INCREMENT THE POINTER, R0)
1965  010010  022710  177777                  CMP     #-1,(R0)        ;IS THERE ANOTHER TABLE ENTRY PRESENT ?
1966  010014  001065                          BNE     18$             ;IF SO, USE NEXT DRIVE & DECR "NOUNITS"
1967                                                                  ;IF NOT, CHANGE PACK ON UNIT #0
1968
1969  010016                          19$:
1970  010164  000000                          HALT
1971  010166  000404                          BR      20$             ;CONTINUE, USING SCRATCH PACK ON UNIT #0
1972
1973  010170  011037  004616          18$:    MOV     (R0),@#UNIT     ;SET UP NEW UNIT UNDER TEST
1974  010174  005337  004620                  DEC     @#NOUNITS       ;DECR BECAUSE UNIT #0 WON'T BE TESTED
1975
1976  010200  013700  004616          20$:    MOV     @#UNIT,R0       ;R0 NOW CONTAINS UNIT NO
1977
1978
1979
1980
1981  010204  005037  004636                  CLR     @#RP06          ;CLEAR RP06 DEVICE TYPE FLAG
1982  010210  010077  171762                  MOV     R0,@RHCS2       ;SET UP UNIT ADDRESSING
1983  010214  022777  024022  172002          CMP     #24022,@RHDT    ;DUAL PORT RP06 ?
1984  010222  001405                          BEQ     2$              ;YES..SET FLAG
1985  010224  022777  020022  171772          CMP     #20022,@RHDT    ;SINGLE PORT RP06 ?
1986  010232  001401                          BEQ     2$              ;YES...SET FLAG
1987  010234  000403                          BR      3$              ;DON'T SET RP06 FLAG
1988  010236  012737  177777  004636  2$:     MOV     #-1,@#RP06      ;SET THE FLAG
1989
1990  010244                          3$:                             ;ASSUME THE NEXT UNIT IS AN RP04/RP05
1991
1992
1993  010244  116037  004566  004644          MOVB    ATABLE(R0),@#ATTENT ;SET APPROPRIATE ATTENTION BIT
1994  010310  013746  004616                  MOV     @#UNIT,-(SP)    ;UNIT NO. TO STACK
1995  010314  104405                          TYPDS                   ;TYPE  DRIVE NO.
```

```
1996
1997                                        ;*TYPE OUT THE DRIVE TYPE IN ASCII
1998
1999
2000  010406  022777  024020  171610       CMP     #24020,@RHDT    ;DUAL PORT RP04 ?
2001  010414  001424                       BEQ     4$              ;TYPE ASCII MESSAGE OUT
2002  010416  022777  020020  171600       CMP     #20020,@RHDT    ;SINGLE PORT RP04 ?
2003  010424  001420                       BEQ     4$              ;TYPE THE MESSAGE
2004
2005  010426  022777  024021  171570       CMP     #24021,@RHDT    ;DUAL PORT RP05 ?
2006  010434  001433                       BEQ     5$              ;TYPE THE MESSAGE
2007  010436  022777  020021  171560       CMP     #20021,@RHDT    ;SINGLE PORT RP05 ?
2008  010444  001427                       BEQ     5$              ;TYPE THE MESSAGE
2009
2010  010446  022777  024022  171550       CMP     #24022,@RHDT    ;DUAL PORT RP06 ?
2011  010454  001442                       BEQ     6$              ;TYPE THE MESSAGE
2012  010456  022777  020022  171540       CMP     #20022,@RHDT    ;SINGLE PORT RP06 ?
2013  010464  001436                       BEQ     6$              ;TYPE THE MESSAGE
2014
2015  010466                        4$:
2016  010522  000435                       BR      1$              ;SKIP NEXT ONES
2017  010524                        5$:
2018  010560  000416                       BR      1$              ;SKIP NEXT
2019  010562                        6$:
2020
2021
2022
2023
2024  010616  005777  171404        1$:    TST     @RHSN           ;READ SERIAL NO. AND DRIVE TYPE
2025  010622  005777  171376               TST     @RHDT           ;THESE TWO ARE TO HELP SCOPE LOOPS
2026  010626  017737  171374  002310       MOV     @RHSN,@#SN      ;SAVE TO CHECK IF DRIVE CLEAR CLEARS ANY BITS
2027  010634  017737  171364  002306       MOV     @RHDT,@#DT      ;SAVE TO CHECK IF DRIVE CLEAR CLEARS ANY BITS
```

```
2028
2029
2030
2031
2032  010652  004737  033066                JSR     PC,@#CLDISK     ;GIVE INITILIZE
2033  010656  032713  010000                BIT     #MOL,@R3        ;CHECK MOL IN RHDS1
2034  011100  032713  010000          1$:   BIT     #MOL,@R3        ;CHECK MOL IN RHDS1
2035  011104  001775                      BEQ     1$              ;WAIT IF MOL IS STILL LOW
2036
2037
2038
```

```
2039
2040
2041  011204  012706  001000                    MOV     #STACK,SP       ;RESET STACK
2042
2043  011214  013700  002166                    MOV     @#RPVEC,R0      ;GET RP VECTOR ADDRESS
2044  011220  012720  011266                    MOV     #RPTRP1,(R0)+   ;THIS IS FOR TIMELY INTERRUPTS
2045  011224  012710  000340                    MOV     #340,(R0)       ;RP04 INTERRUPT SERVICE ROUTINE
2046                                                                    ;PRIORITY = 7
2047  011230  012737  000200  177776            MOV     #200,PS         ;SET PROCESSOR PRIORITY @ 4
2048  011236  012711  000300                    MOV     #RDY!IE,@R1     ;RDY, IE IN RHSC1 SHOULD CAUSE INTERRUPT
2049
2050  011242  013737  033564  001200            MOV     @#TIMCNT,@#$TMP1;COUNTER
2051  011250  005337  001200          1$:       DEC     @#$TMP1         ;WAIT FOR INTERRUPT
2052  011254  001375                            BNE     1$              ;BRANCH IF NOT ZERO
2053                                                                    ;BEFORE THIS IS ZERO INTERRUPT SHOULD OCCUR
2054  011256  104065                            ERROR   65              ;INTERRUPT DID NOT OCCUR
2055  011260  012712  000040                    MOV     #CLR,@R2        ;CLEAR CONTROLLER VIA CS2
2056
2057  011266  022626                  RPTRP1:   CMP     (SP)+,(SP)+     ;RESTORE STACK
2058  011270  022711  004200                    CMP     #DVA!RDY,@R1    ;IE SHOULD BE LOW
2059  011276  104065                            ERROR   65              ;INTERRUPT OCCURED BUT
2060                                                                    ;IE FAILED TO RESET
2061  011300  012712  000040                    MOV     #CLR,@R2        ;CLEAR CONTROLLER
```

```
2062
2063
2064
2065  011314  012706  001000                    MOV     #STACK,SP       ;RESET STACK
2066
2067  011324  013700  002166                    MOV     @#RPVEC,R0      ;GET RP VECTOR ADDRESS
2068  011330  012720  011374                    MOV     #RPTRP2,(R0)+   ;THIS IS FOR UNTIMELY INTERRUPTS
2069  011334  012710  000340                    MOV     #340,(R0)       ;RP04 INTERRUPT SERVICE ROUTINE
2070                                                                    ;PRIORITY = 7
2071  011340  012737  000240  177776            MOV     #240,PS         ;SET PROCESSOR PRIORITY = 5
2072  011346  012711  000300                    MOV     #RDY!IE,@R1     ;RDY, IE IN RHSC1 WHOULD CAUSE INTERRUPT
2073
2074  011352  013737  033564  001200            MOV     @#TIMCNT,@#$TMP1;COUNTER
2075  011360  005337  001200          1$:       DEC     @#$TMP1         ;WAIT FOR INTERRUPT
2076  011364  001375                            BNE     1$              ;BRANCH IF NOT ZERO
2077                                                                    ;BEFORE THIS IS ZERO INTERRUPT WHOULD OCCUR
2078  011366  012712  000040                    MOV     #CLR,@R2        ;CLEAR CONTROLLER
2079
2080  011374  022626                  RPTRP2:   CMP     (SP)+,(SP)+     ;RESTORE STACK
2081  011376  104065                            ERROR   65              ;INTERRUPT OCCURRED WITH
2082                                                                    ;PROCESSOR PRIORITY SAME AS DISK
2083  011400  012712  000040                    MOV     #CLR,@R2        ;CLEAR CONTROLLER
2084
2085
2086
2087
```

```
                                                ;*IN CASE THERE IS ANY DRIVE ERRORS DURING POWER UP
                                                ;*OR POWER DOWN OR ANY PARITY ERRORS A RESET IS GIVEN
011406  000005                                  RESET
011410  004737  037334                          JSR     PC,@#$TKINT     ;INITILIZE TK
011414  012737  000000  177776                  MOV     #0,PS

                                                ;*NOW SAVE REGISTERS FOR COMPARISON AFTER PACK ACKNOWLEDGE

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

011644  104015                  1$:     ERROR   15              ;GIVING A PACK ACKNOWLEDGE
011646  000207                          RTS     PC              ;CAUSED AN ERROR
                                                                ;PACK ACKNOWLEDGE SHOULD
                                                                ;SET VV IN RHDSI
                                                                ;INTERRUPT SHOULD MAKE
                                                                ;IE = 0
                                                                ;NO OTHER REGISTERS SHOULD
                                                                ;CHANGE
                                                                ;GOOD DATA GIVES CONTENTS
                                                                ;OF REGISTER BEFORE COMMAND
                                                                ;RECEIVED DATA GIVES CONTENTS
                                                                ;OF REGISTER AFTER COMMAND
01165C                           2$:
```

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


                                        ;*CHECK THE DRIVE TYPE AND THEN FILL THE
                                        ;*WRITE FROM BUFFER WITH APPROPRIATE HEADER
011670  005737  004636                  TST     @#RP06  ;TEST FOR RP06 DRIVE
011674  001412                          BEQ     11$             ;TREAT UNIT AS AN RP04
                                                                ;TREAT UNIT AS AN RP06

011720  000411                          BR      12$             ;CONTINUE WITH SET UP

011722                          11$:
011744                          12$:

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

```
2143
2144                                            ;*DRIVE TYPE IS CHECKED AND THEN THE APPROPRIATE
2145                                            ;*WRITE HEADER AND DATA COMMAND IS LOADED
2146
2147  011756  005737  004636                   TST     @#RP06  ;TEST FOR RP06 DRIVE
2148  011762  001412                           BEQ     7$              ;TREAT UNIT AS RP04
2149
2150  012006  000411                           BR      8$              ;CONTINUE WITH TEST
2151
2152  012010                          7$:
2153  012032                          8$:
2154
2155
2156                                            ;*NOW SAVE REGISTERS FOR COMPARISON AFTER WRITE
2157
2158
2159
2160                                            ;*TIME IS NOT CRITICAL HERE
2161
2162                                            ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE
2163
2164                                            ;*COMPARE ALL REGISTERS
2165
2166  012210  104045                  1$:     ERROR   45              ;WRITING ON THE LAST BLOCK
2167  012212  000207                           RTS     PC              ;IE. CYLINDER 410./814., SECTOR 21
2168                                                                  ;TRACK 18 CAUSED
2169                                                                  ;IMPROPER REGISTER CHANGE
2170                                                                  ;GOOD DATA GIVES WHAT
2171                                                                  ;SHOULD BE THERE
2172                                                                  ;RECEIVED DATA GIVES WHAT
2173                                                                  ;WAS THERE AFTER WRITE
2174                                                                  ;ON LAST BLOCK
```

```
                                        ;*NOW A READ DATA WILL BE DONE ON SAME CYLINDER, SECTOR & TRACK
                                        ;*CLEAR ANY PREVIOUS ERRORS
012214                          2$:
                                        ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA
                                        ;*FIRST THE DRIVE TYPE IS CHECKED AND THEN THE APPROPRIATE
                                        ;*READ COMMAND IS LOADED
012244  005737  004636                TST     @#RP06  ;TEST FOR RP06 DRIVE
012250  001412                        BEQ     9$              ;TREAT UNIT AS RP04
012274  000411                        BR      10$             ;CONTINUE WITH TEST
012276                          9$:
012320                          10$:
                                        ;*SAVE REGISTERS FOR COMPARISON AFTER READ DATA
                                        ;*TIME IS NOT CRITICAL HERE
                                        ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE
                                        ;*COMPARE ALL REGISTERS
012476  104045                  3$:   ERROR   45              ;READING ON LAST BLOCK IE.
012500  000207                        RTS     PC              ;CYLINDER 410./814., SECTOR 21, TRACK 18
                                                              ;CAUSED AN ERROR
                                                              ;GOOD DATA GIVES WHAT SHOULD
                                                              ;BE THERE
                                                              ;RECEIVED DATA GIVES WHAT
                                                              ;WAS THERE AFTER READ
                                                              ;FROM LAST BLOCK
                                        ;*READ DATA WILL BE COMPARED
012502                          4$:
012520  104046                  5$:   ERROR   46              ;DATA READ FROM
012522  000207                        RTS     PC              ;LAST BLOCK IN ERROR
012524                          6$:
```

```
                                        ;*GET HEADS TO CYLINDER 0



                                        ;*FILL WRITE FROM BUFFER WITH HEADER
                                        ;*FILL WRITE FROM BUFFER WITH DATA
                                        ;*FILL WRITE FROM BUFFER WITH NEXT SECTOR HEADER
                                        ;*FILL WRITE FROM BUFFER WITH NEXT SECTOR DATA
                                        ;*CLEAR READ INTO BUFFER WITH DATA OTHER THAN EXPECTED DATA
                                        ;*THE WRITE HEADER AND DATA WILL BE LOADED
                                        ;*SAVE REGISTERS FOR COMPARISON AFTER WRITE HEADER AND DATA



                                        ;*ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR = 760 MICRO SEC
                                        ;*NOW CHANGE SAVE REGISTERS TO EXPECTED VALUES
                                        ;*NOW COMPARE REGISTERS BEFORE WRITE HEADER AND DATA
                                        ;*WITH REGISTERS AFTER COMMAND

013150  104027                  1$:   ERROR   27              ;WRITE HEADER AND DATA
013152  000207                        RTS     PC              ;CAUSED IMPROPER REGISTER
                                                              ;CHANGE
                                                              ;GOOD DATA GIVES WHAT SHOULD
                                                              ;BE THERE
                                                              ;RECEIVED DATA GIVES WHAT
                                                              ;WAS THERE AFTER COMMAND

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

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

013154                            2$:

                                        ;*SAVE REGISTERS FOR COMPARISON NOT AFTER THE
                                        ;*SEARCH COMMAND BUT AFTER THE READ HEADER AND DATA

                                        ;*NOW SAVE VALUES FOR RHCS1 AND RHDST WHICH
                                        ;*WILL CHANGE AFTER THE SEARCH
```

```
2279
2280  013214  013746  002350                  MOV     @#REFOR,-(SP)   ;SAVE READ HEADER AND DATA
2281  013220  052716  000101                  BIS     #IE!GO,(SP)     ;INTERRUPT ENABLE AND GO
2282  013224  012637  004650                  MOV     (SP)+,@#TMP0    ;SAVE IN R0 FOR RHCS1
2283  013230  012737  000001  004656          MOV     #1,@#TMP5       ;SAVE TRACK 0 SECTOR 1 FOR RHDST
2284
2285                                          ;*THE INTERRUPT VECTOR WILL BE SET TO GO TO 2$
2286                                          ;*AFTER THE SEARCH
2287
2288  013236  012777  013304  166722          MOV     #7$,@RPVEC      ;SET INTERRUPT VECTOR TO 2$
2289
2290                                          ;*TIME IS NOT CRITICAL THIS ONLY WAITS FOR SEARCH COMPLETION
2291
2292  013304  012737  000000  177776  7$:     MOV     #0,PS           ;SET PROSESSOR STATUS TO
2293                                                                  ;PRIORITY 0 IN CASE IT WAS
2294                                                                  ;TAKEN OUT OF WAT ROUTINE
2295                                                                  ;BEFORE RTI
2296  013312  013777  004656  166664          MOV     @#TMP5,@RHDST   ;SET DESIRED SECTOR/TRACK
2297                                                                  ;REGISTER TO SECTOR 1,TRACK 0
2298
2299  013326  013777  004650  166644          MOV     @#TMP0,@RHCS1   ;FILL RHCS1 WITH READ COMMAND
2300                                                                  ;TOGETHER WITH INTERRUPT ENABLE
2301                                                                  ;AND GO
2302
2303                                          ;*TIME ALLOWED HERE IS CRITICAL ANY TIME ERROR
2304                                          ;*INDICATES WRONG SEARCH IN THE SEARCH COMMAND
2305
2306                                          ;*WRITE FROM BUFFER WILL BE FILLED WITH EXPECTED DATA
2307
2308                                          ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES
2309
2310                                          ;*COMPARE REGISTER BEFORE READ HEADER AND DATA
2311                                          ;*WITH REGISTERS AFTER COMMAND
2312
2313  013456  104031                  3$:     ERROR   31              ;READ HEADER AND DATA CAUSED
2314  013460  000207                          RTS     PC              ;IMPROPER REGISTER CHANGE
2315                                                                  ;GOOD DATA GIVES WHAT SHOULD
2316                                                                  ;BE THERE
2317                                                                  ;RECEIVED DATA GIVES WHAT WAS
2318                                                                  ;THERE AFTER COMMAND
2319
2320                                          ;*NOW READ INTO BUFFER WILL BE CHECKED TO SEE
2321                                          ;*THE READ WAS GOOD
2322  013462                          4$:
2323
2324  013500  104053                  5$:     ERROR   53              ;READ HEADER AND DATA
2325  013502  000207                          RTS     PC              ;AFTER A SEARCH CAUSED
2326                                                                  ;AN ERROR
2327  013504                          6$:
2328
```

```
2329
2330
2331                                            ;*GET THE HEADS TO CYLINDER 10
2332
2333                                            ;*FILL REGISTERS FOR READ HEADER AND DATA TO BE DONE AFTER SEARCH
2334
2335                                            ;*SAVE REGISTERS FOR COMPARISON AFTER SEARCH
2336                                            ;*AND READ HEADER AND DATA
2337
2338                                            ;*NOW GIVE THE SEARCH COMMAND
2339  013652  012777  014036  166306            MOV     #3$,@RPVEC      ;INTERRUPT VECTOR SET TO 3$
2340  013670  013700  002334                    MOV     @#SERCH,R0      ;EXPECTED CONTENTS OF RHCS1
2341                                                                    ;IMMEDIATELY AFTER GO
2342  013674  052700  004301                    BIS     #DVA!RDY!IE!GO,R0 ;EXPECTED BITS IN RHCS1
2343  013700  012705  010500                    MOV     #MOL!DPR!VV,R5 ;EXPECTED BITS IN RHDS1
2344                                                                    ;IMMEDIATELY AFTER GO
2345
2346  013720  021100                            CMP     @R1,R0          ;IS RHCS1 GOOD
2347  013722  001413                            BEQ     1$              ;BRANCH IF GOOD
2348  013724  011137  001126                    MOV     @R1,@#$BDDAT    ;BAD DATA FOR RHCS1
2349  013730  010037  001124                    MOV     R0,@#$GDDAT     ;GOOD DATA
2350  013734  010137  004500                    MOV     R1,@#REGADR     ;FAILING REGISTER RHCS1
2351  013740  012737  000340  000036            MOV     #340,@#TRAPVEC+2 ;TRAP PRIORITY = 7
2352  013746  104021                            ERROR   21              ;DURING SEARCH COMMAND
2353                                                                    ;CONTENTS OF RHCS1 WAS
2354                                                                    ;NOT AS EXPECTED
2355  013750  000414                            BR      2$              ;IF LAST ERROR 21 OCCURRED
2356                                                                    ;THEN DO NOT CHECK RHDS1
2357                                                                    ;AS TOO MUCH TIME HAS
2358                                                                    ;PASSED
2359
2360  013752  021305                    1$:     CMP     @R3,R5          ;IS RHDS1 GOOD
2361  013754  001412                            BEQ     2$              ;BRANCH IF GOOD
2362  013756  011337  001126                    MOV     @R3,@#$BDDAT    ;BAD DATA FOR RHDS1
2363  013762  010537  001124                    MOV     R5,@#$GDDAT     ;GOOD DATA
2364  013766  010337  004500                    MOV     R3,@#REGADR     ;FAILING REGISTER RHDS1
2365  013772  012737  000340  000036            MOV     #340,@#TRAPVEC+2 ;TRAP PRIORITY = 7
2366  014000  104063                            ERROR   63              ;DURING SEARCH COMMAND
2367                                                                    ;CONTENTS OF RHDS1 WAS
2368                                                                    ;IN CORRECT
2369
2370  014002  013737  002350  004650    2$:     MOV     @#REFOR,@#TMP0  ;SAVE READ HEADER AND DATA
2371  014010  052737  000101  004650            BIS     #IE!GO,@#TMP0   ;INCLUDE INTERRUPT ENABLE, GO
2372  014016  012737  000001  004656            MOV     #1,@#TMP5       ;SAVE TRACK 0, SECTOR 1
2373
2374                                            ;*THIS IS ONLY A WAIT LOOP
2375
2376  014036  012737  000200  000036    3$:     MOV     #200,@#TRAPVEC+2 ;TRAP PRIORITY = 4
2377  014044  012737  000000  177776            MOV     #0,PS           ;SET PROSESSOR STATUS TO 0
2378  014052  013777  004656  166124            MOV     @#TMP5,@RHDST   ;SET DESIRED SECTOR/TRACK
2379                                                                    ;REGISTER TO SECTOR 1, TRACK 0
2380
2381  014066  013711  004650                    MOV     @#TMP0,@R1      ;FILL RHCS1 WITH READ COMMAND
2382                                                                    ;TOGETHER WITH INTERRUPT ENABLE
2383                                                                    ;AND GO
2384
```

```
2385                                            ;*TIME ALLOWED HERE IS CRITICAL ANY TIME ERROR
2386                                            ;*INDICATES WRONG SEARCH IN THE SEARCH COMMAND
2387
2388                                            ;*WRITE FROM BUFFER WILL BE FILLED WITH EXPECTED DATA
2389
2390                                            ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES
2391
2392                                            ;*COMPARE REGISTER BEFORE READ HEADER AND DATA
2393                                            ;*WITH REGISTERS AFTER COMMAND
2394
2395
2396  014224  104031                    4$:     ERROR   31              ;READ HEADER AND DATA CAUSED
2397  014226  000207                            RTS     PC              ;IMPROPER REGISTER CHANGE
2398                                                                    ;GOOD DATA GIVES WHAT SHOULD
2399                                                                    ;BE THERE
2400                                                                    ;RECEIVED DATA GIVES WHAT WAS
2401                                                                    ;THERE AFTER COMMAND
2402
2403                                            ;*NOW READ INTO BUFFER WILL BE CHECKED TO SEE
2404                                            ;*THE READ WAS GOOD
2405  014230                            5$:
2406
2407  014246  104053                    6$:     ERROR   53              ;READ HEADER AND DATA
2408  014250  000207                            RTS     PC              ;AFTER A SEARCH CAUSED
2409                                                                    ;AN ERROR
2410  014252                            7$:
2411
2412
2413
2414
```

```
2415
2416                                    ;*      THE NEXT TEST REMOVES SECTOR 1 ON CYLINDER 0
2417                                    ;*      TRACK0 AND PUTS SECTOR 0 THERE.
2418                                    ;*      HENCE THE PACK IS UNFORMATTED FROM
2419                                    ;*      THIS POINT ON TO THE TEST WHEN SECTOR
2420                                    ;*      1 IS REPLACED.  IF TESTING IS STOPPED WITH
2421                                    ;*      AN ERROR IN THE SECTION OF THE PROGRAM BETWEEN
2422                                    ;*      THIS AND WHEN SECTOR 1 IS REPLACED THEN THE
2423                                    ;*      DISK BEING USED MAY HAVE BEEN UNFORMATTED
2424                                    ;*      IF THE LAST PASS OF THIS PROGRAM GIVES
2425                                    ;*      NO ERRORS IN THIS SECTION THEN THE DISK
2426                                    ;*      MAY NOT HAVE BEEN UNFORMATTED. HOWEVER IT
2427                                    ;*      IS RECOMMENDED THAT AFTER A PASS OF THIS
2428                                    ;*      PROGRAM THE DISK BE REFORMATTED.
2429
2430
2431
2432
2433
2434
2435
2436                                            ;*FILL WRITE FROM BUFFER WITH HEADER
2437
2438                                            ;*FILL READ INTO BUFFER WITH ALL ONES
2439
2440
2441                                            ;*WRITE HEADER AND DATA IS LOADED
2442
2443                                            ;*NOW SAVE REGISTERS FOR COMPARISON AFTER WRITE
2444
2445
2446
2447
2448
2449                                            ;*TIME IS NOT CRITICAL
2450
2451                                            ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE
2452
2453                                            ;*COMPARE ALL REGISTERS
2454
2455  014476  104027                    1$:     ERROR   27              ;WRITING HEADER AND DATA CAUSED
2456  014500  000207                            RTS     PC
2457                                                                    ;IMPROPER REGISTER CHANGE
2458                                                                    ;GOOD DATA GIVES WHAT
2459                                                                    ;SHOULD BE THERE
2460                                                                    ;RECEIVED DATA GIVES WHAT
2461                                                                    ;WAS THERE AFTER WRITE
```

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

014502                          2$:

                                        ;*READ COMMAND IS LOADED

                                        ;*SAVE REGISTERS FOR COMPARISON AFTER READ DATA




                                        ;*TIME IS NOT CRITICAL

                                        ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE

                                        ;*COMPARE ALL REGISTERS
014732  104047                 3$:     ERROR   47              ;READING ON NON EXISTANT SECTOR
014734  000207                         RTS     PC
                                                                ;CAUSED AN ERROR
                                                                ;GOOD DATA GIVES WHAT SHOULD
                                                                ;BE THERE
                                                                ;RECEIVED DATA GIVES WHAT
                                                                ;WAS THERE AFTER READ

                                        ;*READ DATA WILL BE COMPARED

014736                          4$:
014754  104050                 5$:     ERROR   50              ;DATA READ FROM NON
014756  000207                         RTS     PC              ;EXISTANT SECTOR CAUSED AN ERROR
014760                          6$:
```

```
2497
2498                                            ;*FILL WRITE FROM BUFFER WITH HEADER AND DATA
2499
2500                                            ;*FILL READ INTO BUFFER WITH ALL ONES
2501
2502                                            ;*WRITE HEADER AND DATA IS LOADED
2503
2504                                            ;*NOW SAVE REGISTERS FOR COMPARISON AFTER
2505                                            ;*WRITE HEADER AND DATA
2506
2507
2508
2509
2510
2511                                            ;*TIME IS NOT CRITICAL
2512
2513                                            ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUE
2514
2515                                            ;*COMPARE ALL REGISTERS
2516  015206  104027                    1$:     ERROR   27              ;WRITING HEADER AND DATA CAUSED
2517  015210  000207                            RTS     PC              ;IMPROPER REGISTER CHANGE
2518                                                                    ;GOOD DATA GIVES WHAT
2519                                                                    ;SHOULD BE THERE
2520                                                                    ;RECEIVED DATA GIVES WHAT
2521                                                                    ;WAS THERE AFTER WRITE
2522
```

```
                                                ;*NOW A WRITE DATA WILL BE DONE ON SAME CYLINDER, SECTOR
                                                ;*TRACK
                                
015212                                  2$:
                                                ;*FILL WRITE FROM BUFFER WITH DATA
                                
                                                ;*WRITE DATA COMMAND IS LOADED
                                
                                                ;*SAVE REGISTERS FOR COMPARISON AFTER WRITE DATA
                                
                                
                                
                                                ;*TIME IS NOT CRITICAL
                                
                                                ;*NOW CHANGE REGISTERS TO EXPECTED VALUE
015326  005737  004640                          TST     @#RH70          ;RUNNING ON RH70 ?
015332  001421                                  BEQ     9$              ;IF NOT, SKIP NEXT RH70 CODE
                                
015374  000416                                  BR      10$             ;SKIP NEXT RH11 CODE
                                
015376                                  9$:
                                
                                
015432                                  10$:
                                
                                                ;*COMPARE ALL REGISTERS
015542  104052                          3$:     ERROR   52              ;WRITE DATA ON NON EXISTANT SECTOR
015544  000207                                  RTS     PC              ;CAUSED IMPROPER REGISTER CHANGE
                                                                        ;ATTEMPTED WRITE WAS ON
                                                                        ;CYLINDER 0,SECTOR 1, TRACK 0
                                                                        ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                                                        ;RECEIVED DATA GIVES WHAT WAS THERE
                                                                        ;AFTER COMMAND
                                
                                                ;*READ HEADER AND DATA SECTOR 1, TRACK 0, CYLINDER 0
                                                ;*WILL BE ATTEMPTED
015546                                  4$:
                                
                                                ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA
                                
                                                ;*FILL READ INTO BUFFER WITH ALL ONES
                                                ;*FILL REGISTERS WITH READ HEADER AND DATA COMMAND
                                
                                                ;*SAVE REGISTERS FOR COMPARISON AFTER READ
                                                ;*HEADER AND DATA
                                
                                
                                
                                                ;*TIME IS NOT CRITICAL
                                
                                                ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE
```

```
2579                                            ;*COMPARE REGISTERS BEFORE READ HEADER AND DATA
2580                                            ;*WITH AFTER
2581
2582  016062  104031                  5$:       ERROR   31              ;READ HEADER AND DATA WITH
2583  016064  000207                            RTS     PC              ;FORCED HEADER COMPARE ERROR
2584                                                                    ;CAUSED ERROR
2585                                                                    ;GOOD DATA GIVES WHAT SHOULD
2586                                                                    ;BE THERE
2587                                                                    ;RECEIVED DATA GIVES WHAT
2588                                                                    ;WAS THERE AFTER READ
2589
2590                                            ;*NOW COMPARE READ DATA
2591                                            ;*THE COMMAND READ ONLY 204 WORDS, 4 HEADER WORDS
2592                                            ;*AND 200 DATA WORDS
2593
2594  016066                            6$:
2595  016104  104034                  7$:       ERROR   34              ;DATA READ FROM A FORCED
2596  016106  000207                            RTS     PC              ;HEADER COMPARE ERROR IS
2597                                                                    ;INCORRECT
2598                                                                    ;GOOD DATA GIVES WHAT
2599                                                                    ;THE READ HEADER AND DATA
2600                                                                    ;SHOULD HAVE READ
2601                                                                    ;BAD DATA GIVES WHAT
2602                                                                    ;WAS IN BUFFER AFTER
2603                                                                    ;READ COMMAND
2604  01611C                            8$:
2605
2606
2607
2608
2609
2610
```

```
2611
2612
2613                                    ;*GET HEADS TO CYLINDER 0
2614
2615
2616
2617
2618
2619                                    ;*FILL REGISTERS FOR SEARCH
2620                                    ;*SAVE REGISTERS FOR COMPARISON AFTER SEARCH
2621
2622
2623
2624
2625
2626
2627
2628                                    ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE
2629
2630                                    ;*COMPARE REGISTERS BEFORE SEARCH WITH AFTER SEARCH
2631
2632  016436  104047            1$:     ERROR   47              ;SEARCH TO A NON-EXISTANT
2633
2634  016440  000207                    RTS     PC              ;SECTOR CAUSED IMPROPER
2635                                                            ;REGISTER CHANGE
2636                                                            ;GOOD DATA GIVES WHAT SHOULD
2637                                                            ;BE THERE
2638                                                            ;RECEIVED DATA GIVES
2639                                                            ;WHAT WAS THERE AFTER
2640                                                            ;SEARCH
2641  016442                    2$:
2642
```

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

                                        ;*NOW THE WRITE HEADER AND DATA COMMAND WILL BE FILLED

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


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

                                        ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUES

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

017002  104027          1$:     ERROR   27              ;WRITE HEADER AND DATA
017004  000207                  RTS     PC              ;CAUSED IMPROPER REGISTER
                                                        ;CHANGE
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT
                                                        ;WAS THERE AFTER COMMAND

                                        ;*NOW WRITE FROM BUFFER WILL BE CHECKED TO SEE THAT
                                        ;*NOTHER GOT CHANGED
017006                  2$:

017024  104030          3$:     ERROR   30              ;WRITE HEADER AND DATA
017026  000207                  RTS     PC              ;CHANGED WRITE FROM BUFFER

                                        ;*NOW A READ HEADER AND DATA COMMAND WILL BE GIVEN
                                        ;*READ INTO BUFFER IS FILLED WITH ONES
017030                  4$:

                                        ;*NOW FILL COMMAND

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




                                        ;*CHEANGE SAVED REGISTERS TO EXPECTED VALUES

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

```
2699
2700
2701  017302  104031                  5$:     ERROR   31              ;READ HEADER AND DATA CAUSED
2702  017304  000207                          RTS     PC              ;IMPROPER REGISTER CHANGE
2703                                                                  ;GOOD DATA GIVES WHAT SHOULD
2704                                                                  ;BE THERE
2705                                                                  ;RECEIVED DATA GIVES WHAT WAS
2706                                                                  ;THERE AFTER COMMAND
2707
2708                                          ;*NOW READ INTO BUFFER WILL BE CHECKED TO SEE
2709                                          ;*THE READ WAS GOOD
2710
2711  017306                          6$:
2712
2713  017324  104032                  7$:     ERROR   32              ;WRITE HEADER AND DATA
2714  017326  000207                          RTS     PC              ;FOLLOWED BY A READ HEADER
2715                                                                  ;AND DATA GAVE A READ ERROR
2716                                                                  ;ERROR MAY BE IN READ OR WRITE
2717  017330                          10$:
2718
2719
2720
```

```
2721
2722
2723
2724                                            ;*CHECK THE DRIVE TYPE AND THEN FILL THE
2725                                            ;*WRITE FROM BUFFER WITH APPROPRIATE HEADER
2726
2727  017350  005737  004636                   TST     @#RP06  ;TEST FOR RP06 DRIVE
2728  017354  001411                           BEQ     5$              ;TREAT UNIT AS AN RP04
2729                                                                    ;TREAT AS AN RP06
2730
2731  017376  000410                           BR      6$              ;CONTINUE WITH SET UP
2732
2733  017400                          5$:
2734  017420                          6$:                               ;CONTINUE
2735                                            ;*FILL WRITE FROM BUFFER WITH DATA
2736
2737
2738                                            ;*THE DRIVE TYPE IS CHECKED AND THE APPROPRIATE
2739                                            ;*WRITE HEADER AND DATA COMMAND IS LOADED
2740
2741
2742  017432  005737  004636                   TST     @#RP06  ;TEST FOR RP06 DRIVE
2743  017436  001412                           BEQ     3$              ;TREAT UNIT AS RP04
2744                                                                    ;TREAT UNIT AS RP06
2745
2746
2747  017462  000411                           BR      4$              ;CONTINUE WITH TESTING
2748  017464                          3$:
2749  017506                          4$:                               ;CONTINUE
2750
2751
2752                                            ;*NOW SAVE REGISTERS FOR COMPARISON AFTER
2753                                            ;*WRITE HEADER AND DATA
2754
2755
2756
2757
2758
2759
2760
2761
2762                                            ;*CHANGE        THE SAVED REGISTERS TO EXPECTED VALUES
2763
2764                                            ;*AS EXCEPTION IS ASSERTED BEFORE RUN IS LATCHED,
2765                                            ;*RHWC,RHBA,RHCS1 & RHCS2 CANNOT BE PREDETERMINED -
2766                                            ;*THEY WILL VARY DEPENDING ON GATE DELAYS FOR DIFFERENT UNITS
2767
2768  017566  017737  162400  004512            MOV     @RHWC,@#SAVERE  ;RHWC IS UNPREDICTABLE
2769                                                                    ;AS EXPLAINED ABOVE
2770  017574  017737  162374  004514            MOV     @RHBA,@#SAVERE+2;RHBA IS UNPREDICTABLE
2771                                                                    ;AS EXPLAINED ABOVE
2772  017602  017737  162370  004516            MOV     @RHCS2,@#SAVERE+4;RHCS2 IS UNPREDICTABLE
2773                                                                    ;AS EXPLAINED ABOVE
2774  017610  017737  162364  004520            MOV     @RHCS1,@#SAVERE+6;RHCS1 IS UNPREDICTABLE
2775                                                                    ;AS EXPLAINED ABOVE
2776  017660  017737  162320  004524            MOV     @RHDST,@#SAVERE+12 ;RHDST IS INDETERMINATE
```

```
                                                        ;SO IT IS NOT CHECKED


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

017704  104054                  1$:   ERROR   54        ;ATTEMPTED OPERATION WITH
017706  000207                        RTS     PC        ;INVALID ADDRESS CAUSED
                                                        ;IMPROPER REGISTER CHANGE
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
017710                          2$:                     ;RECEIVED DATA GIVES REGISTER
                                                        ;CONTENTS AFTER ATTEMPTED
                                                        ;WRITE HEADER AND DATA
```

```
                                        ;*FILL WRITE FROM BUFFER WITH DATA
                                        ;*WRITE DATA COMMAND WILL BE FILLED
                                        ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED WRITE DATA




                                        ;*CHANGE        SAVED REGISTERS TO EXPECTED VALUES


                                        ;*AS EXCEPTION IS ASSERTED BEFORE RUN IS LATCHED
                                        ;*RHWC,RHBA,RHCS1,RHCS2,  CANNOT BE PEREDETERMINED
                                        ;*THEY WILL VARY DEPENDING ON GATE DELAYS ON DIFFRENT UNITS
020044  017737  162122  004512           MOV     @RHWC,@#SAVERE  ;RHWC IS UNPREDICTABLE
                                                                ;AS EXPLAINED ABOVE
020052  017737  162116  004514           MOV     @RHBA,@#SAVERE+2;RHBA IS UNPREDICTABLE
                                                                ;AS EXPLAINED ABOVE
020060  017737  162112  004516           MOV     @RHCS2,@#SAVERE+4;RHCS2 IS UNPREDICTABLE
                                                                ;AS EXPLAINED ABOVE
020066  017737  162106  004520           MOV     @RHCS1,@#SAVERE+6;RHCS1 IS UNPREDICTABLE
                                                                ;AS EXPLAINED ABOVE
020114  017737  162064  004524           MOV     @RHDST,@#SAVERE+12 ;RHDST IS INDETERMINATE SC IT IS NOT CHECKED


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

020162  104054                  1$:     ERROR   54              ;ATTEMPTED WRITE DATA
020164  000207                          RTS     PC              ;WITH INVALID ADDRESS
                                                                ;CAUSED IMPROPER REGISTER
                                                                ;CHANGE
020166                          2$:                             ;GOOD DATA GIVES WHAT
                                                                ;SHOULD BE THERE
                                                                ;RECEIVED DATA GIVES WHAT
                                                                ;WAS THERE AFTER AFTER ATTEMPT
```

```
2836
2837
2838                                            ;*GET THE HEADS TO CYLINDER 10
2839
2840
2841
2842
2843
2844
2845
2846                                            ;*FILL READ INTO BUFFER WITH 125252
2847
2848                                            ;*THE READ HEADER AND DATA COMMAND IS FILLED
2849
2850                                            ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED READ
2851
2852
2853
2854
2855                                            ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES
2856
2857
2858
2859                                            ;*AS EXCEPTION IS ASSERTED BEFORE RUN IS LATCHED
2860                                            ;*RHWC,RHBA,RHCS1,RHCS2,  CANNOT BE PEREDETERMINED
2861                                            ;*THEY WILL VARY DEPENDING ON GATE DELAYS ON DIFFRENT UNITS
2862
2863  020402  017737  161564  004512           MOV     @RHWC,@#SAVERE          ;RHWC IS UNPREDICTABLE
2864                                                                            ;AS EXPLAINED ABOVE
2865  020410  017737  161560  004514           MOV     @RHBA,@#SAVERE+2        ;RHBA IS UNPREDICTABLE
2866                                                                            ;AS EXPLAINED ABOVE
2867  020416  017737  161554  004516           MOV     @RHCS2,@#SAVERE+4       ;RHCS2 IS UNPREDICTABLE
2868                                                                            ;AS EXPLAINED ABOVE
2869  020424  017737  161550  004520           MOV     @RHCS1,@#SAVERE+6       ;RHCS1 IS UNPREDICTABLE
2870                                                                            ;AS EXPLAINED ABOVE
2871  020452  017737  161526  004524           MOV     @RHDST,@#SAVERE+12      ;RHDST IS INDETERMINATE SO IT IS NOT CHECKED
2872
2873
2874                                            ;*COMPARE REGISTERS BEFORE ATTEMPTED READ HEADER
2875                                            ;*AND DATA WITH AFTER ATTEMPTED READ
2876
2877  020520  104054                  1$:       ERROR   54              ;ATTEMPTED READ HEADER
2878  020522  000207                            RTS     PC              ;AND DATA WITH INVALID
2879                                                                    ;ADDRESS CAUSED IMPROPER
2880                                                                    ;REGISTER CHANGE
2881                                                                    ;GOOD DATA GIVES WHAT
2882                                                                    ;SHOULD BE THERE
2883                                                                    ;RECEIVED DATA GIVES
2884                                                                    ;REGISTER CONTENTS
2885                                                                    ;AFTER ATTEMPTED
2886                                                                    ;READ
2887  020524                          2$:
2888
```

```
                                        ;*FILL READ INTO BUFFER WITH 125252
                                        ;*THE READ HEADER AND DATA COMMAND IS FILLED
                                        ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED READ
                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES
020700  017737  161300  004524            MOV     @RHDST,@#SAVERE+12;RHDST IS UNPREDICTABLE
                                        ;*COMPARE REGISTERS BEFORE ATTEMPTED READ
                                        ;*DATA WITH AFTER ATTEMPTED READ DATA
020766  104054                  1$:       ERROR   54              ;ATTEMPTED READ
020770  000207                            RTS     PC              ;DATA WITH INVALID
                                                                ;ADDRESS CAUSED IMPROPER
                                                                ;REGISTER CHANGE
                                                                ;GOOD DATA GIVES WHAT
                                                                ;SHOULD BE THERE
                                                                ;RECEIVED DATA GIVES
                                                                ;REGISTERS CONTENTS
                                                                ;AFTER ATTEMPTED
                                                                ;READ
020772                              2$:
```

```
                                        ;*FILL WRITE FROM BUFFER WITH HEADER
                                        ;*FILL WRITE FROM BUFFER WITH DATA


                                        ;*THE FIRST WRITE OPERATION IS DONE
                                        ;*FILL WRITE HEADER AND DATA COMMAND









                                        ;*CHECK THE DRIVE TYPE AND DO THE
                                        ;*APPROPRIATE SECOND WRITE OPERATION
                                        ;*FILL WRITE FROM BUFFER WITH HEADER

021140  005737  004636                  TST     @#RP06  ;TEST FOR RP06 DRIVE
021144  001411                          BEQ     15$             ;TREAT DRIVE AS AN RP04
                                                                ;TREAT AS AN RP06
021166  000410                          BR      16$             ;CONTINUE WITH THE SECOND WRITE

021170                          15$:
021210                          16$:                            ;CONTINUE WRITE
                                        ;*FILL WRITE FROM BUFFER WITH DATA - 65125
                                        ;*CHECK THE DRIVE TYPE AND
                                        ;*FILL WRITE FROM BUFFER WITH APPROPRIATE NEXT HEADER

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

021222  005737  004636                  TST     @#RP06  ;TEST FOR RP06 DRIVE
021226  001411                          BEQ     17$             ;TREAT UNIT AS AN RP04
                                                                ;TREAT AS AN RP06
021250  000410                          BR      18$             ;CONTINUE WITH TEST

021252                          17$:
021272                          18$:                            ;CONTINUE
                                        ;*FILL WRITE FROM BUFFER WITH DATA FOR NEXT SECTOR


                                        ;*CHECK THE DRIVE TYPE AND DO THE APPROPRIATE
                                        ;*FILL WRITE HEADER AND DATA COMMAND
```

```
                                                TST     @#RP06  ;TEST FOR RP06 DRIVE
021304  005737  004636                          BEQ     7$              ;TREAT UNIT AS AN RP04
021310  001412                                                          ;TREAT UNIT AS AN RP06

021334  000411                                  BR      8$
021336                                  7$:
021360                                  8$:

                                                ;*SAVE REGISTERS FOR COMPARISON AFTER WIRTE HEADER AND DATA

                                                ;*CHANGE SAVED REGISTERS TO EXPECTED VALUES

                                                ;*CHECK DEVICE TYPE BEFORE SETTING UP 'RHCA' & 'RHCC'

021562  005737  004636                          TST     @#RP06  ;TEST FOR RP06 DRIVE
021566  001411                                  BEQ     9$              ;TREAT AS RP04
                                                                        ;TREAT AS RP06

021610  000410                                  BR      10$             ;CONTINUE WITH TEST
021612                                  9$:
021632                                  10$:                            ;CONTINUE WITH TEST

021632  017737  160346  004524                  MOV     @RHDST,@#SAVERE+12 ;RHDST IS UNPREDICTABLE

                                                ;*COMPARE REGISTERS BEFORE WRITE HEADER AND DATA WITH AFTER
021656  104055                          1$:     ERROR   55              ;WRITING HEADER AND DATA WITH
021660  000207                                  RTS     PC              ;EXPECTED ADDRESS OVERFLOW ERROR
                                                                        ;CAUSED IMPROPER REGISTER
                                                                        ;CHANGE
                                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                                        ;BE THERE
                                                                        ;RECEIVED DATA GIVES WHAT
                                                                        ;WAS THERE AFTER WRITE
                                                                        ;HEADER AND DATA
```

```
                                                ;*NOW PREPARE TO DO A READ HEADER AND DATA
                                                ;*(THE FIRST READ OPERATION)
                                                ;*CHECK THE DRIVE TYPE AND FILL
                                                ;*WRITE FROM BUFFER WITH APPROPRIATE EXPECTED HEADER
021662                                  2$:
021666  005737  004636                          TST     @#RP06  ;TEST FOR RP06 DRIVE
021672  001411                                  BEQ     19$             ;TREAT UNIT AS AN RP04
                                                                        ;TREAT AS AN RP06
021714  000410                                  BR      20$             ;CONTINUE WITH TEST
021716                                  19$:
021736                                  20$:                            ;CONTINUE
                                                ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA
                                                ;*FILL WRITE FROM BUFFER WITH 377 FROM WORDS 261 TO 266
                                                ;*CLEAR READ INTO BUFFER
                                                ;*CHECK THE DRIVE TYPE AND DO THE APPROPRIATE
                                                ;*FILL READ HEADER AND DATA COMMAND
022000  005737  004636                          TST     @#RP06  ;TEST FOR RP06 DRIVE
022004  001412                                  BEQ     11$             ;TREAT UNIT AS AN RP04
                                                                        ;TREAT UNIT AS AN RP06
022030  000411                                  BR      12$             ;CONTINUE
022032                                  11$:
022054                                  12$:                            ;CONTINUE WITH TESTING
                                                ;*SAVE REGISTERS FOR COMPARISON AFTER
                                                ;*READ HEADER AND DATA
                                                ;*CHANGE        SAVED REGISTERS TO EXPECTED VALUES
                                                ;*CHECK DRIVE TYPE BEFORE SETTING UP 'RHCA'
022230  005737  004636                          TST     @#RP06  ;TEST FOR RP06 DRIVE
022234  001405                                  BEQ     13$             ;TREAT UNIT AS AN RP04
                                                                        ;TREAT UNIT AS AN RP06
022246  000404                                  BR      14$             ;CONTINUE
022250                                  13$:
022260                                  14$:                            ;CONTINUE WITH TEST
```

```
3074
3075
3076  022266  017737  157712  004524          MOV     @RHDST,@#SAVERE+12 ;RHDST IS UNPREDICTABLE
3077
3078                                          ;*COMPARE REGISTERS BEFORE READ HEADER AND DATA WITH
3079                                          ;*REGISTERS AFTER COMMAND
3080
3081  022312  104055                  3$:     ERROR   55              ;READING HEADER AND DATA WITH
3082  022314  000207                          RTS     PC              ;EXPECTED ADDRESS OVERFLOW
3083                                                                  ;ERROR CAUSED IMPROPER
3084                                                                  ;REGISTER CHANGE
3085                                                                  ;GOOD DATA GIVES WHAT SHOULD
3086                                                                  ;BE THERE
3087                                                                  ;RECEIVED DATA GIVES WHAT
3088                                                                  ;WAS THERE AFTER COMMAND
3089
3090                                          ;*NOW COMPARE THE DATA READ
3091  022316                          4$:
3092
3093  022334  104056                  5$:     ERROR   56              ;DATA READ WITH AN EXPECTED
3094  022336  000207                          RTS     PC              ;ADDRESS OVERFLOW ERROR
3095                                                                  ;IS INCORRECT
3096                                                                  ;WORD NO 1 TO 260 SHOULD
3097                                                                  ;BE READ CORRECTLY
3098                                                                  ;WORD NO 261 TO 266 SHOULD
3099                                                                  ;NOT CHANGE DUE TO THE READ
3100  022340                          6$:
3101
```

```
3102
3103                                    ;*NOW PREPARE TO READ CYLINDER 0, SECTOR 0, TRACK 0
3104                                    ;*TO SEE THAT NOTHING GOT WRITTEN ON THERE
3105                                    ;*WITH THE ADDRESS OVER FLOW BIT SET (AOE)
3106
3107                                    ;*FILL WRITE FROM BUFFER WITH EXPECTED HEADER
3108
3109                                    ;*FILL READ INTO BUFFER WITH 377
3110
3111
3112                                    ;*FILL COMMAND FOR READ HEADER AND DATA
3113
3114                                    ;*SAVE REGISTERS FOR COMPARISON AFTER READ
3115
3116
3117
3118
3119                                    ;*CHANGE        REGISTERS TO EXPECTED VALUE
3120
3121  022546                    ST22A:  ;COMPARE REGISTER BEFORE READ WITH AFTER
3122
3123  022564  104031            4$:     ERROR   31              ;READ HEADER AND DATA ON
3124  022566  000207                    RTS     PC              ;CYLINDER 0, SECTOR 0
3125                                                            ;TRACK 0 AFTER A FORCED
3126                                                            ;ADDRESS OVER FLOW ERROR
3127                                                            ;CAUSED IMPROPER REGISTER
3128                                                            ;CHANGE
3129                                                            ;GOOD DATA GIVES WHAT
3130                                                            ;SHOULD BE THERE
3131                                                            ;RECEIVED DATA GIVES WHAT
3132                                                            ;WAS THERE AFTER READ
3133                                                            ;HEADER AND DATA
3134                                                            ;IF HEADER COMPARE ERROR
3135                                                            ;IS FOUND AND THE DATA
3136                                                            ;ERROR GIVES THE NEW
3137                                                            ;HEADER TO
3138                                                            ;CYLINDER 633/1457 (OCTAL)
3139                                                            ;THEN 'AOE' OVER FLOWED
3140                                                            ;INTO HERE
3141
3142                                    ;*COMPARE DATA/READ
3143  022570                    1$:
3144
3145  022606  104032            2$:     ERROR   32              ;READ HEADER AND DATA
3146  022610  000207                    RTS     PC              ;ON CYLINDER 0, TRACK 0
3147                                                            ;SECTOR 0 AFTER A FORCED
3148                                                            ;'AOE' ERROR CAUSED
3149                                                            ;AN ERROR
3150                                                            ;IF FIRST WORD IS
3151                                                            ;10633/11457 (OCTAL) THEN
3152                                                            ;'AOE' OVER FLOWED INTO HERE
3153  022612                    3$:
3154
3155
3156
```

```
3157
3158
3159                                    ;*FIRST WRITE HEADER AND DATA CYLINDER 0, TRACK 0, SECTOR 0
3160                                    ;*FILL WRITE FROM BUFFER WITH HEADER
3161
3162                                    ;*FILL WRITE FROM BUFFER WITH DATA
3163
3164                                    ;*FILL COMMAND
3165
3166
3167
3168
3169
3170
```

```
3171
3172                                        ;*NOW PREPARE TO WRITE WITH WRONG FORMAT
3173
3174                                        ;*FILL WRITE FROM BUFFER
3175
3176                                        ;*FILL WRITE DATA COMMAND
3177
3178                                        ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED WRITE DATA
3179                                        ;*WITH WRONG FORMAT
3180
3181
3182
3183
3184
3185                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE
3186  023074  005737  004640                 TST     @#RH70          ;RH70 CONTROLLER ?
3187  023100  001411                         BEQ     7$              ;IF NOT, SKIP NEXT RH70 CODE
3188
3189  023122  000410                         BR      8$              ;SKIP NEXT RH11 CODE
3190
3191
3192
3193  023124                          7$:
3194
3195  023144                          8$:
3196
3197
3198
3199                                        ;*COMPARE REGISTERS BEFORE WRITE DATA WITH AFTER ATTEMPT
3200
3201  023312  104057                  1$:     ERROR   57              ;ATTEMPTING TO WRITE DATA
3202  023314  000207                          RTS     PC              ;WITH WRONG FORMAT BIT CAUSED
3203                                                                  ;IMPROPER REGISTER CHANGE
3204                                                                  ;GOOD DATA GIVES WHAT SHOULD
3205                                                                  ;BE THERE
3206                                                                  ;RECEIVED DATA GIVES WHAT WAS
3207                                                                  ;THERE AFTER ATTEMPTED WRITE
3208
3209                                        ;*NOW PREPARE TO READ WITH CORRECT FORMAT TO CHECK
3210                                        ;*THAT NOTHING GOT WRITTEN
3211  023316                          2$:
3212                                        ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA
3213
3214                                        ;*FILL READ INTO BUFFER WITH 125252
3215
3216                                        ;*FILL COMMAND TO READ DATA
3217
3218                                        ;*SAVE REGISTERS FOR COMPARISON AFTER NORMAL READ
3219
3220
3221
3222
3223
3224                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE
3225
3226
```

```
3227
3228
3229                                            ;*COMPARE REGISTERS BEFORE READ WITH AFTER
3230
3231  023540  104033                  3$:       ERROR   33              ;READ DATA AFTER AN
3232  023542  000207                            RTS     PC              ;ATTEMPTED WRITE WITH WRONG
3233                                                                    ;IMPROPER REGISTER CHANGE
3234                                                                    ;FORMAT CAUSED
3235                                                                    ;GOOD DATA GIVES WHAT SHOULD
3236                                                                    ;BE THERE
3237                                                                    ;RECEIVED DATA GIVES WHAT
3238                                                                    ;WAS THERE AFTER READ
3239
3240                                            ;*COMPARE DATA READ AFTER ATTEMPTED WRITE WITH
3241                                            ;*WRONG FORMAT BIT
3242  023544                            4$:
3243
3244  023562  104034                  5$:       ERROR   34              ;DATA READ AFTER AN ATTEMPT
3245  023564  000207                            RTS     PC              ;TO WRITE WITH WRONG FORMAT
3246                                                                    ;WAS INCORRECT
3247
3248  023566                            6$:
3249
```

```
3250
3251                                        ;*FILL WRITE FROM BUFFER WITH 107070
3252
3253                                        ;*FILL READ INTO BUFFER WITH 107070
3254
3255                                        ;*FILL COMMAND TO READ WITH WRONG FORMAT
3256
3257                                        ;*SAVE REGISTERS FOR COMPARAISON AFTER READ
3258
3259
3260
3261
3262
3263                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE
3264
3265
3266
3267
3268                                        ;*COMPARE REGISTERS BEFORE WRITE DATA WITH AFTER ATTEMPT
3269
3270  024066  104057            1$:       ERROR   57              ;ATTEMPTING TO READ DATA
3271  024070  000207                      RTS     PC              ;WITH WRONG FORMAT BIT CAUSED
3272                                                              ;IMPROPER REGISTER CHANGE
3273                                                              ;GOOD DATA GIVES WHAT SHOULD BE
3274                                                              ;THERE
3275                                                              ;RECEIVED DATA GIVES WHAT WAS THERE
3276                                                              ;AFTER READ DATA
3277
3278                                        ;*COMPARE READ INTO BUFFER TO CHECK THAT NOTHING WAS READ
3279  024072                    2$:
3280
3281  024110  104034            3$:       ERROR   34              ;ATTEMPT TO READ
3282  024112  000207                      RTS     PC              ;WITH WRONG FORMAT BIT
3283                                                              ;CHANGED READ INTO BUFFER
3284                                                              ;GOOD DATA GIVES WHAT SHOULD
3285                                                              ;BE THERE
3286                                                              ;BAD DATA GIVES WHAT WAS
3287                                                              ;THERE AFTER READ DATA
3288
3289  024114                    4$:
3290
```

```
3291
3292  024134  012737  002200  004650          MOV     #RHCS1,@#TMP0   ;FIRST REGISTER TO BE TESTED
3293  024142  012737  000007  004656          MOV     #7.,@#TMP5      ;NUMBER OF REGISTERS TO BE TESTED
3294
3295                                          ;*PREPARE TO WRITE HEADER AND DATA CYLINDER 1, TRACK 0, SECTOR 0
3296                                          ;*FILL WRITE FROM BUFFER WITH HEADER
3297
3298  024150                          ST22:
3299
3300                                          ;*FILL WRITE FROM BUFFER WITH DATA
3301                                          ;*FILL COMMAND
3302
3303
3304
3305
3306                                          ;*TIME IS NOT IMPORTANT
3307
3308                                          ;*NOW BRING THE HEADS TO CYLINDER 0
3309
3310
3311
3312
3313
3314
3315                                          ;*PREPARE FOR A READ DATA
3316
3317                                          ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA FROM READ
3318
3319                                          ;*FILL READ INTO BUFFER WITH DATA OTHER THAN WHAT IS EXPECTED
3320                                          ;*FILL READ DATA COMMAND
3321
3322                                          ;*SAVE REGISTERS FOR COMPARISON AFTER ATTEMPTED WRITE
3323                                          ;*INTO A REGISTER WHILE THE READ IS GOING ON
3324
3325
3326
3327
3328  024500  013700  004650          MOV     @#TMP0,R0               ;SET UP R0 FOR WRITE
3329  024504  012730  002006          MOV     #BIT1!BIT2!BIT10,@(R0)+ ;ATTEMPT TO WRITE INTO
3330                                                                  ;REGISTERS DURING IMPLIED SEEK
3331  024510  010037  004650          MOV     R0,@#TMP0               ;SAVE OFF  R0
3332
3333                                          ;*NOW RMP IS SET BUT THE COMPLETION OF READ MUST BE
3334                                          ;*WAITED ON
3335
3336
3337                                          ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE
3338
3339                                          ;*COMPARE REGISTERS BEFORE READ DATA WITH REGISTERS
3340                                          ;*AFTER READ AND ATTEMPTED MODIFICATION OF REGISTER
3341
3342  024666                          2$:
3343  024670  013700  004650          MOV     @#TMP0,R0       ;GET REGISTER BEEING MODIFYED + 2 POINTER
3344  024674  014037  001122          MOV     -(R0),@#$BDADR  ;GET ADDRESS OF REGISTER BEING MODIFYED
3345  024700  104060                  ERROR   60              ;ATTEMPTING TO MODIFY REGISTER
3346  024704  000207                  RTS     PC              ;DURING A READ COMMAND CAUSED
```

```
3347                                                    ;IMPROPER REGISTER CHANGE
3348                                                    ;GOOD DATA GIVES WHAT SHOULD
3349                                                    ;BE THERE
3350                                                    ;RECEIVED DATA GIVES WHAT WAS
3351                                                    ;THERE AFTER READ
3352                                    ;*COMPARE DATA READ
3353  024706                            3$:
3354
3355  024722  104034                    4$:     ERROR   34              ;DATA READ WITH AN ATTEMPTED
3356  024724  000207                            RTS     PC              ;MODIFICATION OF REGISTER
3357                                                                    ;DURING READ CAUSED ERROR
3358  024726  005337  004656            ST23:   DEC     @#TMP5          ;COUNT DOWN
3359  024732  001002                            BNE     1$              ;BRANCH IF 7 NOT DONE
3360  024740  000137  024150            1$:     JMP     @#ST22          ;JUMP TO BEGINING OF TEST
3361
```

```
                                                ;*PREPARE TO WRITE HEADER AND DATA

025000                                  ST24:

                                                ;*FILL WRITE FROM BUFFER WITH HEADER

                                                ;*FILL WRITE FROM BUFFER WITH DATA

                                                ;*FILL WRITE FROM BUFFER WITH NEXT SECTOR HEADER

                                                ;*FILL WRITE FROM BUFFER WITH WITH NEXT SECTOR DATA

                                                ;*NOW THE WRITE HEADER AND DATA COMMAND WILL BE FILLED



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

                                                ;*NOW PREPARE FOR THE WRITE DATA COMMAND

                                                ;*FILL WRITE FROM BUFFER WITH 256 OF 2000 AND 4 OF 2001

                                                ;*FILL WRITE DATA COMMAND

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


025274  013700  004650                  MOV     @#TMP0,R0               ;SET R0 TO REG ADDRESS
025300  012730  002002                  MOV     #BIT1!BIT10,@(R0)+      ;ATTEMPT TO WRITE INTO A REGISTER
                                                                        ;DURING WRITE DATA
025304  010037  004650                  MOV     R0,@#TMP0               ;SAVE OFF NEW REG ADDRESS

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


                                                ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE

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

025462                                  2$:
025464  013700  004650                  MOV     @#TMP0,R0               ;GET REGISTER BEEING MODIFYED + 2 POINTER
025470  014037  001122                  MOV     -(R0),@#$BDADR          ;GET ADDRESS OF REGISTER BEING MODIFYED
025474  104060                          ERROR   60                      ;ATTEMPTING TO MODIFY REGISTER
025500  000207                          RTS     PC                      ;DURING A WRITE COMMAND CAUSED
                                                                        ;IMPROPER REGISTER GIVES WHAT SHOULD
```

```
                                                        ;GOOD DATA GIVES WHAT SHOULD
                                                        ;BE THERE
                                                        ;RECEIVED DATA GIVES WHAT WAS
                                                        ;THERE AFTER REF
                                        ;*CLEAR ALL ERROR FLAGS
025502                          3$:
                                        ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA
                                        ;*NOW THE READ DATA COMMAND WILL BE FILLED
                                        ;*NOW SAVE REGISTERS FOR COMPARISON AFTER READ DATA COMMAND
                                        ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUES
                                        ;*NOW COMPARE REGISTERS BEFORE READ DATA WITH
                                        ;*AFTER COMMAND
025766  104033                  4$:     ERROR   33              ;READ DATA CAUSED IMPROPER REGISTER
025770  000207                          RTS     PC              ;CHANGE
                                                                ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                                                ;RECEIVED DATA GIVES WHAT WAS THERE AFTER COMMAND
                                        ;*NOW READ INTO BUFFER WILL BE CHECKED TO SEE THAT READ
                                        ;*WAS GOOD
025772                          5$:
026010  104034                  6$:     ERROR   34              ;READ DATA ERROR AFTER A WRITE DATA
026012  000207                          RTS     PC              ;WITH REGISTER MODIFICATION
                                                                ;WITHIN THE WRITE DATA
                                        ;*IF ALL 7 REGISTERS NOT COMPLETE THEN REPEAT
026014  005337  004656          ST28:   DEC     @#TMP5          ;COUNT DOWN
026020  001002                          BNE     1$              ;BRANCH IF 7 NOT DONE
026026  000137  025000          1$:     JMP     ST24            ;JUMP TO BEGINING OF TEST
```

```
                                        ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA
                                        ;*FILL READ INTM BUFFER WITH ALL ONES
                                        ;*NOW THE READ DATA COMMAND WILL BE FILLED
                                        ;*NOW SAVE REGISTERS FOR COMPARISON AFTER READ DATA COMMAND


026172  012777  177777  154016          MOV     #-1,@RHAS       ;WRITE INTO RHAS THIS SHOULD
                                                                ;NOT SET RMR

                                        ;*TIME IS NOT IMPORTANT

                                        ;*NOW CHANGE SAVED REGISTERS TO EXPECTED VALUES

                                        ;*NOW COMPARE REGISTERS BEFORE READ DATA WITH
                                        ;*AFTER COMMAND

026350  104033                  1$:    ERROR   33              ;READ DATA CAUSED IMPROPER REGISTER
026352  000207                         RTS     PC              ;CHANGE
                                                                ;GOOD DATA GIVES WHAT SHOULD BE THERE
                                                                ;RECEIVED DATA GIVES WHAT WAS THERE AFTER COMMAND
                                        ;*NOW READ INTO BUFFER WILL BE CHECKED TO SEE THAT READ
                                        ;*WAS GOOD
026354                           2$:

026372  104034                  3$:    ERROR   34              ;READ DATA ERROR AFTER WRITING INTO
026374  000207                         RTS     PC              ;RHAS DURING READ

026376                           4$:
```

```
3490
3491
3492  026416  005737  004640                          TST     @#RH70          ;RH70 CONTROLLER ?
3493  026422  001402                                  BEQ     30$             ;SKIP NEXT IF NOT = 1
3494  026430                                30$:
3495
3496                                                  ;*GENERATE ILLEGAL FUNCTION
3497
3498  026430  005037  001200                          CLR     @#$TMP1         ;GET READY TO MAKE ILLEGAL FUNCTION
3499  026434  012700  002322                1$:       MOV     #FUTABL,R0      ;GET POINTER TO BEGINNING OF COMMANDS
3500  026440  012705  000021                          MOV     #17.,R5         ;COUNTER (17 GOOD FUNCTIONS)
3501  026444  023720  001200                2$:       CMP     @#$TMP1,(R0)+   ;IS THIS A LEGAL FUNCTION
3502  026450  001004                                  BNE     3$              ;BRANCH IF NOT LEGAL
3503  026452  062737  000002  001200                  ADD     #2,@#$TMP1      ;MAKE ANOTHER FUNCTION
3504  026460  000765                                  BR      1$              ;GET READY TO TEST NEW FUNCTION
3505  026462  005305                3$:       DEC     R5              ;NOT LEGAL SO DECREMENT COUNTER
3506  026464  001367                                  BNE     2$              ;BRANCH IF 17 NOT DONE
3507  026466  032737  000100  001200                  BIT     #100,@#$TMP1    ;ALL BITS UP TO BIT #5 COMPARED?
3508  026474  001001                                  BNE     20$             ;BRANCH OUT IF DONE
3509  026476  000402                                  BR      19$             ;BRANCH TO CONTINUE
3510  026500  000137  027224                20$:      JMP     @#7$            ; DONE
3511  026504  013737  001200  002364        19$:      MOV     @#$TMP1,@#ILLEGL ;AN ILLEGAL FUNCTION IS FOUND
3512  026512  062737  000002  001200                  ADD     #2,@#$TMP1      ;GET READY FOR NEW FUNCTION NEXT TIME
3513
3514                                                  ;*ILLEGAL FUNCTION HAS BEEN FOUND
3515                                                  ;*IT IS IN 'ILLEGL'
3516  026520  012737  026526  001110                  MOV     #4$,@#$LPERR    ;ERROR RETURN POINT
3517
3518                                                  ;*SAVE REGISTERS FOR COMPARISON AFTER GO
3519  026526                                4$:
3520  026532  005077  153434                          CLR     @RHWC           ;CLEAR WORD COUNT
3521  026536  005077  153432                          CLR     @RHBA           ;CLEAR BUS ADDRESS
3522  026542  023727  002364  000050                  CMP     @#ILLEGL,#50    ;50 AND HIGHER FUNCTIONS ARE DATA
3523                                                                          ;FUNCTIONS WHICH WILL SET MXF AND TRE
3524  026550  103014                                  BHIS    13$             ;BRANCH IF ILLEGL IS HIGHER THAN 50
3525  026552  012737  100000  027126                  MOV     #SC,@#11$+12    ;EXPECTED VALUE OF RHCS1 SHOULD HAVE
3526                                                                          ;ONLY SC ADDED
3527  026560  005037  027150                          CLR @#12$+12            ;EXPECTED VALUE OF RHCS2 SHOULD HAVE
3528                                                                          ;NOTHING ADDED
3529  026564  005037  027154                          CLR     @#12$+16        ;NO BITS TO BE CLEARED IN RHCS2
3530  026570  005037  027164                          CLR     @#15$+6         ;RHBA SHOULD BE 0
3531  026574  005037  027174                          CLR     @#16$+6         ;CLEAR SAVED RHWC
3532  026600  000500                                  BR      14$             ;BRANCH
3533  026602  022737  000064  002364  13$:           CMP     #64,@#ILLEGL    ;IS FUNCTION 64
3534  026610  001020                                  BNE     17$             ;BRANCH IF NOT
3535  026612  012737  140000  027126                  MOV     #SC!TRE,@#11$+12;SAVED RHCS1 SHOULD HAVE SC AND TRE
3536  026620  012737  000204  027164                  MOV     #204,@#15$+6    ;RHBA SHOULD HAVE 204
3537  026626  012737  000102  027174                  MOV     #102,@#16$+6    ;RHWC SHOULD HAVE 102
3538  026634  012737  001200  027150                  MOV     #MXF!OR,@#12$+12;RHCS2 SHOULD HAVE MXF AND OR
3539  026642  012737  000100  027154                  MOV     #IR,@#12$+16    ;RHCS2 SHOULD HAVE IR CLEARED
3540  026650  000454                                  BR      14$             ;BRANCH
3541  026652  022737  000066  002364  17$:           CMP     #66,@#ILLEGL    ;IS FUNCTION 66
3542  026660  001030                                  BNE     18$             ;BRANCH IF NOT
3543  026662  012777  177672  153302                  MOV     #-70.,@RHWC     ; MOVE 70 INTO RHWC
3544  026670  012777  002370  153276                  MOV     #WRFROM,@RHBA   ;FILL RHBA WITH WRFROM
3545  026676  012737  140000  027126                  MOV     #SC!TRE,@#11$+12;SAVED RHCS1
```

```
3546  026704  012737  002164  027164          MOV     #WRFROM-<66.*2>,15$+6;RHBA
3547  026712  012737  177774  027174          MOV     #-4.,16$+6          ;SAVED RHWC
3548  026720  012737  001200  027150          MOV     #MXF!OR,@#12$+12    ;SAVED RHCS2
3549  026726  005037  027154                  CLR     @#12$+16            ;RHCS2
3550  026732  012737  000100  027154          MOV     #IR,@#12$+16        ;RHCS2 SHOULD HAVE IR CLEARED
3551  026740  000420                          BR      14$                 ;BRANCH
3552  026742  005077  153224          18$:    CLR     @RHWC               ;CLEAR RHWC
3553  026746  005077  153222                  CLR     @RHBA               ;CLEAR RHBA
3554  026752  012737  140000  027126          MOV     #SC!TRE,@#11$+12;RHCS1 SHOULD HAVE SC AND TRE
3555  026760  005037  027164                  CLR     @#15$+6             ;RHBA
3556  026764  005037  027174                  CLR     @#16$+6             ;RHWC
3557  026770  012737  001000  027150          MOV     #MXF,@#12$+12       ;RHCS2
3558  026776  005037  027154                  CLR     @#12$+16            ;RHCS2
3559  027002                          14$:
3560
3561  027026  013746  002364                  MOV     @#ILLEGL,-(SP)  ;GET ILLEGAL FUNCTION
3562  027032  052716  000101                  BIS     #GO!IE,(SP)     ;INCLUDE IE AND GO
3563  027036  012611                          MOV     (SP)+,@R1       ;GO TO RHCS1 WITH ILLEGAL FUNCTION
3564
3565                                          ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE
3566
3567                                          ;*RHCS1 WILL HAVE SC AND TRE ADDED IF FUNCTION IS GREATER THAN 50
3568  027114                          11$:
3569  027130  053737  002364  004520          BIS     @#ILLEGL,@#SAVERE+6;INCLUDE ILLEGAL FUNCTION
3570                                                                      ;IN RHCS1
3571                                          ;*RHCS2 WILL HAVE NOTHING ADDED IF FUNCTION IS LESS THAN 50
3572  027136                          12$:
3573  027156                          15$:
3574  027166                          16$:
3575
3576                                          ;*NOW COMPARE REGISTERS AFTER GIVING AN ILLEGAL COMMAND
3577
3578  027214  104051                  5$:     ERROR   51              ;GIVING ILLEGAL FUNCTION CAUSED
3579  027216  000207                          RTS     PC              ;IMPROPER REGISTER CHANGE
3580                                                                  ;GOOD DATA GIVES WHAT
3581                                                                  ;SHOULD BE THERE
3582                                                                  ;RECEIVED DATA GIVES REGISTER
3583                                                                  ;CONTENTS AFTER ILLEGAL
3584                                                                  ;FUNCTION WA GIVEN
3585  027220  000137  026434          6$:     JMP     @#1$            ;BRANCH FOR NEXT FUNCTION
3586  027224                          7$:
3587
3588  027224                          10$:
3589
3590
3591
3592
```

```
3593
3594
3595                                                ;*THESE ARE REGULAR SETUPS
3596  027244  012777  177374  152720              MOV     #-260.,@RHWC      ;256 DATA WORDS 4 HEADER WORDS
3597  027252  012700  002370                      MOV     #WRFROM,R0        ;THESE TWO INSTRUCTIONS GETS
3598  027256  010077  152712                      MOV     R0,@RHBA          ;ADDR. OF WRFROM BUFFER INTO R0 AND
3599                                                                        ;BUS ADDRESS REGISTER
3600  027262  012710  010000                      MOV     #FMT22,(R0);      ;FORMAT=16 BIT WORDS
3601                                                                        ;CYLINDER=0
3602  027266  012720  000001                      MOV     #1,(R0)+          ;TRACK=0, SECTOR=1, KEYS=0
3603  027272  005020                              CLR     (R0)+             ;KEY1=0
3604  027274  005020                              CLR     (R0)+             ;KEY2=0
3605  027276  012705  000400                      MOV     #256.,R5          ;COUNTER
3606
3607                                                ;*SETUP DATA, WRITE HEADER & DATA, AND FORMAT OF THE WRITE
3608  027302  012720  177777          1$:         MOV     #-1,(R0)+         ;MOVE ALL ONES FOR DATA
3609  027306  005305                              DEC     R5
3610  027310  001374                              BNE     1$                ;BRANCH IF DATA NOT COMPLETE
3611  027312  012777  000001  152664              MOV     #1,@RHDST         ;TRACK=0 SECTOR=1
3612  027332  013711  002344                      MOV     @#WRIFOR,@R1      ;GET READY FOR WRITE HEADER AND
3613                                                                        ;DATA WITH 62 IN RHCS1
3614  027336  005037  004632                      CLR     @#ERFLG$          ;CLEAR ERROR FLAG
3615  027342  012777  010000  152640              MOV     #FMT22,@RHOF      ;FORMAT BIT=1 (16 BIT WORDS)
3616  027350  005077  152636                      CLR     @RHCA             ;CYLINDER =0
3617
3618                                                ;*SAVE REGISTERS FOR COMPARISON AFTER READ
```

```
3619
3620                                        ;*GO TO WRITE HEADER AND DATA
3621                                        ;*BUT BEFORE GO, ONE INDEX PULSE IS GIVEN
3622                                        ;*TO CLEAR OUT THE SECTOR CLOCK COUNTER IN THE RH11
3623                                        ;*SO THAT NO SECTOR PULSES COME DURING THIS TEST
3624
3625  027366  013700  002220                MOV     @#RHMR,R0       ;NOW R0 HAS MAINTENANCE REG. ADDR.
3626  027372  012710  000001                MOV     #DMD,@R0        ;SET DIAGNOSTIC MODE
3627  027376  052710  000004                BIS     #MINX,@R0       ;SET INDEX
3628  027402  042710  000004                BIC     #MINX,@R0       ;CLEAR INDEX THIS GIVES
3629                                                                ;ONE INDEX PULSE
3630
3631  027406  052777  000001  152564        BIS     #GO,@RHCS1      ;ISSUE THE 'GO' BIT TO THE RH11
3632  027414  012737  000113  004642  RUNWAT: MOV     #75.,@#RUNCTR   ;LOAD 'RUN' LINE DELAY COUNTER
3633                                                                ;= APPROX 450 US ON 11/50 CPU WITH CORE
3634                                                                ;AND PROVIDES FOR TIME TO FILL THE SILO
3635  027422  005337  004642          1$:     DEC     @#RUNCTR        ;COUNT DOWN ONCE
3636  027426  001375                        BNE     1$              ;CONTINUE UNTIL = 0
3637
3638                                        ;*ISSUE THE FIRST DIAGNOSTIC INDEX PULSE
3639  027430  052710  000004                BIS     #MINX,@R0       ;SET INDEX PULSE
3640  027434  042710  000004                BIC     #MINX,@R0       ;RESET INDEX
3641
3642                                        ;*SECOND INDEX PULSE
3643  027440  052710  000004                BIS     #MINX,@R0       ;SET INDEX
3644  027444  042710  000004                BIC     #MINX,@R0       ;CLEAR INDEX
3645
3646                                        ;*THIRD INDEX PULSE
3647  027450  052710  000004                BIS     #MINX,@R0       ;SET INDEX
3648  027454  042710  000004                BIC     #MINX,@R0       ;CLEAR INDEX
3649
3650
3651                                        ;*CHANGE SAVED REGISTERS TO EXPECTED VALUE
3652
3653
3654                                        ;*RHWC,RHBA AND OR AND IR BITS OF RHCS2 WILL NOT BE CHECKED
3655  027566  017737  152400  004512        MOV     @RHWC,@#SAVERE  ;SAVED RHWC
3656  027574  017737  152374  004514        MOV     @RHBA,@#SAVERE+2;SAVED RHBA
3657  027602  017746  152370                MOV     @RHCS2,-(SP)    ;GET RHCS2
3658  027606  042716  177477                BIC     #^C<IR!OR>,(SP) ;GET 'IR' & 'OR' STATES
3659  027612  042737  000300  004516        BIC     #IR!OR,@#SAVERE+4;CLEAR 'IR' & 'OR' BITS
3660  027620  052637  004516                BIS     (SP)+,@#SAVERE+4;SET 'OR' & 'IR' AS REQUIRED
3661
3662
3663                                        ;*COMPARE REGISTERS BEFORE WRITE WITH RESULTS AFTER WRITE
3664
3665  027642  104071                  2$:     ERROR   71              ;FORCING OPI CAUSED
3666  027644  000207                        RTS     PC              ;IMPROPER REGISTER CHANGE
3667                                                                ;GOOD DATA GIVES WHAT SHOULD BE THERE
3668                                                                ;RECEIVED DATA GIVES WHAT WAS THERE
3669                                                                ;AFTER 3 INDEX PULSES WERE ISSUED
3670
3671
3672  027646  004737  033066          3$:     JSR     PC,@#CLDISK     ;CLEAR THE 'GO' BIT
```

```
3673
3674  027672  012737  000025  027726          MOV     #21.,@#1$+12    ;SET UP TO START FROM
3675  027700  012737  000025  027742          MOV     #21.,@#2$+6     ;SECTOR 21.
3676  027706  012737  000056  004652          MOV     #46.,@#TMP1     ;46 SECTORS TO COVER 3 TRACKS
3677
3678                                          ;*FILL WRITE FROM BUFFER WITH THE HEADER
3679  027714                          1$:
3680
3681                                          ;*NOW THE WRITE HEADER AND DATA COMMAND WILL BE SETUP
3682  027734                          2$:
3683
3694
3685
3686
3687                                          ;*ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR=760 MICRO SEC
3688
3689                                          ;*NOW ONE MORE SECTOR HAS BEEN WRITTEN
3690                                          ;*'SC' WILL BE CHECKED TO MAKE SURE
3691                                          ;*NO ERRORS OCCURED
3692
3693  030030  017737  152144  002262          MOV     @RHCS1,@#CS1    ;GET RHCS1
3694  030036  032737  100000  002262          BIT     #SC,@#CS1       ;IS 'SC' SET ?
3695  030044  001403                          BEQ     3$              ;BRANCH IF "SPECIAL CONDITION" NOT SET
3696  030046  004737  035010                  JSR     PC,@#PUTREG     ;READ & SAVE  ALL RH11 & RP04 REGISTERS
3697  030052  104072                          ERROR   72              ;THERE WAS AN UNDEFINED ERROR AFTER
3698                                                                  ;A WRITE HEADER AND DATA
3699
3700                                          ;*A SECTOR HAS BEEN FORMATTED NOW,
3701                                          ;*THE HARDWARE WILL BE CLEARED AND
3702                                          ;*CHANGES WILL BE MADE TO FORMAT NEXT SECTOR.
3703
3704  030054                          3$:
3705  030060  013705  027726                  MOV     @#1$+12,R5      ;GET SECTOR TRACK WORD
3706  030064  005205                          INC     R5              ;+ 1
3707  030066  122705  000026                  CMPB    #22.,R5         ;IS IT 22 SECTORS (WHOLE TRACK DONE) ?
3708  030072  001405                          BEQ     4$              ;YES...DO NEXT TRACK
3709  030074  010537  027726                  MOV     R5,@#1$+12      ;NO...RESTORE SECTOR TRACK FOR DATA
3710  030100  010537  027742                  MOV     R5,@#2$+6       ;RESTORE SECTOR TRACK FOR "RUN" ROUTINE
3711  030104  000410                          BR      5$              ;CHECK FOR 46 SECTORS COMPLETED
3712
3713  030106  105037  027726          4$:     CLRB    @#1$+12         ;SET SECTOR = 0 FOR DATA WRITTEN
3714  030112  105237  027727                  INCB    @#1$+13         ;INCR TRACK FOR DATA WRITTEN
3715  030116  105037  027742                  CLRB    @#2$+6          ;SET SECTOR = 0 FOR "RUN" ROUTINE
3716  030122  105237  027743                  INCB    @#2$+7          ;INCR TRACK FOR THE "RUN" ROUTINE
3717
3718  030126  005337  004652          5$:     DEC     @#TMP1          ;ARE 46 SECTORS DONE ?
3719  030132  001270                          BNE     1$              ;CONTINUE FORMATTING IF NOT
3720
3721  030134                          6$:                             ;GO ON TO NEXT TEST IF SO
```

```
                                                ;*FILL WRITE FROM BUFFER WITH HEADER
030176                                  1$:
                                                ;*NOW THE WRITE HEADER AND DATA COMMAND WILL BE FILLED
030216                                  2$:
                                                ;*ONE REVOLUTION=16670 MICRO SEC, ONE SECTOR=760 MICRO SEC
                                                ;*NOW ONE MORE SECTOR HAS BEEN WRITTEN
                                                ;*'SC' WILL BE CHECKED TO MAKE SURE
                                                ;*NO ERRORS OCCURED
030312  017737  151662  002262            MOV     @RHCS1,@#CS1    ;GET RHCS1
030320  032737  100000  002262            BIT     #SC,@#CS1       ;IS 'SC' SET ?
030326  001405                           BEQ     3$              ;BRANCH IF "SPECIAL CONDITION" NOT SET
030330  004737  035010                   JSR     PC,@#PUTREG     ;READ & SAVE  ALL RH11 & RP04 REGISTERS
030334  104072                           ERROR   72              ;THERE WAS AN UNDEFINED ERROR AFTER
                                                                ;A WRITE HEADER AND DATA
                                                                ;GO ON TO NEXT TEST
                                                ;*ONE SECTOR HAS BEEN FORMATTED NOW,
                                                ;*THE HARDWARE WILL BE CLEARED AND
                                                ;*CHANGES WILL BE MADE TO FORMAT NEXT SECTOR.
030342                                  3$:
030346  013705  030210                   MOV     @#1$+12,R5      ;GET SECTOR TRACK WORD
030352  005205                           INC     R5              ;+ 1
030354  122705  000026                   CMPB    #22.,R5         ;IS IT 22 (WHOLE TRACK) ?
030360  001405                           BEQ     4$              ;YES...DO NEXT TRACK
030362  010537  030210                   MOV     R5,@#1$+12      ;NO...RESTORE SECTOR TRACK FOR DATA WRITTEN
030366  010537  030224                   MOV     R5,@#2$+6       ;RESTORE SECTOR TRACK FOR "RUN" ROUTINE
030372  000410                           BR      5$              ;CHECK FOR 46 SECTORS COMPLETED
030374  105037  030210            4$:     CLRB    @#1$+12         ;SET SECTOR = 0 FOR DATA WRITTEN
030400  105237  030211                   INCB    @#1$+13         ;INCR TRACK FOR THE "RUN" ROUTINE
030404  105037  030224                   CLRB    @#2$+6          ;SET SECTOR = 0 FOR DATA WRITTEN
030410  105237  030225                   INCB    @#2$+7          ;INCR TRACK FOR THE "RUN" ROUTINE
030414  005337  004652            5$:     DEC     @#TMP1          ;ARE 46 SECTORS DONE ?
030420  001266                           BNE     1$              ;CONTINUE IF NOT
                                                ;*NOW 46 SECTORS HAVE BEEN FORMATTED
                                                ;*READ HEADER AND DATA FOR 46 SECTORS=11960 WORDS
                                                ;*WITH BUS ADDRESS INHIBITED
```

```
3778
3779
3780                                                ;*FILL READ HEADER AND DATA COMMAND
3781
3782
3783                                                ;*TIME IS NOT IMPORTANT
3784
3785
3786                                                ;*NOW THAT ALL 11960 WORDS HAVE BEEN READ
3787                                                ;*'OPI' WILL BE CHECKED TO BE NOT SET
3788
3789  030522  017737  151454  002264              MOV     @RHER1,@#ER1    ;GET RHER1
3790  030530  032737  020000  002264              BIT     #OPI,@#ER1      ;IS 'OPI' SET ?
3791  030536  001403                              BEQ     6$              ;CHECK 'SC' IF NOT
3792  030540  004737  035010                      JSR     PC,@#PUTREG     ;READ & SAVE ALL RH11 & RP04 REGISTERS
3793  030544  104074                              ERROR   74              ;READ HEADER AND DATA
3794                                                                      ;OVER 3 INDEX PULSES
3795                                                                      ;CAUSED 'OPI' TO SET
3796
3797                                                ;*'SC' WILL BE CHECKED
3798
3799  030546  017737  151426  002262  6$:         MOV     @RHCS1,@#CS1    ;GET RHCS1
3800  030554  032737  100000  002262              BIT     #SC,@#CS1       ;IS 'SC' SET ?
3801  030562  001403                              BEQ     7$              ;CONTINUE TESTING IF NOT
3802  030564  004737  035010                      JSR     PC,@#PUTREG     ;READ & SAVE ALL RH11 & RP04 REGISTERS
3803  030570  104072                              ERROR   72              ;READ HEADER AND DATA
3804                                                                      ;FOR 11960 WORDS, THAT IS OVER THREE
3805                                                                      ;INDEX PULSES, CAUSED AN UNDEFINED ERROR
3806
3807  030572                                7$:                           ;CONTINUE WITH THE NEXT TEST
```

```
3808
3809
3810
3811                                            ;*THE FOLLOWING CLEARS ARE TO INITIALIZE TEST FROM CYLINDER 0
3812  030612  005037  030720                    CLR     @#1$+12         ;START WITH SECTOR/TRACK = 0
3813  030616  005037  030736                    CLR     @#2$+10         ;START WITH DATA = 0
3814  030622  005037  030746                    CLR     @#3$+6          ;START WITH 0 FOR COMMAND
3815
3816  030626  012737  000023  001200            MOV     #19.,@#STMP1    ;19 TRACKS TO BE WRITTEN
3817
3818                                            ;*THIS GETS THE HEADS TO CYLINDER 0
3819
3820
3821
3822
3823
3824
3825
3826                                            ;*FILL WRITE FROM BUFFER WITH HEADER
3827  030706                          1$:
3828
3829                                            ;*FILL WRITE FROM BUFFER WITH DATA
3830  030726                          2$:
3831
3832                                            ;*THE WRITE HEADER AND DATA COMMAND WILL BE FILLED
3833  030740                          3$:
3834
3835
3836
3837
3838                                            ;*ONE REVOLUTION = 16670 MICRO SEC., ONE SECTOR = 760
3839                                            ;*MICRO SEC. MAX TIME ALLOWED = ONE REVOLUTION + HEAD
3840                                            ;*SWITCH + 2 SECTORS, MIN TIME ALLOWED - SECTOR (FIRST CASE)
3841                                            ;*IF THERE IS A FAILURE HERE HALT PROGRAM AFTER ERROR WITH
3842                                            ;*SWITCH 15 AND SEE CURRENT CYLINDER REGISTER TO DETERMINE
3843                                            ;*WHAT CYLINDER IS FAILING
3844
3845
3846                                            ;*NOW SECTOR 0 OF ONE TRACK HAS BEEN WRITTEN CHECK COMPOSIT
3847                                            ;*ERROR BIT TO BE SURE NO ERRORS HAPPENED
3848
3849                                            ;*SAVE REGISTERS IN SAVE TABLE
3850  031030  004737  035010                    JSR     PC,@#PUTREG
3851
3852  031034  032737  040000  002304            BIT     #ERR,@#DS1      ;ANY DISK ERRORS
3853  031042  001004                            BNE     9$              ;BRANCH IF YES
3854  031044  032737  040000  002262            BIT     #TRE,@#CS1      ;ANY RH ERRORS
3855  031052  001401                            BEQ     4$              ;BRANCH IF NO
3856
3857  031054  104066                  9$:       ERROR   66              ;SOME ERRORS OCCURRED
3858                                                                    ;WHILE DOING WRITE HEADER
3859                                                                    ;AND DATA
3860
3861                                            ;*THE FOLLOWING 3 ADDS SETS UP FOR NEXT TRACK WRITING
3862
3863  031056  062737  000400  030720  4$:       ADD     #400,@#1$+12    ;NEXT TRACK FOR HEADER
```

```
3864  031064  062737  000040  030736          ADD     #40,@#2$+10     ;NEXT TRACK FOR DATA
3865  031072  062737  000400  030746          ADD     #400,@#3$+6     ;NEXT TRACK FOR COMMAND
3866
3867  031100  005337  001200                  DEC     @#$TMP1         ;COUNT 19 TRACKS
3868  031104  001300                          BNE     1$
3869
3870                                          ;*THE FOLLOWING CLEARS SETS UP FOR READ HEADER AND DATA
3871  031106  005037  031166                  CLR     @#SST3+12       ;START WITH SECTOR/TRACK = 0
3872  031112  005037  031204                  CLR     @#SST4+10       ;START WITH DATA = 0
3873  031116  005037  031214                  CLR     @#SST5+6        ;START WITH 0 FOR COMMAND
3874
3875
3876                                          ;*SET UP FOR READ HEADER AND DATA
3877  031126  012737  000023  001200  SST1:   MOV     #19.,@#$TMP1    ;19 TRACKS TO BE READ
3878
3879                                          ;*FILL READ INTO BUFFER WITH ALL ONES
3880  031134                          SST2:
3881  031146  013737  031134  001110          MOV     @#SST2,@#$LPERR ;SET LOOP POINT
3882
3883                                          ;*FILL WRITE FROM BUFFER WITH EXPECTED HEADER
3884  031154                          SST3:
3885
3886                                          ;*FILL WRITE FROM BUFFER WITH EXPECTED DATA
3887  031174                          SST4:
3888
3889                                          ;*FILL COMMAND FOR READ HEADER AND DATA
3890  031206                          SST5:
3891
3892
3893
3894
3895
3896                                          ;*NOW SECTOR 0 OF ONE TRACK HAS EEEN READ CHECK COMPOSIT
3897                                          ;*ERROR BIT TO BE SURE NO ERROR HAPPENED
3898
3899                                          ;*SAVE REGISTERS IN SAVE TABLE
3900  031276  004737  035010                  JSR     PC,@#PUTREG
3901
3902  031302  032737  040000  002304          BIT     #ERR,@#DS1      ;ANY DISK ERRORS
3903  031310  001004                          BNE     10$             ;BRANCH IF YES
3904  031312  032737  040000  002262          BIT     #TFE,@#CS1      ;ANY RH ERRORS
3905  031320  001401                          BEQ     11$             ;BRANCH IF NO
3906
3907  031322  104066                  10$:    ERROR   66              ;SOME ERRORS OCCURRED
3908                                                                  ;WHILE DOING READ
3909                                                                  ;HEADER AND DATA
3910
3911                                          ;*NOW THE READ DATA WILL BE COMPARED DATA IN EACH SECTOR
3912                                          ;*IS UNIQUE IF PROGRAM IS HALTED ON ERROR THEN LOOK AT
3913                                          ;*RHDST TO GET WHAT TRACK IS IN ERROR. LOOKING AT THE DATA
3914                                          ;*BITS NO 4,5,6,7,8 IN GOOD DATA ALSO GIVES TRACK NUMBER
3915                                          ;*IN GOOD DATA ALSO GIVES TRACK NUMBER
3916
3917  031324                          11$:
3918
3919                                                                  ;BITS 4,5,6,7,8
```

```
 3920  031342  104067                    12$:    ERROR   67              ;READ HEADER AND DATA
 3921  031344  000207                            RTS     PC              ;ERROR
 3922                                                                    ;HEAD SELECTION ERROR
 3923                                                                    ;DATA READ GIVES NATURE
 3924                                                                    ;OF ERROR
 3925                                                                    ;EXCEPT FOR THE
 3926                                                                    ;FOUR  HEADER WORDS
 3927                                                                    ;THE BITS 4,5,6,7,8
 3928                                                                    ;GIVE THE TRACK NUMBER
 3929
 3930                                            ;*NOW INCREMENT TO READ NEXT TRACK
 3931
 3932  031346  062737  000400  031166  13$:     ADD     #400,@#SST3+12  ;NEXT TRACK FOR HEADER
 3933  031354  062737  000040  031204            ADD     #40,@#SST4+10   ;NEXT TRACK FOR DATA
 3934  031362  062737  000400  031214            ADD     #400,@#SST5+6   ;NEXT TRACK FOR COMMAND
 3935
 3936  031370  005337  001200                    DEC     @#$TMP1         ;COUNT 19 TRACKS
 3937  031374  001001                            BNE     5$
 3938  031400  000137  031134            5$:     JMP     @#SST2          ;JUMP BACK
```

```
3939
3940
3941
3942                                                    ;*SET UP TO INITIALIZE TEST FROM CYLINDER 0, TRACK 0,
3943                                                    ;*SECTOR 0
3944  031436  012737  010000  031550                    MOV     #10000,@#1$+10  ;CYLINDER HEADER DATA
3945  031444  005037  031570                            CLR     @#2$+10         ;DATA
3946  031450  005037  031576                            CLR     @#3$+4          ;CYLINDER COMMAND RHCA
3947
3948                                                    ;*THIS IS TO GET THE HEADS TO CYLINDER ZERO
3949
3950
3951
3952                                                    ;*THE DRIVE TYPE IS CHECKED AND THE APPROPRIATE MAX.
3953                                                    ;*CYLINDER DIFFERENCE IS SET UP
3954
3955  031510  005737  004636                            TST     @#RP06  ;TEST FOR RP06 DRIVE
3956  031514  001404                                    BEQ     14$             ;TREAT UNIT AS AN RP04
3957                                                                            ;TREAT AS AN RP06
3958
3959  031516  012737  001001  001200                    MOV     #513.,@#$TMP1   ;513 CYLINDERS
3960  031524  000403                                    BR      15$             ;CONTINUE
3961
3962  031526  012737  000401  001200  14$:             MOV     #257.,@#$TMP1   ;257 CYLINDERS
3963  031534                          15$:                                      ;CONTINUE WITH TEST
3964
3965
3966                                                    ;*FILL WRITE FROM BUFFER WITH HEADER
3967  031540                          1$:
3968
3969                                                    ;*FILL WRITE FROM BUFFER WITH DATA
3970  031560                          2$:
3971
3972                                                    ;*THE WRITE HEADER AND DATA COMMAND WILL BE LOADED
3973  031572                          3$:
3974
3975
3976
3977
3978                                                    ;*ONE REVOLUTION = 16670 MICRO SECONDS, ONE SECTOR = 760
3979                                                    ;*MICRO SECONDS, ONE SEEK = 7000 MICRO SECONDS.
3980                                                    ;*MAX TIME = 1 REVOLUTION + 1 SEEK + 2 SECTORS
3981                                                    ;*MIN TIME = 1 SECTOR
3982
3983
3984                                                    ;*NOW ONE SECTOR WRITE IS COMPLETE.  CHANGES WILL BE MADE
3985                                                    ;*FOR THE NEXT SECTOR, THEN THE ABOVE WILL BE REPEATED
3986                                                    ;*UNTIL CYLINDER 256./512. IS REACHED
3987  031662  005237  031550                            INC     @#1$+10         ;CYLINDER HEADER DATA
3988  031666  005237  031570                            INC     @#2$+10         ;DATA
3989  031672  005237  031576                            INC     @#3$+4          ;CYLINDER COMMAND (RHCA)
3990  031676  005337  001200                            DEC     @#$TMP1         ;COUNT DOWN FOR 256./512. CYLINDERS
3991  031702  001316                                    BNE     1$              ;DO NEXT WRITE IF 256./512. NOT DONE
3992
3993                                                    ;*NOW ALL 256./512. CYLINDERS HAVE CYLINDER NUMBER WRITTEN
3994                                                    ;*AS DATA ON SECTOR 0, TRACK 0. NOW A RECALIBRATE, FOLLOWED
```

```
 3995                                                ;*BY READ HEADER AND DATA, THEN A CHECK WILL BE DONE ON
 3996                                                ;*CYLINDER 0,1,2,4,8,16,32,64,128,256,512, AND 0
 3997
 3998  031704  013737  031734  001110                MOV     @#4$,@#$LPERR   ;LOOP ON ERROR
 3999  031712  005037  001200                        CLR     @#$TMP1         ;CYLINDER COUNTER
```

```
4000
4001                                            ;*INITIALIZE, RECALIBRATE, AND READ CYLINDERS
4002
4003                                            ;*SETUP FOR CYLINDER 0
4004  031716  012737  010000  032016            MOV     #10000,@#5$+10  ;CYLINDER HEADER (DATA)
4005  031724  005037  032036                    CLR     @#6$+10         ;DATA
4006  031730  005037  032044                    CLR     @#7$+4          ;CYLINDER COMMAND (RHCA)
4007  031734                          4$:
4008
4009
4010
4011                                            ;*CLEAR READ INTO BUFFER WITH ALL ONES
4012
4013                                            ;*FILL WRITE FROM BUFFER WITH EXPECTED HEADER
4014
4015  032006                          5$:
4016  032026                          6$:
4017
4018                                            ;*FILL READ HEADER AND DATA COMMAND
4019  032040                          7$:
4020
4021
4022
4023                                            ;*ONE SECTOR = 760 MICRO SECONDS, ONE REVOLUTION =
4024                                            ;*16670 MICRO SECONDS, MAX SEEK = 52000 MICRO SECONDS
4025                                            ;*MAX TIME = ONE REV + 1 SEEK + 1 SECTOR
4026                                            ;*MIN TIME = 1 SECTOR
4027
4028
4029
4030                                            ;*CHECK READ WORDS AS ALL READ COMMANDS HAVE BEEN CHECKED
4031
4032                                            ;*(DATA ERRORS MAY IMPLY "IMPLIED SEEK" ERRORS)
4033
4034
4035
4036  032146  104070                  8$:     ERROR   70              ;READ HEADER AND DATA ERROR
4037  032150  000207                          RTS     PC              ;DATA GIVES EXPECTED CYLINDER
4038
4039                                            ;*NOW ONE CYLINDER HAS BEEN CHECKED.  CHANGES WILL BE MADE
4040                                            ;*TO READ THE NEXT CYLINDER AND THE ABOVE SECTOR READ WILL BE
4041                                            ;*REPEATED
4042
4043  032152  005737  001200          9$:     TST     @#$TMP1         ;IS IT ZERO ?
4044  032156  001003                          BNE     10$             ;BRANCH IF NOT ZERO
4045  032160  005237  001200                  INC     @#$TMP1         ;ADD ONE IF = 0
4046  032164  000416                          BR      11$             ;PUT ONE IN CYLINDER
4047
4048  032166  005737  004636          10$:    TST     @#RP06  ;TEST FOR RP06 DRIVE
4049  032172  001404                          BEQ     16$             ;TREAT UNIT AS AN RP04
4050                                                                  ;TREAT AS AN RP06
4051
4052  032174  022737  001000  001200          CMP     #512.,@#$TMP1   ;IS IT PASSED 512 CYLINDERS YET ?
4053  032202  000403                          BR      17$             ;CONTINUE
4054  032204  022737  000400  001200  16$:    CMP     #256.,@#$TMP1   ;IS IT PASSED 256 CYLINDERS YET ?
4055  032212                          17$:                            ;CONTINUE
```

```
4056
4057  032212  101421                                  BLOS    12$                 ;YES, SO GO TO ZERO
4058  032214  063737  001200  001200                  ADD     @#$TMP1,@#$TMP1     ;DOUBLE THE CYLINDER
4059  032222  013737  001200  032036  11$:            MOV     @#$TMP1,@#6$+10     ;MAKE CYLINDER ADDRESS THE DATA
4060  032230  013746  001200                          MOV     @#$TMP1,-(SP)       ;GET CYLINDER NUMBER
4061  032234  052716  010000                          BIS     #FMT22,(SP)         ;INCLUDE FORMAT BIT
4062  032240  012637  032016                          MOV     (SP)+,@#5$+10       ;HEADER DATA (CYLINDER)
4063  032244  013737  001200  032044                  MOV     @#$TMP1,@#7$+4      ;CYLINDER COMMAND (RHCA)
4064  032252  000137  031734                          JMP     @#4$                ;RETURN TO RECALIBRATE
4065
4066  032256  005737  004636          12$:            TST     @#RP06  ;TEST FOR RP06 DRIVE
4067  032262  001405                                  BEQ     18$                 ;TREAT UNIT AS AN RP04
4068                                                                              ;TREAT AS AN RP06
4069
4070  032264  022737  002000  001200                  CMP     #1024.,@#$TMP1      ;512 DONE YET ?
4071  032272  000142                                  BEQ     13$                 ;OUT ---------------------------,
4072  032274  000401                                  BR      19$                 ;CONTINUE
4073  032276  022737  001000  001200  18$:            CMP     #512.,@#$TMP1       ;256 DONE YET ?
4074  032304  001414                                  BEQ     13$                 ;OUT ---------------------------,
4075  032306                          19$:                                        ;CONTINUE
4076
4077  032306  063737  001200  001200                  ADD     @#$TMP1,@#$TMP1     ;DOUBLE THE CYLINDER
4078  032314  012737  010000  032016                  MOV     #10000,@#5$+10      ;CYLINDER HEADER DATA
4079  032322  005037  032036                          CLR     @#6$+10             ;DATA
4080  032326  005037  032044                          CLR     @#7$+4              ;CYLINDER COMMAND (RHCA)
4081  032332  000137  031734                          JMP     @#4$                ;RETURN TO THE RECALIBRATE
4082
4083  032336                          13$:                                        ;END OF TEST
```

```
 4084
 4085  032346  012737  000000  177776          MOV     #0,PS                   ;REINSTATE PS TO 0
 4086  032434  013746  004616                  MOV     @#UNIT,-(SP)            ;GET READY TO TYPE UNIT NUMBER
 4087  032440  104405                          TYPDS
 4088  032454  013746  001112                  MOV     @#$ERTTL,-(SP)          ;GET READY TO TYPE NUMBER OF ERRORS
 4089  032460  104405                          TYPDS
 4090  032462  005037  001112                  CLR     @#$ERTTL                ;CLEAR TOTAL NUMBER OF ERRORS
 4091  032466  005037  001102                  CLR     @#$TSTNM                ;CLEAR TEST NUMBER
 4092  032472  005737  004626                  TST     @#SELECT                ;STARTING FROM 200 ?
 4093  032476  001413                          BEQ     3$                      ;TEST NEXT DRIVE IF SO
 4094                                                                          ;CONTINUE TESTING THIS ONE IF NOT
 4095
 4096  032500  005237  001100                  INC     @#$PASS                 ;INCREASE PASS COUNT
 4097  032504  104401  032675                  TYPE    ,$ENDMG                 ;TYPE END PASS #
 4098  032510  013746  001100                  MOV     @#$PASS,-(SP)           ;GET PASS NO.
 4099  032514  104405                          TYPDS                           ;TYPE IT OUT
 4100  032516  104401  032672                  TYPE    ,$ENULL
 4101  032522  000137  007714                  JMP     @#TST4                  ;JUMP TEST 4 ----------------------,
 4102                                                                                                            |
 4103  032526  012737  177777  040742  3$:     MOV     #-1,@#PRITEM            ;CLEAR PREVIOUS ITEM NUMBER     |
 4104  032534  005337  004620                  DEC     @#NOUNITS               ;NO. OF UNITS PRESENT DECREMENTED|
 4105  032540  001413                          BEQ     $EOP                    ;BRANCH IF ALL DRIVES COMPLETE  |
 4106  032542  013700  004616                  MOV     @#UNIT,R0               ;UNIT UNDER TEST                |
 4107  032546  012701  004576                  MOV     #UNITS,R1               ;TABLE                          |
 4108  032552  022100          1$:     CMP     (R1)+,R0                ;IS THIS UNIT JUST TESTED ?             |
 4109  032554  001401                          BEQ     2$                      ;CONTINUE IF YES                |
 4110  032556  000775                          BR      1$                      ;INCREMENT IF NO                |
 4111  032560  011137  004616          2$:     MOV     (R1),@#UNIT             ;THIS IS NEXT UNIT              |
 4112  032564  000137  007714                  JMP     @#TST4                  ;TEST THE NEXT DRIVE ------------
 4113
```

```
4114
4115                                            .SBTTL
4116                                            .SBTTL  ***SUBROUTINES***
4117                                            .SBTTL
4118
4119
4120
4121
4122
```

```
                                        ;THIS FILLS MEMORY WITH GIVEN DATA
                                        ;USED CHIEFLY FOR HEADER INFORMATION
                                        ;CALL IS
                                        ;       JSR     R0,@#FLHEAD     ;FILL HEADER
                                        ;       LOC                     ;LOCATION WHERE SAVED
                                        ;       XN                      ;NUMBER OF WORDS
                                        ;       XD1                     ;DATA REPEATED XN TIMES
                                        ;       XD2                     ;DATA REPEATED XN TIMES
                                        ;
                                        ;
                                        ;
032712                                  FLHEAD:
032716  012001                                  MOV     (R0)+,R1        ;R1 HAS ADDRESS OF WHERE TO SAVE
032720  012002                                  MOV     (R0)+,R2        ;R2 HAS NUMBER OF WORDS
                                                ;*NOW FILL DATA
032722  012021                          1$:     MOV     (R0)+,(R1)+     ;SAVE DATA
032724  005302                                  DEC     R2              ;DECREMENT COUNT
032726  001375                                  BNE     1$              ;BRANCH IF INCOMPLETE
032734  000200                                  RTS     R0


                                        ;THIS CLEARS ANY BLOCK OF MEMORY.
                                        ;FILLING IT WITH ANY DATA
                                        ;CALL IS
                                        ;       JSR     R0,@#CLAREA
                                        ;       F                       ;FROM
                                        ;       N                       ;NUMBER OF WORDS
                                        ;       D                       ;DATA  TO BE FILLED
                                        ;
                                        ;R1 WILL HAVE STARTING ADDRESS OF BLOCK TO BE FILLED
                                        ;R2 WILL HAVE NUMBER OF WORDS
                                        ;R3 WILL HAVE DATA

032736                                  CLAREA:
032744  012001                                  MOV     (R0)+,R1        ;FROM
032746  012002                                  MOV     (R0)+,R2        ;NUMBER
032750  012003                                  MOV     (R0)+,R3        ;DATA
032752  010321                          1$:     MOV     R3,(R1)+        ;MOVE DATA
032754  005302                                  DEC     R2              ;COUNT
032756  001375                                  BNE     1$              ;BRANCH IF NOT COMPLETE
032766  000200                                  RTS     R0              ;RETURN TO MAIN PROGRAM


                                        ;THIS IS A SUBROUTINE TO FILL SAVED REGISTER LOCATION
                                        ;WITH GIVEN VALJE
                                        ;CALL IS
```

```
4179                                    ;       JSR     R0,@#FILLRE
4180                                    ;       RHXX            ;REGISTER NAME
4181                                    ;       D               ;DATA
4182                                    ;
4183
4184  032770                            FILLRE:
4185  032774  012001                            MOV     (R0)+,R1        ;ADDRESS OF ADDRESS OF REGISTER
4186  032776  012002                            MOV     (R0)+,R2        ;DATA
4187  033000  162701  002172                    SUB     #RHWC,R1        ;OFSET
4188  033004  010261  004512                    MOV     R2,SAVERE(R1)   ;DATA IS MOVED IN
4189  033014  000200                            RTS     R0              ;RETURN TO MAIN PROGRAM
4190
4191
4192
```

```
                                        ;THIS SUBROUTINE SETS UP FOR SEARCH
                                        ;CALL IS
                                        ;       JSR     R0,@#SRCH
                                        ;       C                       ;CYLINDER
                                        ;.BYTE  S                       ;SECTOR
                                        ;.BYTE  T                       ;TRACK
                                        ;
033016  012077  147170          SRCH:   MOV     (R0)+,@RHCA     ;SET DESIRED CYLINDER ADDRESS
033022  012077  147156                  MOV     (R0)+,@RHDST    ;SET DESIRED SECTOR/TRACK ADDRESS
033026  013777  002334  147144          MOV     @#SERCH,@RHCS1  ;GET READY FOR SEARCH
                                                                ;WITH 30 IN RHCS1
033034  000200                          RTS     R0


                                        ;THIS SUBROUTINE SETS UP FOR SEEK COMMANDS
                                        ;CALL IS
                                        ;       JSR     R0,@#SEEKCY
                                        ;       C                       ;CYLINDER
                                        ;
033036  012077  147150          SEEKCY: MOV     (R0)+,@RHCA     ;SET DESIRED CYLINDER ADDRESS
033042  013777  002352  147130          MOV     @#SEECOM,@RHCS1 ;MOV 4 INTO RHCS1
033050  000200                          RTS     R0              ;RETURN TO MAIN PROGRAM
```

```
 4221
 4222                                   ;THIS SUBROUTINE SETS UP FOR OFFSET COMMANDS
 4223                                   ;CALL IS
 4224                                   ;       JSR     R0,@#OFSET
 4225                                   ;       0                       ;MICRO INCHES OFFSET
 4226
 4227  033052  052077  147132  OFSET:  BIS     (R0)+,@RHOF     ;SET OFFSET REGISTER
 4228  033056  013777  002354  147114  MOV     @#OFSETC,@RHCS1 ;MOV14 INTO RHCS1
 4229  033064  000200                  RTS     R0              ;RETURN TO MAIN PROGRAM
 4230
 4231
 4232  033066  013701  002200  CLDISK: MOV     @#RHCS1,R1      ;R1 WILL BE CONTROL AND STATUS1
 4233  033072  013702  002176          MOV     @#RHCS2,R2      ;R2 WILL BE CONTROL AND STATUS2
 4234  033076  013703  002222          MOV     @#RHDS1,R3      ;R3 WILL BE DISK STATUS REGISTER1
 4235  033102  013704  002202          MOV     @#RHER1,R4      ;R4 WILL BE ERROR REGISTER #1
 4236
 4237  033106  012712  000040          MOV     #CLR,@R2        ;CLEAR ALL REG.
 4238  033112  013712  004616          MOV     @#UNIT,@R2      ;REINSTATE UNIT NO.
 4239  033116  005011                  CLR     @R1             ;CLEAR FUNCTION BITS
 4240  033120  000207                  RTS     PC
```

```
4241
4242
4243
4244
4245                                    ;THIS CHECKS DEVICE AVAILABLE (DVA) AND READY (RDY) IN RHCS1
4246                                    ;AND CHECKS MEDIUM ON LINE (MOL), DEVICE PRESENT (DPR), DEVICE READY (DRY) IN RHDS1
4247
4248                                    ;IT MAY CHECK VOLUME VALID (VV) IN RHDS1, DEPENDING ON ENTRY POINT
4249
4250
4251  033122  000000                    PCJSR:  0                               ;PC OF JSR
4252
4253  033124  011637  033122            CHECK:  MOV     (SP),@#PCJSR            ;SAVE PC OF JSR+4
4254  033130  162737  000004  033122            SUB     #4,@#PCJSR              ;GET PC OF JSR
4255  033136  011346                            MOV     @R3,-(SP)               ;GET RHDS1
4256  033140  052716  000100                    BIS     #VV,(SP)                ;DONT CHECK VV BIT
4257  033144  000406                            BR      CHECKC                  ;GOTO COMMON CHECK ROUTINE
4258
4259  033146  011637  033122            CHECKT: MOV     (SP),@#PCJSR            ;SAVE PC OF JSR+4
4260  033152  162737  000004  033122            SUB     #4,@#PCJSR              ;GET PC OF JSR
4261  033160  011346                            MOV     @R3,-(SP)               ;GET RHDS1 & DO VV CHECK AT 3$
4262
4263  033162  011146                    CHECKC: MOV     @R1,-(SP)               ;GET CS1
4264  033164  042716  173577                    BIC     #173577,(SP)            ;CLEAR UNWANTED BITS
4265  033170  022726  004200                    CMP     #DVA!RDY,(SP)+          ;RHCS1 SHOULD HAVE DEVICE AVAILABLE
4266                                                                            ;AND BE READY
4267  033174  001403                            BEQ     3$                      ;BRANCH IF GOOD
4268  033176  011137  001122                    MOV     @R1,@#$BDADR            ;BAD DATA REGISTER (RHCS1)
4269  033202  104062                            ERROR   62                      ;RHCS1 DID NOT HAVE DEVICE
4270                                                                            ;AVAILABLE RIGHT AT THE START
4271                                                                            ;ALL OTHER BITS SHOULD BE 0
4272  033204  042716  102000            3$:     BIC     #ATA!LBT,(SP)           ;CLEAR UNWANTED BITS
4273  033210  022726  010700                    CMP     #MOL!DPR!DRY!VV,(SP)+   ;RHDS1 SHOULD HAVE THESE SET
4274  033214  001404                            BEQ     7$                      ;BRANCH IF GOOD
4275  033216  011337  001122                    MOV     @R3,@#$BDADR            ;BAD DATA IN REGISTER (RHDS1)
4276  033222  104061                            ERROR   61                      ;RHDS1 HAS SOME BITS OTHER
4277                                                                            ;THAN MOL, DRY, DPR,VV SET
4278                                                                            ;ALL OTHER BITS SHOULD BE 0
4279  033224  000207                            RTS     PC                      ;RETURN TO TEST AND HALT
4280
4281  033226  062716  000006            7$:     ADD     #6,(SP)                 ;ADJUST STACK TO JUMP OVER HALT IN TEST
4282  033232  000207                            RTS     PC                      ;RETURN TO TEST AND CONTINUE
```

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

033234                          SAVER:
033242  012001                          MOV     (R0)+,R1        ;FROM
033244  012002                          MOV     (R0)+,R2        ;TO
033246  012003                          MOV     (R0)+,R3        ;NUMBER
033250  013122                  1$:     MOV     @(R1)+,(R2)+    ;SAVE REGISTER CONTENTS
033252  005303                          DEC     R3              ;COUNT
033254  001375                          BNE     1$              ;BRANCH IF NOT DONE
033264  000200                          RTS     R0


                                        ;WHEN AN EVENT IS TO BE TIMED THE RP04 VECTORS TO "TIME 1"
                                        ;PRIORITY OF PROCESS OR IS 4
                                        ;PRIORITY OF TRAPS MUST BE 6
                                        ;PRIORITY OF RP04 INTERRUPTS IS 7
                                        ;

033266  005077  146752          TIME1:  CLR     @PCLCSR         ;STOP THE CLOCK
033272  017737  146752  033324          MOV     @PCLCTR,@#WAITTM ;GET TIME ON CLOCK
033300  017737  146730  004564  TIME2:  MOV     @RHCC,@#FINACC  ;GET CURRENT CYLINDER
033306  017737  146724  004562          MOV     @RHLA,@#FINALA  ;GET LOOK AHEAD
033314  000002                          RTI                     ;RETURN TO WAIT P OR WAIT.T


                                        ;THIS IS A WAIT LOOP WHEN AN EVENT IS TO BE TIMED
                                        ;THE CALL IS
                                        ;       WAT
                                        ;       A       ;ABSOLUTE REGISTER ADDRESS
                                        ;       B       ;BIT WAITED FOR
                                        ;       TA      ;TIME ALLOWED GIVEN IN 10 MICROSEC
                                        ;       TC      ;TOLERANCE PLUS/MINUS IN 10 MICROSEC
                                        ;
```

```
                                        ;R1-WILL HAVE TIME ALLOWED IN 10 MICRO SECONDS
                                        ;R2-WILL HAVE TOLERANCE PLUS/MINUS IN 10 MICRO SECONDS
                                        ;MINIMUM TIME THAT CAN BE MEASURED IS ABOUT 12 MICRO SECONDS
                                        ;FOR THE SLOWEST PROCESSOR

033316  000000                  WAITPC: 0                       ;WAT PC
033320  000000                  WAITRE: 0                       ;WAIT ON REGISTER ADDRESS
033322  000000                  WAITBT: 0                       ;WAIT ON BIT
033324  000000                  WAITTM: 0                       ;WAITED TIME
033326  005037  033324          WAIT.P: CLR     @#WAITTM        ;CLEAR WAITED TIME
033332  005077  146710                  CLR     @PCLBUF ;CLEAR COUNT SET BUFFER
033336  012777  000021  146700        MOV     #GO!BIT4,@PCLCSR ;COUNT UP, 100 KHZ, START CLOCK
033354  016600  000010                MOV     10(SP),R0       ;R0 HAS ADDRESS OF NEXT LOCATION
033360  010037  033316                MOV     R0,@#WAITPC     ;NOW WAITPC HAS WAT PC + 2
033364  162737  000002  033316        SUB     #2,@#WAITPC     ;WAT PC IS IN WAITPC
033372  013037  033320                MOV     @(R0)+,@#WAITRE ;WAIT ON REGISTER ADDRESS
033376  012037  033322                MOV     (R0)+,@#WAITBT  ;WAIT ON BIT
033402  012001                        MOV     (R0)+,R1        ;R1 HAS TIME IN 10 MSEC
033404  012002                        MOV     (R0)+,R2        ;R2 HAS TOLERANCE IN 10 MSEC
033406  010066  000010                MOV     R0,10(SP)       ;RESTORE RETURN ON STACK

                                        ;*THIS SECTION WAITS FOR BIT, THROUGH TWO COUNT DOWNS

033412  013703  033564                MOV     @#TIMCNT,R3     ;R3 IS A TEMPORARY COUNTER
033416  033777  033322  177674  1$:   BIT     @#WAITBT,@WAITRE ;IS REQUIRED BIT THERE
033424  001025                        BNE     4$              ;BRANCH IF YES
033426  005303                        DEC     R3              ;COUNT IF REQUIRED BIT NOT THERE
033430  001372                        BNE     1$
033432  013703  033564                MOV     @#TIMCNT,R3     ;TEMPORARY COUNTER
033436  033777  033322  177654  2$:   BIT     @#WAITBT,@WAITRE ;IS REQUIRED BIT THERE
033444  001015                        BNE     4$              ;BRANCH IF YES
033446  005303                        DEC     R3              ;COUNT IF REQUIRED BIT NOT THERE
033450  001372                        BNE     2$
033452  017737  177642  001126        MOV     @WAITRE,@#$BDDAT ;REGISTER CONTENTS FOR TYPEOUT
033460  032777  000100  146512        BIT     #IE,@RHCS1      ;DID ANY INTERRUPT OCCUR
033466  001402                        BEQ     3$              ;BRANCH IF YES
033470  104001                        ERROR   1               ;RP04 DID NOT INTERRUPT
033472  000427                        BR      7$              ;OUT
033474  104002                  3$:   ERROR   2               ;RP04 INTERRUPTED BUT WAITED
                                                              ;ON BIT DID NOT OCCUR
                                                              ;EVEN AFTER TWO COUNT DOWNS
                                                              ;FROM 177777 TO 0
033476  000425                        BR      7$              ;OUT

                                        ;*NOW TIME AND TOLERANCE WILL BE CHECKED
033500  017737  177614  001126  4$:   MOV     @WAITRE,@#$BDDAT ;REGISTER CONTENTS FOR TYPEOUT
033506  032777  000100  146464        BIT     #IE,@RHCS1      ;DID ANY INTERRUPT OCCUR
033514  001402                        BEQ     5$              ;BRANCH IF YES
033516  104003                        ERROR   3               ;INTERRUPT DID NOT OCCUR EVEN
                                                              ;AFTER ONE BNE AND ONE MOV
                                                              ;OF THE WAITED ON BIT SETTING
033520  000414                        BR      7$              ;OUT
033522  160201                  5$:   SUB     R2,R1           ;R1 NOW HAS LOWER LIMIT OF TIME
033524  023701  033324                CMP     @#WAITTM,R1     ;FOR GOOD RESULTS, WAITTM
                                                              ;MUST BE GREATER OR EQUAL
                                                              ;TORI
```

```
4395  033530  103002                          BHIS    6$              ;BRANCH IF GOOD
4396  033532  104004                          ERROR   4               ;BIT DID OCCUR BUT TIME
4397                                                                  ;TAKEN IS BELOW LOWER LIMIT
4398  033534  000406                          BR      7$              ;OUT
4399
4400  033536  060202                  6$:     ADD     R2,R2           ;DOUBLE TOLERANCE
4401  033540  060201                          ADD     R2,R1           ;R1 NOW HAS UPPER LIMIT OF TIME
4402  033542  020137  033324                  CMP     R1,@#WAITTM     ;FOR GOOD RESULTS, WAITTM
4403                                                                  ;MUST BE LESS OR EQUAL TO R1
4404  033546  103001                          BHIS    7$              ;BRANCH IF GOOD
4405  033550  104004                          ERROR   4               ;BIT DID OCCUR BUT TIME TAKEN
4406                                                                  ;IS ABOVE UPPER LIMIT
4407  033552                          7$:
4408  033562  000002                          RTI                     ;RETURN TO MAIN TEST
4409
4410
4411
4412
4413
4414
4415                                  ;THIS IS A WAIT LOOP WHEN NO P-CLOCK IS AVAILABLE
4416                                  ;NO TIMING IS DONE
4417                                  ;CALL IS
4418                                  ;       WAT
4419                                  ;       A       ;ABSOLUTE REGISTER ADDRESS
4420                                  ;       B       ;BIT WAITED FOR
4421                                  ;       TA      ;TIME-NOT USED HERE
4422                                  ;       TO      ;TIME-NOT USED HERE
4423                                  ;R3-IS A TEMPORARY COUNTER
4424
4425  033564  177777                  TIMCNT: 177777                  ;COUNT FOR WAIT LOOP
4426  033566  000025                  RPTCTR: 25                      ;COUNT FOR INTERRUPT WAIT (11/70 CPU)
4427
4428
4429  033570                          WAIT.T:
4430
4431  033574  016600  000004                  MOV     4(SP),R0        ;R0 HAS ADDRESS OF NEXT LOCATION
4432  033600  010037  033316                  MOV     R0,@#WAITPC     ;WAT PC +2 IS IN WAITPC
4433  033604  162737  000002  033316          SUB     #2,@#WAITPC     ;WAT PC IS IN .-ITPC
4434  033612  013037  033320                  MOV     @(R0)+,@#WAITRE ;WAIT ON REGISTER ADDRESS
4435  033616  012037  033322                  MOV     (R0)+,@#WAITBT  ;WAIT ON BIT
4436  033622  022020                          CMP     (R0)+,(R0)+     ;DUMP NEXT TWO WORDS-TA, TO
4437  033624  010066  000004                  MOV     R0,4(SP)        ;RESTORE RETURN ON STACK
4438
4439                                  ;*THIS HAS THE TWO COUNT DOWNS FROM 177777
4440
4441  033630  013703  033564                  MOV     @#TIMCNT,R3     ;R3 HAS TEMPORARY COUNT
4442  033634  033777  033322  177456  1$:     BIT     @#WAITBT,@WAITRE ;IS REQUIRED BIT THERE ?
4443  033642  001025                          BNE     4$              ;CHECK FOR THE INTERRUPT
4444  033644  005303                          DEC     R3              ;COUNT IF REQUIRED BIT NOT THERE
4445  033646  001372                          BNE     1$
4446  033650  013703  033564                  MOV     @#TIMCNT,R3     ;SECOND COUNT DOWN FROM 177777
4447  033654  033777  033322  177436  2$:     BIT     @#WAITBT,@WAITRE ;IS REQUIRED BIT THERE ?
4448  033662  001015                          BNE     4$              ;CHECK FOR INTERRUPT
4449  033664  005303                          DEC     R3              ;COUNT IF REQUIRED BIT NOT THERE
4450  033666  001372                          BNE     2$
```

```
4451  033670  017737  177424  001126          MOV     @WAITRE,@#$BDDAT ;REGISTER CONTENTS FOR TYPEOUT
4452  033676  032777  000100  146274          BIT     #IE,@RHCS1       ;DID ANY INTERRUPT OCCUR ?
4453  033704  001402                          BEQ     3$               ;BRANCH IF YES
4454
4455  033706  104001                          ERROR   1                ;RP04 DID NOT INTERRUPT
4456                                                                   ;BIT DID NOT OCCUR
4457  033710  000417                          BR      5$               ;OUT ------------------------------>
4458
4459  033712  104002                  3$:     ERROR   2                ;RP04 INTERRUPTED BUT
4460                                                                   ;WAITED ON BIT DID NOT OCCUR
4461                                                                   ;EVEN AFTER TWO COUNT DOWNS
4462                                                                   ;FROM 177777 TO 0
4463  033714  000415                          BR      5$               ;OUT ------------------------------>
4464
4465                                          ;*BIT DID SET SO CHECK IF INTERRUPT OCCURRED
4466
4467                                          ;*THE AMOUNT OF TIME ALLOWED CAN BE CHANGED BY ALTERING LOCATION
4468                                          ;*"RPTCTR" ABOVE
4469
4470  033716  013703  033566          4$:     MOV     @#RPTCTR,R3      ;LOAD COUNTER WITH COUNT
4471  033722  005303                  6$:     DEC     R3               ;COUNT DOWN ONE
4472  033724  001376                          BNE     6$               ;DO AGAIN IF NOT ZERO YET
4473
4474
4475  033726  032777  000100  146244          BIT     #IE,@RHCS1       ;DID ANY INTERRUPT OCCUR ?
4476  033734  001405                          BEQ     5$               ;BRANCH IF YES
4477  033736  017737  177356  001126          MOV     @WAITRE,@#$BDDAT ;REGISTER CONTENTS FOR TYPEOUT
4478  033744  104003                          ERROR   3                ;INTERRUPT DID NOT OCCUR
4479                                                                   ;EVEN AFTER ONE BNE OF
4480                                                                   ;THE WAITED ON BIT OCCURING
4481  033746  000400                          BR      5$               ;OUT ------------------------------>
4482
4483  033750                          5$:
4484  033754  000002                          RTI                      ;RETURN TO MAIN TEST
4485
```

```
4486
4487                                    ;THIS CHANGES REGISTER SAVED VALUE
4488                                    ;CALL IS
4489                                    ;       JSR     R0,@#CHREG
4490                                    ;       R                       ;REGISTER TO BE CHANGED
4491                                    ;       N                       ;NUMBER OF BITS TO BE CHANGED
4492                                    ;       NEW                     ;NEW VALUE OF BIT MUST BE 0 OR1
4493                                    ;       P                       ;POSITION OF BIT TO BE CHANGED
4494                                    ;NEW AND P WILL BE REPEATED N NUMBER OF TIMES
4495
4496  033756                            CHREG:
4497  033762  012001                            MOV     (R0)+,R1        ;R1 HAS ADDRESS OF ADDRESS OF REGISTER
4498  033764  012002                            MOV     (R0)+,R2        ;R2 HAS NUMBER OF CHANGES
4499  033766  162701  002172                    SUB     #RHWC,R1        ;R1 HAS OFSET OF REQUIRED REGISTER
4500  033772  005720                    1$:     TST     (R0)+           ;IS A BIC OR A BIS TO BE DONE
4501  033774  001403                            BEQ     2$              ;BRANCH IF A BIC IS REQUIRED
4502  033776  052061  004512                    BIS     (R0)+,SAVERE(R1) ;SET REQUIRED BIT
4503  034002  000402                            BR      3$              ;BRANCH TO DECREMENT COUNT
4504  034004  042061  004512            2$:     BIC     (R0)+,SAVERE(R1) ;CLEAR REQUIRED BIT
4505  034010  005302                    3$:     DEC     R2              ;DECREMENT NUMBER OF CHANGES
4506  034012  001367                            BNE     1$              ;BRANCH IF NOT COMPLETE
4507  034020  000200                            RTS     R0              ;RETURN TO MAIN PROGRAM
4508
4509
4510
4511
4512
4513
4514                                    ;THIS FILLS A BLOCK WITH INCREMENTAL DATA
4515                                    ;CALL IS
4516                                    ;       JSR     R0,@#FILL
4517                                    ;       F                       ;FROM
4518                                    ;       N                       ;NUMBER OF WORDS
4519                                    ;       S                       ;STARTING VALUE OF DATA
4520                                    ;       I                       ;INCREMENT DATA BY
4521
4522  034022                            FILL:
4523  034032  012001                            MOV     (R0)+,R1        ;R1 HAS ADDRESS WHERE DATA IS TO GO
4524  034034  012002                            MOV     (R0)+,R2        ;R2 HAS NUMBER OF WORDS TO BE FILLED
4525  034036  012003                            MOV     (R0)+,R3        ;STARTING VALUE OF DATA
4526  034040  012004                            MOV     (R0)+,R4        ;R4 HAS INCREMENT
4527
4528                                            ;*NOW DATA WILL BE FILLED
4529  034042  010321                    1$:     MOV     R3,(R1)+        ;FILL DATA
4530  034044  060403                            ADD     R4,R3           ;GET NEXT VALUE OF DATA
4531  034046  005302                            DEC     R2              ;DECREMENT COUNT
4532  034050  001374                            BNE     1$              ;BRANCH IF ALL NOT DONE
4533  034062  000200                            RTS     R0              ;RETURN TO MAIN PROGRAM
4534
4535
4536
4537
4538
4539
4540                                    ;THIS IS A SUBROUTINE TO COMPARE REGISTERS
4541                                    ;GOOD DATA IS ALREADY SAVED IN 'SAVERE'
```

```
                                       ;TEST DATA IS IN THE REGISTERS
                                       ;CALL IS
                                       ;       JSR     R0,@#COMREG
                                       ;       SAVERE                  ;GOOD DATA
                                       ;       RHCS1                   ;ADDRESS OF ADDRESS TEST DATA
                                       ;       N.                      ;RETURN FOR ERROR
                                       ;       RG                      ;RETURN FOR GOOD COMPARISON
                                       ;ON RETURN WITH ERROR '$GDDAT' HAS GOOD DATA, '$BDDAT' HAS BAD DATA
                                       ;'REGADR' HAS REGISTER ADDRESS

034064                                 COMREG:
034076  012001                                 MOV     (R0)+,R1        ;R1 HAS ADDRESS OF GOOD DATA
034100  012002                                 MOV     (R0)+,R2        ;R2 HAS ADDRESS OF ADDRESS OF TEST DATA
034102  012003                                 MOV     (R0)+,R3        ;R3 HAS NUMBER OF WORDS
034104  012004                                 MOV     (R0)+,R4        ;R4 HAS RETURN FOR ERROR
034106  011000                                 MOV     (R0),R0         ;R0 HAS RETURN ON NO ERROR
                                               ;*NOW SAVE REGISTERS
034110  004737  035010                         JSR     PC,@#PUTREG     ;SAVE REGISTERS
034114  113737  004537  002301                 MOVB    @#SAVERE+25,@#AS+1;MAKE UPPER BYTE OF RHAS SAME
034122  012705  177776                         MOV     #-2,R5          ;PRESET R5 TO -2
                                               ;*NOW COMPARES WILL MADE
034126  062705  000002                 1$:     ADD     #2,R5           ;INCREMENT TO INDEX
034132  022122                               CMP     (R1)+,(R2)+     ;COMPARE REGISTER CONTENTS
034134  001420                               BEQ     2$              ;BRANCH IF GOOD
034136  014137  001124                       MOV     -(R1),@#$GDDAT  ;SAVE GOOD DATA
034142  014237  001126                       MOV     -(R2),@#$BDDAT  ;SAVE BAD DATA
034146  016537  002172  004500               MOV     RHWC(R5),@#REGADR       ;SAVE ADDRESS OF FAILING REGISTER
034154  004714                               JSR     PC,@R4          ;RETURN TO MAIN PROGRAM
                                                                       ;TO PRINT ERROR
034156  022122                               CMP     (R1)+,(R2)+     ;UNDO -(R1) AND -(R2) FOR ERRORS
034160  017746  144754                       MOV     @SWR,-(SP)      ;GET SWITCH SETTING
034164  042716  177177                       BIC     #^C600,(SP)     ;KEEP ONLY SWITCH 7 AND 8
034170  022726  000200                       CMP     #SW07,(SP)+     ;IS 7 SET AND 8 DOWN
034174  001402                               BEQ     3$              ;BRANCH OUT IF YES
034176  005303                         2$:   DEC     R3              ;ARE ALL COMPARES DONE
034200  001352                               BNE     1$              ;BRANCH IF NOT COMPLETE

034202                                 3$:
034214  000200                               RTS     R0              ;RETURN TO MAIN PROGRAM
034216  000000                         4$:   .WORD   0               ;TEMP STORAGE
```

```
                                        ;HERE IS A DETAILED EXPLAINATION OF HOW THE LOOP ON ERROR WORKS.
                                        ;ON HITTING AN ERROR IF THE LOOP ON ERROR SWITCH IS SET, THE
                                        ;PROGRAM GOES BACK - USUALLY BACK TO THE BEGINNING OF THE TEST.

                                        ;WHEN THIS OPERATOR SELECTABLE SCOPE LOOP IS USED THEN THE POINT
                                        ;THE PROGRAM GOES BACK TO CAN BE CHANGED.
                                        ;THE RESTRICTIONS TO THE POINT WHERE THE PROGRAM CAN GO ARE: -
                                        ;1.  IT MUST BE WITHIN THE TEST UNDER CONSIDERATION
                                        ;2.  LOOP ON ERROR SWITCH MUST BE SET
                                        ;3.  THE ERROR MUST OCCUR WITHIN THE TEST UNDER CONSIDERATION
                                        ;IF THE ERROR DOES NOT OCCUR WITHIN THE TEST UNDER CONSIDERATION
                                        ;THE PROGRAM WILL REVERT TO NORMAL OPERATION.  HOWEVER, IF LOOP ON
                                        ;TEST SWITCH IS SET AND THIS OPERATOR SELECTABLE SCOPE LOOP IS USED
                                        ;THEN THE PROGRAM WILL LOOP BACK TO THE SELECTED POINT WHEN IT
                                        ;COMES TO THE END OF THE TEST UNDER CONSIDERATION.
                                        ;
                                        ;AFTER LOOPING FOR SOME TIME IF THE LOOP SWITCH IS PUT DOWN THEN
                                        ;NORMAL OPERATION WILL CONTINUE.

034220  000000                  TESTAD: 0                               ;FIRST ADDRESS OF TEST
034222                          OPERSEL:
034222  005037  177776                  CLR     PS                      ;MAKE PROCESSOR STATUS ZERO
034226  012737  177777  040742          MOV     #-1,@#PRITEM            ;CLEAR PREVIOUS ITEM NUMBER
034304  013746  004504                  MOV     @#TSTNM,-(SP)           ;GET READY TO TYPE TEST
034310  104402                          TYPOC                           ;NUMBER
034350  013746  001110                  MOV     @#$LPERR,-(SP)          ;GET READY TO TYPE LOOP BACK PC
034354  104402                          TYPOC
034356  104401  001223                  TYPE    ,$CRLF
034610  104412                          RDOCT
034612  062716  000002                  ADD     #2,(SP)                 ;GET LPADR
034616  012637  001106                  MOV     (SP)+,@#$LPADR
034774  104412                          RDOCT
034776  012637  001110                  MOV     (SP)+,@#$LPERR          ;GET LPERR
035002  013746  001106                  MOV     @#$LPADR,-(SP)
035006  000002                          RTI


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


035010                          PUTREG:
035016  012700  002172                  MOV     #RHWC,R0                ;STARTING ADDRESS OF REGISTERS
035022  012701  002254                  MOV     #WC,R1                  ;STARTING ADDRESS OF SAVING LOCATIONS
035026  012702  000022                  MOV     #RHCC-RHWC+2/2,R2       ;NUMBER OF REG. INTO R2
```

```
 4638  035032  013021                  10$:    MOV     @(R0)+,(R1)+    ;SAVE HARDWARE REG.
 4639  035034  005302                          DEC     R2
 4640  035036  001375                          BNE     10$
 4641  035046  000207                          RTS     PC
```

```
                                ;THIS IS A DATA  COMMAND SETUP SUBROUTINE
                                ;THE CALL IS
                                ;       JSR     R0,@#RUN
                                ;       C                       ;CYLINDER
                                ;.BYTE  S                       ;SECTOR
                                ;.BYTE  T                       ;TRACK
                                ;       -W                      ;WORD COUNT
                                ;       B                       ;BUS ADDRESS
                                ;       BAI                     ;BUS ADDRESS INHIBIT
                                ;       FMT22!ECI!HCI           ;FMT22=1 =16 BIT WORDS
                                ;                               ;ECI = ECC CORRECTION INHIBIT
                                ;                               ;HCI = HEADER COMPARE INHIBIT
                                ;       COM                     ;COMMAND ADDRESS
035050  012077  145136          RUN:    MOV     (R0)+,@RHCA     ;CYLINDER
035054  012077  145124                  MOV     (R0)+,@RHDST    ;DESIRED SECTOR/TRACK
035060  012077  145106                  MOV     (R0)+,@RHWC     ;WORD COUNT
035064  012077  145104                  MOV     (R0)+,@RHBA     ;BUS ADDRESS
035070  013746  004616                  MOV     @#UNIT,-(SP)    ;GET UNIT NO
035074  052016                          BIS     (R0)+,(SP)      ;SET BUS ADDRESS INHIBIT
035076  012677  145074                  MOV     (SP)+,@RHCS2    ;UNIT NO AND BAI TO RHCS2
035102  012077  145102                  MOV     (R0)+,@RHOF     ;FORMAT, ECC INHIBIT, HEADER
                                                                ;COMPARE, IF THERE
035106  013077  145066                  MOV     @(R0)+,@RHCS1   ;COMMAND IN RHCS1
035112  000200                          RTS     R0              ;RETURN TO MAIN PROGRAM



                                ;THIS IS A SUBROUTINE TO COMPARE TWO BLOCKS IN MEMORY
                                ;R1 HAS GOOD DATA BUFFER ADDRESS
                                ;R2 HAS TEST DATA BUFFER ADDRESS
                                ;R5 HAS ADDRESS OF RETURN ON ERROR
                                ;R3 HAS NUMBER OF WORDS TO BE COMPARED
                                ;R4 HAS ONE MORE THAN NUMBER OF WORDS TO BE COMPARED
                                ;CALL IS
                                ;       JSR     R0,@#COMPAR
                                ;       G                       ;ADDRESS OF GOOD DATA
                                ;       T                       ;ADDRESS OF TEST DATA
                                ;       N                       ;NUMBER OF WORDS TO BE COMPARED
                                ;       RE                      ;RETURN ON ERROR
                                ;       RG                      ;RETURN ON NO ERROR



035114                          COMPAR:
035126  012001                          MOV     (R0)+,R1        ;ADDRESS OF GOOD DATA BUFFER
035130  012002                          MOV     (R0)+,R2        ;ADDRESS OF TEST DATA BUFFER
035132  012003                          MOV     (R0)+,R3        ;NO OF WORDS TO BE COMPARED
035134  012005                          MOV     (R0)+,R5        ;RETURN ON ERROR
035136  011000                          MOV     (R0),R0         ;RETURN ON NO ERROR
035140  010304                          MOV     R3,R4           ;NO OF WORDS TO BE COMPARED
035142  005204                          INC     R4
035144  010437  004502          1$:     MOV     R4,@#ERWORD     ;FOR ERROR WORD NO
035150  022122                          CMP     (R1)+,(R2)+     ;COMPARE GOOD WITH TEST DATA
035152  001417                          BEQ     2$              ;BRANCH IF GOOD
```

```
 4698  035154  014137  001124                  MOV     -(R1),@#$GDDAT  ;GOOD DATA
 4699  035160  014237  001126                  MOV     -(R2),@#$BDDAT  ;BAD DATA
 4700  035164  160337  004502                  SUB     R3,@#ERWORD     ;ERROR WORD NO.
 4701  035170  004715                          JSR     PC,@R5  ;RETURN TO PRINT ERROR
 4702  035172  022122                          CMP     (R1)+,(R2)+     ;UNDO -(R1) AND -(R2) FOR ERRORS
 4703  035174  017746  143740                  MOV     @SWR,-(SP)      ;GET SWITCH SETTING
 4704  035200  042716  177177                  BIC     #^C600,(SP)     ;KEEP ONLY SWITCH 7 AND 8
 4705  035204  022726  000200                  CMP     #SW07,(SP)+     ;IS 7 SET AND 8 RESET
 4706  035210  001402                          BEQ     3$              ;BRANCH OUT IF YES
 4707  035212  005303                  2$:     DEC     R3              ;COUNT
 4708  035214  001353                          BNE     1$              ;BRANCH IF ALL NOT DEVICE
 4709  035216                          3$:
 4710  035230  000200                          RTS     R0              ;RETURN TO MAIN PROGRAM
 4711                                  ;*      THIS ROUTINE WILL ALLOW THE CHANGE OF THE BASE
 4712                                  ;*      ADDRESS FROM 176700 TO ANY TYPED VALUE
 4713
 4714  035232                          BASECH:
 4715  035312  013746  002200                  MOV     @#RHCS1,-(SP)   ;GET READY TO TYPE OLD BASE
 4716  035316  104402                          TYPOC
 4717  035400  004737  037334                  JSR     PC,@#$TKINT     ;INITIALIZE THE TTY KEYBOARD
 4718  035404  104412                          RDOCT
 4719  035406  012700  002170                  MOV     #RHDB,R0        ;GET STARTING ADDRESS OF REGISTERS
 4720  035412  012701  000026                  MOV     #22.,R1         ;NUMBER OF REGISTERS
 4721  035416  012737  036222  000004          MOV     #ADTIMO,@#4     ;SET UP TRAP CATCHER FOR TEST
 4722  035424  021637  002200                  CMP     @SP,@#RHCS1     ;NEW ADDRESS
 4723  035430  001407                          BEQ     1$              ;NO, JUST OLD ONE RETYPED
 4724  035432  005776  000000                  TST     @0(SP)          ;DO THE ADDRESS ACCESS
 4725  035436  163716  002200                  SUB     @#RHCS1,@SP     ;GET THE ADDRESS OFFSET
 4726  035442  061620                  2$:     ADD     @SP,(R0)+       ;AND PLUG IT IN
 4727  035444  005301                          DEC     R1              ;ONE LESS REGISTER TO DO
 4728  035446  001375                          BNE     2$              ;BUT WE'RE NOT DONE YET!
 4729  035450                          1$:
 4730  035514  013746  002166                  MOV     @#RPVEC,-(SP)   ;GET READY TO TYPE OLD VECTOR ADDRESS
 4731  035520  104402                          TYPOC
 4732  035626  104412                          RDOCT
 4733  035630  012637  002166                  MOV     (SP)+,@#RPVEC   ;SETUP VECTOR ADDRESS
 4734  035700  013746  002200                  MOV     @#RHCS1,-(SP)
 4735  035704  104402                          TYPOC
 4736  035752  013746  002166                  MOV     @#RPVEC,-(SP)
 4737  035756  104402                          TYPOC
 4738  036176  012746  000200                  MOV     #RA,-(SP)
 4739  036202  104402                          TYPOC
 4740  036216  000137  004710                  JMP     @#BEGIN         ;DO IT OVER AGAIN
 4741  036222                          ADTIMO:
 4742  036300  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
 4743  036302  000137  035232                  JMP     @#BASECH        ;AND DO THE QUERY AGAIN!
 4744
```

```
                                       RPVECT:
4745  036306
4746  036364  104402                           TYPOC                          ;TYPE FROM PC
4747  036366  012777  036306  143572           MOV     #RPVECT,@RPVEC         ;RESTORE TRAP RP04 VECTOR
4748  036374  000000                           HALT                           ;CHANGE TO CONTINUE
4749
4750
```

```
                                .SBTTL  SYSMAC LIBRARY ROUTINES
```

```
4754                                                    ;FROM THE TTY
```

```
                                        ;;*****************************************************************
                                        .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

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

040742  000000          PRITEM: 0                       ;PREVIOUS ITEM NO. LOCATION

040744  017746  140170  $ERRTYP: MOV     @SWR,-(SP)      ;GET SWITCH SETTING
040750  042716  177277          BIC     #^C500,(SP)     ;KEEP ONLY SWITCH 8 AND 6
040754  022726  000100          CMP     #SW06,(SP)+     ;IS 6 SET AND 8 RESET
040760  001001                  BNE     1$              ;IF NOT BRANCH
040762  000402                  BR      2$              ;BRANCH IF SW 6 IS SET AND 8 RESET
040764  000137  041704  1$:     JMP     @#TYPERR        ;JUMP IF SW 8 IS SET
                                                        ;OR IF SW 8 IS RESET AND SW 6 IS RESET
040770                  2$:
041700  005037  040742          CLR     @#PRITEM        ;CLEAR PREVIOUS ERROR ITEM

041704                  TYPERR:
041704  104401  001223          TYPE    ,$CRLF          ;"CARRIAGE RETURN" & "LINE FEED"
041710  010046                  MOV     R0,-(SP)        ;SAVE R0
041712  005000                  CLR     R0              ;PICKUP THE ITEM INDEX
041714  153700  001114          BISB    @#$ITEMB,R0
041720  001004                  BNE     1$              ;IF ITEM NUMBER IS ZERO, JUST
                                                        ;TYPE THE PC OF THE ERROR
041722  013746  001116          MOV     $ERRPC,-(SP)    ;SAVE $ERRPC FOR TYPEOUT
                                                        ;ERROR ADDRESS
041726  104402                  TYPOC                   ;GO TYPE--OCTAL ASCII(ALL DIGITS)
041730  000454                  BR      10$             ;GET OUT
041732  005300          1$:     DEC     R0              ;ADJUST THE INDEX SO THAT IT WILL
041734  006300                  ASL     R0              ;       WORK FOR THE ERROR TABLE
041736  006300                  ASL     R0
041740  006300                  ASL     R0
041742  062700  001226          ADD     #$ERRTB,R0      ;FORM TABLE POINTER
041746  020037  040742          CMP     R0,@#PRITEM     ;WAS PREVIOUS ERROR SAME
041752  001002                  BNE     13$             ;BRANCH IF NOT
041754  022020                  CMP     (R0)+,(R0)+     ;POP R0 OVER EM AND DH
041756  000420                  BR      5$
041760  010037  040742  13$:    MOV     R0,@#PRITEM     ;SAVE NEW ERROR ITEM
041764  012037  041774          MOV     (R0)+,2$        ;PICKUP "ERROR MESSAGE" POINTER
041770  001404                  BEQ     3$              ;SKIP TYPEOUT IF NO POINTER
041772  104401                  TYPE                    ;TYPE THE "ERROR MESSAGE"
041774  000000          2$:     .WORD   0               ;"ERROR MESSAGE" POINTER GOES HERE
041776  104401  001223          TYPE    ,$CRLF          ;"CARRIAGE RETURN" & "LINE FEED"
042002  012037  042012  3$:     MOV     (R0)+,4$        ;PICKUP "DATA HEADER" POINTER
042006  001404                  BEQ     5$              ;SKIP TYPEOUT IF 0
```

```
4811  042010  104401                        TYPE                    ;TYPE THE "DATA HEADER"
4812  042012  000000                4$:     .WORD   0               ;"DATA HEADER" POINTER GOES HERE
4813  042014  104401  001223                TYPE    $CRLF           ;"CARRIAGE RETURN" & "LINE FEED"
4814  042020  010146                5$:     MOV     R1,-(SP)        ;SAVE R1
4815  042022  012001                        MOV     (R0)+,R1        ;PICKUP "DATA TABLE" POINTER
4816  042024  001415                        BEQ     9$              ;BR IF NO DATA TO BE TYPED
4817  042026  012000                        MOV     (R0)+,R0        ;PICKUP "DATA FORMAT" POINTER
4818  042030  105720                6$:     TSTB    (R0)+           ;"OCTAL" OR "DECIMAL"
4819  042032  001003                        BNE     7$              ;BR IF DECIMAL
4820  042034  013146                        MOV     @(R1)+,-(SP)    ;SAVE @(R1)+ FOR TYPEOUT
4821  042036  104402                        TYPOC                   ;GO TYPE--OCTAL ASCII(ALL DIGITS)
4822  042040  000402                        BR      8$
4823  042042                        7$:
4824  042042  013146                        MOV     @(R1)+,-(SP)    ;SAVE @(R1)+ FOR TYPEOUT
4825  042044  104405                        TYPDS                   ;GO TYPE--DECIMAL ASCII WITH SIGN
4826  042046  005711                8$:     TST     (R1)            ;IS THERE ANOTHER NUMBER?
4827  042050  001403                        BEQ     9$              ;BR IF NO
4828  042052  104401  042066                TYPE    ,11$            ;TYPE TWO(2) SPACES
4829  042056  000764                        BR      6$              ;LOOP
4830
4831  042060  012601                9$:     MOV     (SP)+,R1        ;RESTORE R1
4832  042062  012600                10$:    MOV     (SP)+,R0        ;"CARRIAGE RETURN" & "LINE FEED"
4833  042064  000207                        RTS     PC              ;RETURN
4834  042066  020040      000       11$:    .ASCIZ  /  /            ;TWO(2) SPACES
4835          042072                        .EVEN
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4836
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4837
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                                ;*****************************************************************
                                ;
                                ;ERROR AND MESSAGE TABLE CONDIMENTS
                                ;
                                ;*****************************************************************


042566  050122  032060  042040  EM1:    .ASCIZ  /RP04 DID NOT INTERRUPT/
042574  042111  047040  052117
042602  044440  052116  051105
042610  052522  052120  000000
042615  000111  052116  051105  EM2:    .ASCIZ  /INTERRUPT ENABLE BIT DOWN BUT EXPECTED BIT DID NOT SET/
042622  052522  052120  042440
042630  040516  046102  020105
042636  044502  020124  047504
042644  047127  041040  052125
042652  042440  050130  041505
042660  042524  020104  044502
042666  020124  044504  020104
042674  047516  020124  042523
042702  000124
042704  050122  032060  042040  EM3:    .ASCIZ  /RP04 DID NOT INTERRUPT WHEN EXPECTED BIT DID SET/
042712  042111  047040  052117
042720  044440  052116  051105
042726  052522  052120  053440
042734  042510  020116  054105
042742  042520  052103  042105
042750  041040  052111  042040
042756  042111  051440  052105
042764  000000
042765  000105  050130  041505  EM4:    .ASCIZ  /EXPECTED BIT DID SET BUT TIME IS IN ERROR - TIME IN 10 MICROSEC. DECIMA
042772  042524  020104  044502
043000  020124  044504  020104
043006  042523  020124  052502
043014  020124  044524  042515
043022  044440  020123  047111
043030  042440  051122  051117
043036  026440  052040  046511
043044  020105  047111  030440
043052  020060  044515  051103
043060  051517  041505  020056
043066  042504  044503  040515
043074  000114
043076  044122  051501  042040  EM5:    .ASCIZ  /RHAS DOES NOT CLEAR BY MOVING IN ALL ONES/
043104  042517  020123  047516
043112  020124  046103  040505
043120  020122  054502  046440
043126  053117  047111  020107
043134  047111  040440  046114
043142  047440  042516  000123
043150  047514  042101  047111  EM6:    .ASCIZ  /LOADING RHER1 FOR ALL UNITS DID NOT SET ANY RHAS BITS
043156  020107  044122  051105
043164  020061  047506  020122
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4894   043172  046101  020114  047125
4895   043200  052111  020123  044504
4896   043206  020104  047516  020124
4897   043214  042523  020124  047101
4898   043222  020131  044122  051501
4899   043230  041040  052111  000123
4900   043236  047516  020116  054105  EM7:    .ASCIZ  /NON EXISTENT REGISTER, PROGRAM ABORTED./
4901   043244  051511  042524  052116
4902   043252  051040  043505  051511
4903   043260  042524  026122  050040
4904   043266  047522  051107  046501
4905   043274  040440  047502  052122
4906   043302  042105  000056
4907   043306  052123  050117  042520  EM10:   .ASCIZ  /STOPPED DRIVE HAS MOL BIT IN RHDS1 SET/
4908   043314  020104  051104  053111
4909   043322  020105  040510  020123
4910   043330  047515  020114  044502
4911   043336  020124  047111  051040
4912   043344  042110  030523  051440
4913   043352  052105     000
4914
4915   043355     127  052111  020110  EM11:   .ASCIZ  /WITH SPINDLE POWERED DOWN RHCS2 SHOULD ONLY HAVE UNIT NO: AND IR SET/
4916   043362  050123  047111  046104
4917   043370  020105  047520  042527
4918   043376  042522  020104  047504
4919   043404  047127  051040  041510
4920   043412  031123  051440  047510
4921   043420  046125  020104  047117
4922   043426  054514  044040  053101
4923   043434  020105  047125  052111
4924   043442  047040  035117  040440
4925   043450  042116  044440  020122
4926   043456  042523  000124
4927   043462  043101  042524  020122  EM12:   .ASCIZ  /AFTER SPINDLE POWERED UP, NO PACK ACKN. RHDS1 SHOULD HAVE MOL=1, VV=0/
4928   043470  050123  047111  046104
4929   043476  020105  047520  042527
4930   043504  042522  020104  050125
4931   043512  020054  047516  050040
4932   043520  041501  020113  041501
4933   043526  047113  020056  044122
4934   043534  051504  020061  044123
4935   043542  052517  042114  044040
4936   043550  053101  020105  047515
4937   043556  036514  026061  053040
4938   043564  036526  000060
4939   043570  044527  044124  051440  EM13:   .ASCIZ  /WITH SPINDLE POWERED, NO INTIALIZE, RHCS1 SHOULD HAVE GO=0, DVA=1, RDY=
4940   043576  044520  042116  042514
4941   043604  050040  053517  051105
4942   043612  042105  020054  047516
4943   043620  044440  052116  040511
4944   043626  044514  042532  020054
4945   043634  044122  051503  020061
4946   043642  044123  052517  042114
4947   043650  044040  053101  020105
4948   043656  047507  030075  020054
4949   043664  053104  036501  026061
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 4950  043672  051040  054504  030475
 4951  043700  020054  042511  030075
 4952  043706     000
 4953  043707     101  052106  051105  EM14:    .ASCIZ  /AFTER SPINDLE POWERED UP RHCC SHOULD BE=0/
 4954  043714  051440  044520  042116
 4955  043722  042514  050040  053517
 4956  043730  051105  042105  052440
 4957  043736  020120  044122  041503
 4958  043744  051440  047510  046125
 4959  043752  020104  042502  030075
 4960  043760     000
 4961  043761     120  041501  020113  EM15:    .ASCII  /PACK ACKNOWLEDGE COMMAND CAUSED AN ERROR/<15><12>
 4962  043766  041501  047113  053517
 4963  043774  042514  043504  020105
 4964  044002  047503  046515  047101
 4965  044010  020104  040503  051525
 4966  044016  042105  040440  020116
 4967  044024  051105  047522  006522
 4968  044032     012
 4969  044033     107  047517  020104          .ASCIZ  /GOOD DATA IS BEFORE COMMAND, REC DATA IS AFTER COMMAND/
 4970  044040  040504  040524  044440
 4971  044046  020123  042502  047506
 4972  044054  042522  041440  046517
 4973  044062  040515  042116  020054
 4974  044070  042522  020103  040504
 4975  044076  040524  044440  020123
 4976  044104  043101  042524  020122
 4977  044112  047503  046515  047101
 4978  044120  000104
 4979  044122  047516  047455  020120  EM16:    .ASCII  /NO-OP COMMAND CAUSED AN ERROR/<15><12>
 4980  044130  047503  046515  047101
 4981  044136  020104  040503  051525
 4982  044144  042105  040440  020116
 4983  044152  051105  047522  006522
 4984  044160     012
 4985  044161     107  047517  020104          .ASCIZ  /GOOD DATA IS BEFORE COMMAND, REC DATA IS AFTER COMMAND/
 4986  044166  040504  040524  044440
 4987  044174  020123  042502  047506
 4988  044202  042522  041440  046517
 4989  044210  040515  042116  020054
 4990  044216  042522  020103  040504
 4991  044224  040524  044440  020123
 4992  044232  043101  042524  020122
 4993  044240  047503  046515  047101
 4994  044246  000104
 4995  044250  051104  053111  020105  EM17:     ASCII  /DRIVE CLEAR COMMAND CAUSED AN ERROR/<15><12>
 4996  044256  046103  040505  020122
 4997  044264  047503  046515  047101
 4998  044272  020104  040503  051525
 4999  044300  042105  040440  020116
 5000  044306  051105  047522  006522
 5001  044314     012
 5002  044315     107  047517  020104          .ASCIZ  /GOOD DATA GIVES SHOULD BE, REC DATA GIVES AFTER COMMAND/
 5003  044322  040504  040524  043440
 5004  044330  053111  051505  051440
 5005  044336  047510  046125  020104
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5006  044344  042502  020054  042522
5007  044352  020103  040504  040524
5008  044360  043440  053111  051505
5009  044366  040440  052106  051105
5010  044374  041440  046517  040515
5011  044402  042116     000
5012  044405     122  040505  026504  EM20:   .ASCII  /READ-IN COMMAND CAUSED AN ERROR/<15><12>
5013  044412  047111  041440  046517
5014  044420  040515  042116  041440
5015  044426  052501  042523  020104
5016  044434  047101  042440  051122
5017  044442  051117  005015
5018  044446  047507  042117  042040          .ASCIZ  /GOOD DATA GIVES SHOULD BE, REC DATA GIVES REG. CONTENTS AFTER COMMAND/
5019  044454  052101  020101  044507
5020  044462  042526  020123  044123
5021  044470  052517  042114  041040
5022  044476  026105  051040  041505
5023  044504  042040  052101  020101
5024  044512  044507  042526  020123
5025  044520  042522  027107  041440
5026  044526  047117  042524  052116
5027  044534  020123  043101  042524
5028  044542  020122  047503  046515
5029  044550  047101  000104
5030
5031  044554  044122  051503  020061  EM21:   .ASCIZ  /RHCS1 CONTENTS DURING COMMAND WAS IN ERROR/
5032  044562  047503  052116  047105
5033  044570  051524  042040  051125
5034  044576  047111  020107  047503
5035  044604  046515  047101  020104
5036  044612  040527  020123  047111
5037  044620  042440  051122  051117
5038  044626     000
5039  044627     122  042110  030523  EM22:   .ASCIZ  /RHDS1 CONTENTS DURING COMMAND WAS IN ERROR/
5040  044634  041440  047117  042524
5041  044642  052116  020123  052504
5042  044650  044522  043516  041440
5043  044656  046517  040515  042116
5044  044664  053440  051501  044440
5045  044672  020116  051105  047522
5046  044700  000122
5047  044702  047125  047514  042101  EM23:   .ASCII  /UNLOAD COMMAND CAUSED AN ERROR/<15><12>
5048  044710  041440  046517  040515
5049  044716  042116  041440  052501
5050  044724  042523  020104  047101
5051  044732  042440  051122  051117
5052  044740  005015
5053  044742  047507  042117  042040          .ASCIZ  /GOOD DATA GIVES SHOULD BE, REC DATA GIVES REGISTER CONT. AFTER COMMAND/
5054  044750  052101  020101  044507
5055  044756  042526  020123  044123
5056  044764  052517  042114  041040
5057  044772  026105  051040  041505
5058  045000  042040  052101  020101
5059  045006  044507  042526  020123
5060  045014  042522  044507  052123
5061  045022  051105  041440  047117
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5062  045030  027124  040440  052106
5063  045036  051105  041440  046517
5064  045044  040515  042116     000
5065  045051     117  043106  042523  EM24:   .ASCII  /OFFSET COMMAND CAUSED AN ERROR/<15><12>
5066  045056  020124  047503  046515
5067  045064  047101  020104  040503
5068  045072  051525  042105  040440
5069  045100  020116  051105  047522
5070  045106  006522     012
5071  045111     107  047517  020104          .ASCIZ  /GOOD DATA GIVES SHOULD BE, REC DATA GIVES REG. CONT. AFTER COMMAND/
5072  045116  040504  040524  043440
5073  045124  053111  051505  051440
5074  045132  047510  046125  020104
5075  045140  042502  020054  042522
5076  045146  020103  040504  040524
5077  045154  043440  053111  051505
5078  045162  051040  043505  020056
5079  045170  047503  052116  020056
5080  045176  043101  042524  020122
5081  045204  047503  046515  047101
5082  045212  000104
5083  045214  042522  052524  047122  EM25:   .ASCII  /RETURN TO CENTER LINE COMMAND CAUSED AN ERROR/<15><12>
5084  045222  052040  020117  042503
5085  045230  052116  051105  046040
5086  045236  047111  020105  047503
5087  045244  046515  047101  020104
5088  045252  040503  051525  042105
5089  045260  040440  020116  051105
5090  045266  047522  006522     012
5091  045273     107  047517  020104          .ASCIZ  /GOOD DATA GIVES SHOULD BE, REC DATA GIVES REG. CONT. AFTER COMMAND/
5092  045300  040504  040524  043440
5093  045306  053111  051505  051440
5094  045314  047510  046125  020104
5095  045322  042502  020054  042522
5096  045330  020103  040504  040524
5097  045336  043440  053111  051505
5098  045344  051040  043505  020056
5099  045352  047503  052116  020056
5100  045360  043101  042524  020122
5101  045366  047503  046515  047101
5102  045374  000104
5103  045376  030065  020060  043117  EM26:   .ASCIZ  /500 OFFSET COMMANDS ONE AFTER THE OTHER CAUSED AN ERROR/
5104  045404  051506  052105  041440
5105  045412  046517  040515  042116
5106  045420  020123  047117  020105
5107  045426  043101  042524  020122
5108  045434  044124  020105  052117
5109  045442  042510  020122  040503
5110  045450  051525  042105  040440
5111  045456  020116  051105  047522
5112  045464  000122
5113  045466  051127  052111  020105  EM27:   .ASCII  /WRITE HEADER AND DATA CAUSED IMPROPER REGISTER CHANGE/<15><12>
5114  045474  042510  042101  051105
5115  045502  040440  042116  042040
5116  045510  052101  020101  040503
5117  045516  051525  042105  044440
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 5118  045524  050115  047522  042520
 5119  045532  020122  042522  044507
 5120  045540  052123  051105  041440
 5121  045546  040510  040516  006505
 5122  045554     012
 5123  045555     107  047517  020104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
 5124  045562  040504  040524  043440
 5125  045570  053111  051505  053440
 5126  045576  040510  020124  044123
 5127  045604  052517  042114  041040
 5128  045612  020105  044124  051105
 5129  045620  006505     012
 5130  045623     122  041505  044505          .ASCIZ  /RECEIVED DATA GIVES WHAT WAS THERE AFTER COMMAND/
 5131  045630  042526  020104  040504
 5132  045636  040524  043440  053111
 5133  045644  051505  053440  040510
 5134  045652  020124  040527  020123
 5135  045660  044124  051105  020105
 5136  045666  043101  042524  020122
 5137  045674  047503  046515  047101
 5138  045702  000104
 5139  045704  051127  052111  020105  EM30:   .ASCIZ  /WRITE HEADER AND DATA CHANGED WRITE FROM BUFFER/
 5140  045712  042510  042101  051105
 5141  045720  040440  042116  042040
 5142  045726  052101  020101  044103
 5143  045734  047101  042507  020104
 5144  045742  051127  052111  020105
 5145  045750  051106  046517  041040
 5146  045756  043125  042506  000122
 5147
 5148  045764  042522  042101  044040  EM31:   .ASCII  /READ HEADER AND DATA CAUSED IMPROPER REGISTER CHANGE/<15><12>
 5149  045772  040505  042504  020122
 5150  046000  047101  020104  040504
 5151  046006  040524  041440  052501
 5152  046014  042523  020104  046511
 5153  046022  051120  050117  051105
 5154  046030  051040  043505  051511
 5155  046036  042524  020122  044103
 5156  046044  047101  042507  005015
 5157  046052  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
 5158  046060  052101  020101  044507
 5159  046066  042526  020123  044127
 5160  046074  052101  051440  047510
 5161  046102  046125  020104  042502
 5162  046110  052040  042510  042522
 5163  046116  005015
 5164  046120  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES WHAT WAS THERE AFTER COMMAND/
 5165  046126  042105  042040  052101
 5166  046134  020101  044507  042526
 5167  046142  020123  044127  052101
 5168  046150  053440  051501  052040
 5169  046156  042510  042522  040440
 5170  046164  052106  051105  041440
 5171  046172  046517  040515  042116
 5172  046200     000
 5173  046201     127  044522  042524  EM32:   .ASCIZ  /WRITE HEADER DATA FOLLOWED BY READ HEADER AND DATA CAUSED DATA ERROR
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 5174  046206  044040  040505  042504
 5175  046214  020122  040504  040524
 5176  046222  043040  046117  047514
 5177  046230  042527  020104  054502
 5178  046236  051040  040505  020104
 5179  046244  042510  042101  051105
 5180  046252  040440  042116  042040
 5181  046260  052101  020101  040503
 5182  046266  051525  042105  042040
 5183  046274  052101  020101  051105
 5184  046302  047522  000122
 5185  046306  042522  042101  042040  EM33:    .ASCII  /READ DATA CAUSED IMPROPER REGISTER CHANGE/<15><12>
 5186  046314  052101  020101  040503
 5187  046322  051525  042105  044440
 5188  046330  050115  047522  042520
 5189  046336  020122  042522  044507
 5190  046344  052123  051105  041440
 5191  046352  040510  043516  006505
 5192  046360     012
 5193  046361     107  047517  042104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
 5194  046366  040504  040524  043440
 5195  046374  053111  051505  053440
 5196  046402  040510  020124  044123
 5197  046410  052517  042114  041040
 5198  046416  020105  044124  051105
 5199  046424  006505     012
 5200  046427     122  041505  044505          .ASCIZ  /RECEIVED DATA GIVES WHAT WAS THERE AFTER COMMAND/
 5201  046434  042526  020104  040504
 5202  046442  040524  043440  053111
 5203  046450  051505  053440  040510
 5204  046456  020124  040527  020123
 5205  046464  044124  051105  020105
 5206  046472  043101  042524  020122
 5207  046500  047503  046515  047101
 5208  046506  000104
 5209  046510  042522  042101  042040  EM34:    .ASCIZ  /READ DATA INCORRECT/
 5210  046516  052101  020101  047111
 5211  046524  047503  051122  041505
 5212  046532  000124
 5213  046534  051127  052111  020105  EM35:    .ASCII  /WRITE DATA COMMAND CAUSED IMPROPER REGISTER CHANGE/<15><12>
 5214  046542  040504  040524  041440
 5215  046550  046517  040515  042116
 5216  046556  041440  052501  042523
 5217  046564  020104  046511  051120
 5218  046572  050117  051105  051040
 5219  046600  043505  051511  042524
 5220  046606  020122  044103  047101
 5221  046614  042507  005015
 5222  046620  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
 5223  046626  052101  020101  044507
 5224  046634  042526  020123  044127
 5225  046642  052101  051440  047510
 5226  046650  046125  020104  042502
 5227  046656  052040  042510  042522
 5228  046664  005015
 5229  046666  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER COMMAND/
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5230  046674  042105  042040  052101
5231  046702  020101  044507  042526
5232  046710  020123  042522  044507
5233  046716  052123  051105  041440
5234  046724  047117  042524  052116
5235  046732  020123  043101  042524
5236  046740  020122  047503  046515
5237  046746  047101  000104
5238  046752  051127  052111  020105  EM36:    .ASCIZ  /WRITE DATA COMMAND CHANGED WRITE FROM BUFFER/
5239  046760  040504  040524  041440
5240  046766  046517  040515  042116
5241  046774  041440  040510  043516
5242  047002  042105  053440  044522
5243  047010  042524  043040  047522
5244  047016  020115  052502  043106
5245  047024  051105     000
5246  047027     123  042505  020113  EM37:    .ASCII  /SEEK COMMAND CAUSED IMPROPER REGISTER CHANGE/<15><12>
5247  047034  047503  046515  047101
5248  047042  020104  040503  051525
5249  047050  042105  044440  050115
5250  047056  047522  042520  020122
5251  047064  042522  044507  052123
5252  047072  051105  041440  040510
5253  047100  043516  006505     012
5254  047105     107  047517  020104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
5255  047112  040504  040524  043440
5256  047120  053111  051505  053440
5257  047126  040510  020124  044123
5258  047134  052517  042114  041040
5259  047142  020105  044124  051105
5260  047150  006505     012
5261  047153     122  041505  044505          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER SEEK COMMAND/
5262  047160  042526  020104  040504
5263  047166  040524  043440  053111
5264  047174  051505  051040  043505
5265  047202  051511  042524  020122
5266  047210  047503  052116  047105
5267  047216  051524  040440  052106
5268  047224  051105  051440  042505
5269  047232  020113  047503  046515
5270  047240  047101  000104
5271  047244  051127  052111  020105  EM40:    .ASCII  /WRITE CHECK CAUSED IMPROPER REGISTER CHANGE/<15><12>
5272  047252  044103  041505  020113
5273  047260  040503  051525  042105
5274  047266  044440  050115  047522
5275  047274  042520  020122  042522
5276  047302  044507  052123  051105
5277  047310  041440  040510  043516
5278  047316  006505     012
5279  047321     107  047517  020104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
5280  047326  040504  040524  043440
5281  047334  053111  051505  053440
5282  047342  040510  020124  044123
5283  047350  052517  042114  041040
5284  047356  020105  044124  051105
5285  047364  006505     012
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5286  047367    122   041505  044505          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER COMMAND/
5287  047374  042526  020104  040504
5288  047402  040524  043440  053111
5289  047410  051505  051040  043505
5290  047416  051511  042524  020122
5291  047424  047503  052116  047105
5292  047432  051524  040440  052106
5293  047440  051105  041440  046517
5294  047446  040515  042116     000
5295
5296  047453    114   041517  044513  EM41:   .ASCII  /LOCKING OUT WRITE BY WRITE LOCK BUTTON CAUSED IMPROPER REGISTER CHANGE/
5297  047460  043516  047440  052125
5298  047466  053440  044522  042524
5299  047474  041040  020131  051127
5300  047502  052111  020105  047514
5301  047510  045503  041040  052125
5302  047516  047524  020116  040503
5303  047524  051525  042105  044440
5304  047532  050115  047522  042520
5305  047540  020122  042522  044507
5306  047546  052123  051105  041440
5307  047554  040510  043516  006505
5308  047562     012
5309  047563    107   047517  020104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
5310  047570  040504  040524  043440
5311  047576  053111  051505  053440
5312  047604  040510  020124  044123
5313  047612  052517  042114  041040
5314  047620  020105  044124  051105
5315  047626  006505     012
5316  047631    122   041505  044505          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER WRITES WERE LOCKED OUT/
5317  047636  042526  020104  040504
5318  047644  040524  043440  053111
5319  047652  051505  051040  043505
5320  047660  051511  042524  020122
5321  047666  047503  052116  047105
5322  047674  051524  040440  052106
5323  047702  051105  053440  044522
5324  047710  042524  020123  042527
5325  047716  042522  046040  041517
5326  047724  042513  020104  052517
5327  047732  000124
5328  047734  052101  042524  050115  EM42:   .ASCII  /ATTEMPTING TO WRITE WITH WRITES LOCKED OUT CAUSED IMPROPER REGISTER CHA
5329  047742  044524  043516  052040
5330  047750  020117  051127  052111
5331  047756  020105  044527  044124
5332  047764  053440  044522  042524
5333  047772  020123  047514  045503
5334  050000  042105  047440  052125
5335  050006  041440  052501  042523
5336  050014  020104  046511  051120
5337  050022  050117  051105  051040
5338  050030  043505  051511  042524
5339  050036  020122  044103  047101
5340  050044  042507  005015
5341  050050  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
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5342  050056  052101  020101  044507
5343  050064  042526  020123  044127
5344  050072  052101  051440  047510
5345  050100  046125  020104  042502
5346  050106  052040  042510  042522
5347  050114  005015
5348  050116  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER ATTEMPTED WRITE/
5349  050124  042105  042040  052101
5350  050132  020101  044507  042526
5351  050140  020123  042522  044507
5352  050146  052123  051105  041440
5353  050154  047117  042524  052116
5354  050162  020123  043101  042524
5355  050170  020122  052101  042524
5356  050176  050115  042524  020104
5357  050204  051127  052111  000105
5358  050212  051127  052111  047111  EM43:   .ASCII  /WRITING WITH WRITES LOCKED OUT CHANGED DISK DATA/<15><12>
5359  050220  020107  044527  044124
5360  050226  053440  044522  042524
5361  050234  020123  047514  045503
5362  050242  042105  047440  052125
5363  050250  041440  040510  043516
5364  050256  042105  042040  051511
5365  050264  020113  040504  040524
5366  050272  005015
5367  050274  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT WAS ON DISK BEFORE WRITE WITH WRITE LOCKED OUT/<15
5368  050302  052101  020101  044507
5369  050310  042526  020123  044127
5370  050316  052101  053440  051501
5371  050324  047440  020116  044504
5372  050332  045523  041040  043105
5373  050340  051117  020105  051127
5374  050346  052111  020105  044527
5375  050354  044124  053440  044522
5376  050362  042524  046040  041517
5377  050370  042513  020104  052517
5378  050376  006524  000012
5379  050401  000127  051501  040440          .ASCII  /WAS ATTEMPTED/<15><12>
5380  050406  052124  046505  052120
5381  050414  042105  005015
5382  050420  042522  042503  053111          .ASCII  /RECEIVED DATA GIVES WHAT WAS READ BACK AFTER WRITE/<15><12>
5383  050426  042105  042040  052101
5384  050434  020101  044507  042526
5385  050442  020123  044127  052101
5386  050450  053440  051501  051040
5387  050456  040505  020104  040502
5388  050464  045503  040440  052106
5389  050472  051105  053440  044522
5390  050500  042524  005015
5391  050504  044527  044124  053440          .ASCIZ  /WITH WRITE LOCKED OUT WAS ATTEMPTED/
5392  050512  044522  042524  046040
5393  050520  041517  042513  020104
5394  050526  052517  020124  040527
5395  050534  020123  052101  042524
5396  050542  050115  042524  000104
5397  050550  047105  041101  044514  EM44:   .ASCII  /ENABLING WRITES BY WRITE LOCK BUTTON CAUSED IMPROPER REGISTER CHANGE/<1
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5398  050556  043516  053440  044522
5399  050564  042524  020123  054502
5400  050572  053440  044522  042524
5401  050600  046040  041517  020113
5402  050606  052502  052124  047117
5403  050614  041440  052501  042523
5404  050622  020104  046511  051120
5405  050630  050117  051105  051040
5406  050636  043505  051511  042524
5407  050644  020122  044103  047101
5408  050652  042507  005015
5409  050656  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
5410  050664  052101  020101  044507
5411  050672  042526  020123  044127
5412  050700  052101  051440  047510
5413  050706  046125  020104  042502
5414  050714  052040  042510  042522
5415  050722  005015
5416  050724  042522  042503  053111          .ASCII  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER WRITE LOCK BUTTON/<15><12>
5417  050732  042105  042040  052101
5418  050740  020101  044507  042526
5419  050746  020123  042522  044507
5420  050754  052123  051105  041440
5421  050762  047117  042524  052116
5422  050770  020123  043101  042524
5423  050776  020122  051127  052111
5424  051004  020105  047514  045503
5425  051012  041040  052125  047524
5426  051020  006516     012
5427  051023     105  040516  046102          .ASCIZ  /ENABLED WRITES/
5428  051030  042105  053440  044522
5429  051036  042524  000123
5430  051042  051124  047101  043123  EM45:   .ASCII  /TRANSFERRING ON LAST BLOCK - CYLINDER 410. - 814., SECTOR 21, /<15><12>
5431  051050  051105  044522  043516
5432  051056  047440  020116  040514
5433  051064  052123  041040  047514
5434  051072  045503  026440  041440
5435  051100  046131  047111  042504
5436  051106  020122  030464  027060
5437  051114  026440  034040  032061
5438  051122  026056  051440  041505
5439  051130  047524  020122  030462
5440  051136  020054  005015
5441  051142  051124  041501  020113          .ASCII  /TRACK 18, CAUSED IMPROPER REGISTER CHANGE/<15><12>
5442  051150  034061  020054  040503
5443  051156  051525  042105  044440
5444  051164  050115  047522  042520
5445  051172  020122  042522  044507
5446  051200  052123  051105  041440
5447  051206  040510  043516  006505
5448  051214     012
5449  051215     107  047517  020104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
5450  051222  040504  040524  043440
5451  051230  053111  051505  053440
5452  051236  040510  020124  044123
5453  051244  052517  042114  041040
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5454  051252  020105  044124  051105
5455  051260  006505      012
5456  051263      122  041505  044505          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER TRANSFER/
5457  051270  042526  020104  040504
5458  051276  040524  043440  053111
5459  051304  051505  051040  043505
5460  051312  051511  042524  020122
5461  051320  047503  052116  047105
5462  051326  051524  040440  052106
5463  051334  051105  052040  040522
5464  051342  051516  042506  000122
5465  051350  040504  040524  051040  EM46:   .ASCII  /DATA READ FROM LAST BLOCK - CYLINDER 410. - 814., SECTOR 21,/<15><12>
5466  051356  040505  020104  051106
5467  051364  046517  046040  051501
5468  051372  020124  046102  041517
5469  051400  020113  020055  054503
5470  051406  044514  042116  051105
5471  051414  032040  030061  020056
5472  051422  020055  030470  027064
5473  051430  020054  042523  052103
5474  051436  051117  031040  026061
5475  051444  005015
5476  051446  051124  041501  020113          .ASCIZ  /TRACK 18, IS IN ERROR/
5477  051454  034061  020054  051511
5478  051462  044440  020116  051105
5479  051470  047522  000122
5480  051474  051124  047101  043123  EM47:   .ASCII  /TRANSFERRING DATA FROM NONEXISTANT SECTOR CAUSED IMPROPER /<15><12>
5481  051502  051105  044522  043516
5482  051510  042040  052101  020101
5483  051516  051106  046517  047040
5484  051524  047117  054105  051511
5485  051532  040524  052116  051440
5486  051540  041505  047524  020122
5487  051546  040503  051525  042105
5488  051554  044440  050115  047522
5489  051562  042520  020122  005015
5490  051570  042522  044507  052123          .ASCII  /REGISTER CHANGE, GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
5491  051576  051105  041440  040510
5492  051604  043516  026105  043440
5493  051612  047517  020104  040504
5494  051620  040524  043440  053111
5495  051626  051505  053440  040510
5496  051634  020124  044123  052517
5497  051642  042114  041040  020105
5498  051650  044124  051105  006505
5499  051656      012
5500  051657      122  041505  044505          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER ATTEMPTED TRANSFER/
5501  051664  042526  020104  040504
5502  051672  040524  043440  053111
5503  051700  051505  051040  043505
5504  051706  051511  042524  020122
5505  051714  047503  052116  047105
5506  051722  051524  040440  052106
5507  051730  051105  040440  052124
5508  051736  046505  052120  042105
5509  051744  052040  040522  051516
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 5510  051752  042506  000122
 5511  051756  051124  047101  043123  EM50:   .ASCII  /TRANSFERRING FROM NONEXISTANT SECTOR CAUSED DATA ERROR/<15><12>
 5512  051764  051105  044522  043516
 5513  051772  043040  047522  020115
 5514  052000  047516  042516  044530
 5515  052006  052123  047101  020124
 5516  052014  042523  052103  051117
 5517  052022  041440  052501  042523
 5518  052030  020104  040504  040524
 5519  052036  042440  051122  051117
 5520  052044  005015
 5521  052046  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
 5522  052054  052101  020101  044507
 5523  052062  042526  020123  044127
 5524  052070  052101  051440  047510
 5525  052076  046125  020104  042502
 5526  052104  052040  042510  042522
 5527  052112  005015
 5528  052114  040502  020104  040504          .ASCIZ  /BAD DATA GIVES WHAT WAS IN BUFFER AFTER TRANSFER/
 5529  052122  040524  043440  053111
 5530  052130  051505  053440  040510
 5531  052136  020124  040527  020123
 5532  052144  047111  041040  043125
 5533  052152  042506  020122  043101
 5534  052160  042524  020122  051124
 5535  052166  047101  043123  051105
 5536  052174     000
 5537
 5538  052175     107  053111  047111  EM51:   .ASCII  /GIVING ILLEGAL FUNCTION CAUSED IMPROPER REGISTER CHANGE/<15><12>
 5539  052202  020107  046111  042514
 5540  052210  040507  020114  052506
 5541  052216  041516  044524  047117
 5542  052224  041440  052501  042523
 5543  052232  020104  046511  051120
 5544  052240  050117  051105  051040
 5545  052246  043505  051511  042524
 5546  052254  020122  044103  047101
 5547  052262  042507  005015
 5548  052266  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
 5549  052274  052101  020101  044507
 5550  052302  042526  020123  044127
 5551  052310  052101  051440  047510
 5552  052316  046125  020104  042502
 5553  052324  052040  042510  042522
 5554  052332  005015
 5555  052334  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER ILLEGAL FUNCTION IS GIVEN/
 5556  052342  042105  042040  052101
 5557  052350  020101  044507  042526
 5558  052356  020123  042522  044507
 5559  052364  052123  051105  041440
 5560  052372  047117  042524  052116
 5561  052400  020123  043101  042524
 5562  052406  020122  046111  042514
 5563  052414  040507  020114  052506
 5564  052422  041516  044524  047117
 5565  052430  044440  020123  044507
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 5566  052436  042526  000116
 5567  052442  051127  052111  020105  EM52:   .ASCII  /WRITE DATA ON NONEXISTANT SECTOR CAUSED IMPROPER REGISTER CHANGE/<15><1
 5568  052450  040504  040524  047440
 5569  052456  020116  047516  042516
 5570  052464  044530  052123  047101
 5571  052472  020124  042523  052103
 5572  052500  051117  041440  052501
 5573  052506  042523  020104  046511
 5574  052514  051120  050117  051105
 5575  052522  051040  043505  051511
 5576  052530  042524  020122  044103
 5577  052536  047101  042507  005015
 5578  052544  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
 5579  052552  052101  020101  044507
 5580  052560  042526  020123  044127
 5581  052566  052101  051440  047510
 5582  052574  046125  020104  042502
 5583  052602  052040  042510  042522
 5584  052610  005015
 5585  052612  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER ATTEMPTED WRITE DATA/
 5586  052620  042105  042040  052101
 5587  052626  020101  044507  042526
 5588  052634  020123  042522  044507
 5589  052642  052123  051105  041440
 5590  052650  047117  042524  052116
 5591  052656  020123  043101  042524
 5592  052664  020122  052101  042524
 5593  052672  050115  042524  020104
 5594  052700  051127  052111  020105
 5595  052706  040504  040524     000
 5596  052713     122  040505  020104  EM53:   .ASCIZ  /READ HEADER AND DATA AFTER A SEARCH CAUSED DATA ERROR/
 5597  052720  042510  042101  051105
 5598  052726  040440  042116  042040
 5599  052734  052101  020101  043101
 5600  052742  042524  020122  020101
 5601  052750  042523  051101  044103
 5602  052756  041440  052501  042523
 5603  052764  020104  040504  040524
 5604  052772  042440  051122  051117
 5605  053000     000
 5606  053001     101  052124  046505  EM54:   .ASCII  /ATTEMPTING COMMAND WITH INVALID ADDRESS CAUSED IMPROPER REGISTER CHANGE
 5607  053006  052120  047111  020107
 5608  053014  047503  046515  047101
 5609  053022  020104  044527  044124
 5610  053030  044440  053116  046101
 5611  053036  042111  040440  042104
 5612  053044  042522  051523  041440
 5613  053052  052501  042523  020104
 5614  053060  046511  051120  050117
 5615  053066  051105  051040  043505
 5616  053074  051511  042524  020122
 5617  053102  044103  047101  042507
 5618  053110  005015
 5619  053112  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
 5620  053120  052101  020101  044507
 5621  053126  042526  020123  044127
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5622  053134  052101  051440  047510
5623  053142  046125  020104  042502
5624  053150  052040  042510  042522
5625  053156  005015
5626  053160  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER OPERATION/
5627  053166  042105  042040  052101
5628  053174  020101  044507  042526
5629  053202  020123  042522  044507
5630  053210  052123  051105  041440
5631  053216  047117  042524  052116
5632  053224  020123  043101  042524
5633  053232  020122  050117  051105
5634  053240  052101  047511  000116
5635  053246  051127  052111  047111  EM55:   .ASCII  /WRITING OR READING WITH EXPECTED ADDRESS OVERFLOW ERROR/<15><12>
5636  053254  020107  051117  051040
5637  053262  040505  044504  043516
5638  053270  053440  052111  020110
5639  053276  054105  042520  052103
5640  053304  042105  040440  042104
5641  053312  042522  051523  047440
5642  053320  042526  043122  047514
5643  053326  020127  051105  047522
5644  053334  006522  000012
5645  053337  000103  052501  042523          .ASCII  /CAUSED IMPROPER REGISTER CHANGE/<15><12>
5646  053344  020104  046511  051120
5647  053352  050117  051105  051040
5648  053360  043505  051511  042524
5649  053366  020122  044103  047101
5650  053374  042507  005015
5651  053400  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
5652  053406  052101  020101  044507
5653  053414  042526  020123  044127
5654  053422  052101  051440  047510
5655  053430  046125  020104  042502
5656  053436  052040  042510  042522
5657  053444  005015
5658  053446  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER OPERATION/
5659  053454  042105  042040  052101
5660  053462  020101  044507  042526
5661  053470  020123  042522  044507
5662  053476  052123  051105  041440
5663  053504  047117  042524  052116
5664  053512  020123  043101  042524
5665  053520  020122  050117  051105
5666  053526  052101  047511  000116
5667  053534  040504  040524  051040  EM56:   .ASCII  /DATA READ WITH AN EXPECTED ADDRESS OVERFLOW ERROR IS INCORRECT/<15><12>
5668  053542  040505  020104  044527
5669  053550  044124  040440  020116
5670  053556  054105  042520  052103
5671  053564  042105  040440  042104
5672  053572  042522  051523  047440
5673  053600  042526  043122  047514
5674  053606  020127  051105  047522
5675  053614  020122  051511  044440
5676  053622  041516  051117  042522
5677  053630  052103  005015
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5678  053634  047527  042122  047040          .ASCII  /WORD NO. 1 TO 260 SHOULD BE READ, WORD NO 261 TO 266 SHOULD/<15><12>
5679  053642  027117  030440  052040
5680  053650  020117  033062  020060
5681  053656  044123  052517  042114
5682  053664  041040  020105  042522
5683  053672  042101  020054  047527
5684  053700  042122  047040  020117
5685  053706  033062  020061  047524
5686  053714  031040  033066  051440
5687  053722  047510  046125  006504
5688  053730     012
5689  053731     102  020105  044103          .ASCIZ  /BE CHANGED/
5690  053736  047101  042507  000104
5691  053744  052101  042524  050115  EM57:   .ASCII  /ATTEMPTING DATA COMMAND WITH WRONG FORMAT BIT CAUSED/<15><12>
5692  053752  044524  043516  042040
5693  053760  052101  020101  047503
5694  053766  046515  047101  020104
5695  053774  044527  044124  053440
5696  054002  047522  043516  043040
5697  054010  051117  040515  020124
5698  054016  044502  020124  040503
5699  054024  051525  042105  005015
5700  054032  046511  051120  050117          .ASCII  /IMPROPER REGISTER CHANGE/<15><12>
5701  054040  051105  051040  043505
5702  054046  051511  042524  020122
5703  054054  044103  047101  042507
5704  054062  005015
5705  054064  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
5706  054072  052101  020101  044507
5707  054100  042526  020123  044127
5708  054106  052101  051440  047510
5709  054114  046125  020104  042502
5710  054122  052040  042510  042522
5711  054130  005015
5712  054132  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER ATTEMPTED DATA TRANSFER/
5713  054140  042105  042040  052101
5714  054146  020101  044507  042526
5715  054154  020123  042522  044507
5716  054162  052123  051105  041440
5717  054170  047117  042524  052116
5718  054176  020123  043101  042524
5719  054204  020122  052101  042524
5720  054212  050115  042524  020104
5721  054220  040504  040524  052040
5722  054226  040522  051516  042506
5723  054234  000122
5724  054236  052101  042524  050115  EM60:   .ASCII  /ATTEMPTING TO MODIFY REGISTER DURING AN OPERATION CAUSED IMPROPER /15 <
5725  054244  044524  043516  052040
5726  054252  020117  047515  044504
5727  054260  054506  051040  043505
5728  054266  051511  042524  020122
5729  054274  052504  044522  043516
5730  054302  040440  020116  050117
5731  054310  051105  052101  047511
5732  054316  020116  040503  051525
5733  054324  042105  044440  050115
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5734  054332  047522  042520  006522
5735  054340     012
5736  054341     122  043505  051511          .ASCII  /REGISTER CHANGE. GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
5737  054346  042524  020122  044103
5738  054354  047101  042507  020056
5739  054362  047507  042117  042040
5740  054370  052101  020101  044507
5741  054376  042526  020123  044127
5742  054404  052101  051440  047510
5743  054412  046125  020104  042502
5744  054420  052040  042510  042522
5745  054426  005015
5746  054430  042522  042503  053111          .ASCII  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER OPERATION WAS ATTEMPTED/<15
5747  054436  042105  042040  052101
5748  054444  020101  044507  042526
5749  054452  020123  042522  044507
5750  054460  052123  051105  041440
5751  054466  047117  042524  052116
5752  054474  020123  043101  042524
5753  054502  020122  050117  051105
5754  054510  052101  047511  020116
5755  054516  040527  020123  052101
5756  054524  042524  050115  042524
5757  054532  006504     012
5758  054535     115  042117  044506          .ASCIZ  /MODFING REG GIVES ADDRESS OF REGISTER BEING MODIFIED WHICH CAUSED ERROR
5759  054542  043516  051040  043505
5760  054550  043440  053111  051505
5761  054556  040440  042104  042522
5762  054564  051523  047440  020106
5763  054572  042522  044507  052123
5764  054600  051105  041040  044505
5765  054606  043516  046440  042117
5766  054614  043111  042511  020104
5767  054622  044127  041511  020110
5768  054630  040503  051525  042105
5769  054636  042440  051122  051117
5770  054644     000
5771
5772  054645     104  053105  041511  EM61:   .ASCIZ  /DEVICE NOT AVAILABLE BEFORE COMMAND WAS TO BE GIVEN/
5773  054652  020105  047516  020124
5774  054660  053101  044501  040514
5775  054666  046102  020105  042502
5776  054674  047506  042522  041440
5777  054702  046517  040515  042116
5778  054710  053440  051501  052040
5779  054716  020117  042502  043440
5780  054724  053111  047105     000
5781  054731     122  042110  030523  EM63:   .ASCIZ  /RHDS1 CONTENTS DURING COMMAND WAS IN ERROR/
5782  054736  041440  047117  042524
5783  054744  052116  020123  052504
5784  054752  044522  043516  041440
5785  054760  046517  040515  042116
5786  054766  053440  051501  044440
5787  054774  020116  051105  047522
5788  055002  000122
5789  055004  042522  040503  044514  EM64:   .ASCII  /RECALIBRATE COMMAND CAUSED IMPROPER REGISTER CHANGE/<15><12>
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 5790  055012  051102  052101  020105
 5791  055020  047503  046515  047101
 5792  055026  020104  040503  051525
 5793  055034  042105  044440  050115
 5794  055042  047522  042520  020122
 5795  055050  042522  044557  052123
 5796  055056  051105  041440  040510
 5797  055064  043516  006505     012
 5798  055071     107  047517  020104          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
 5799  055076  040504  040524  043440
 5800  055104  053111  051505  053440
 5801  055112  040510  020124  044123
 5802  055120  052517  042114  041040
 5803  055126  020105  044124  051105
 5804  055134  006505     012
 5805  055137     122  041505  044505          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER COMMAND/
 5806  055144  042526  020104  040504
 5807  055152  040524  043440  053111
 5808  055160  051505  051040  043505
 5809  055166  051511  042524  020122
 5810  055174  047503  052116  047105
 5811  055202  051524  040440  052106
 5812  055210  051105  041440  046547
 5813  055216  040515  042116     000
 5814  055223     111  052116  051105  EM65:   .ASCIZ  /INTERRUPT FAILING/
 5815  055230  052522  052120  043040
 5816  055236  044501  044514  043516
 5817  055244     000
 5818  055245     110  040505  042504  EM66:   .ASCII  /HEADER AND DATA COMMAND FOR HEAD SELECTION TEST/<15><12>
 5819  055252  020122  047101  020104
 5820  055260  040504  040524  041440
 5821  055266  046517  040515  042116
 5822  055274  043040  051117  044040
 5823  055302  040505  020104  042523
 5824  055310  042514  052103  047511
 5825  055316  020116  042524  052123
 5826  055324  005015
 5827  055326  040503  051525  042105          .ASCII  /CAUSED ERROR/<15><12>
 5828  055334  042440  051122  051117
 5829  055342  005015
 5830  055344  044122  051504  020124          .ASCII  /RHDST GIVES WHAT TRACK WAS BEING WRITTEN OR READ/<15><12>
 5831  055352  044507  042526  020123
 5832  055360  044127  052101  052040
 5833  055366  040522  045503  053440
 5834  055374  051501  041040  044505
 5835  055402  043516  053440  044522
 5836  055410  052124  047105  047440
 5837  055416  020122  042522  042101
 5838  055424  005015
 5839  055426  047117  041440  046131          .ASCIZ  /ON CYLINDER 0, SECTOR 0/
 5840  055434  047111  042504  020122
 5841  055442  026060  051440  041505
 5842  055450  047524  020122  000060
 5843  055456  042522  042101  044040  EM67:   .ASCII  /READ HEADER AND DATA ERROR IN HEAD SELECTION TEST/<12><15>
 5844  055464  040505  042504  020122
 5845  055472  047101  020104  040504
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 5846  055500  040524  042440  051122
 5847  055506  051117  044440  020116
 5848  055514  042510  042101  051440
 5849  055522  046105  041505  044524
 5850  055530  047117  052040  051505
 5851  055536  005124     015
 5852  055541     106  051111  052123          .ASCII  /FIRST FOUR WORD NUMBERS ARE HEADER/<12><15>
 5853  055546  043040  052517  020122
 5854  055554  047527  042122  047040
 5855  055562  046525  042502  051522
 5856  055570  040440  042522  044040
 5857  055576  040505  042504  005122
 5858  055604     015
 5859  055605     127  051117  020104          .ASCII  /WORD NUMBERS 5 TO 260 ARE DATA WORDS/<12><15>
 5860  055612  052516  041115  051105
 5861  055620  020123  020065  047524
 5862  055626  031040  030066  040440
 5863  055634  042522  042040  052101
 5864  055642  020101  047527  042122
 5865  055650  005123     015
 5866  055653     111  020116  040504          .ASCIZ  /IN DATA WORDS BITS 4,5,6,7,8 GIVE TRACK NUMBER/
 5867  055660  040524  053440  051117
 5868  055666  051504  041040  052111
 5869  055674  020123  026064  026065
 5870  055702  026066  026067  020070
 5871  055710  044507  042526  052040
 5872  055716  040522  045503  047040
 5873  055724  046525  042502  000122
 5874
 5875  055732  042522  042101  044040  EM70:   .ASCII  /READ HEADER AND DATA ERROR IN/<15><12>
 5876  055740  040505  042504  020122
 5877  055746  047101  020104  040504
 5878  055754  040524  042440  051122
 5879  055762  051117  044440  006516
 5880  055770     012
 5881  055771     104  043111  042506          .ASCII  /DIFFERENCE LINE TEST/<15><12>
 5882  055776  042522  041516  020105
 5883  056004  044514  042516  052040
 5884  056012  051505  006524     012
 5885  056017     127  051117  020104          .ASCII  /WORD NOS 1-4 GIVE HEADER/<15><12>
 5886  056024  047516  020123  026461
 5887  056032  020064  044507  042526
 5888  056040  044040  040505  042504
 5889  056046  006522     012
 5890  056051     127  051117  020104          .ASCIZ  /WORD NOS 5-260 GIVE DATA WHICH IS THE CYLINDER ADDRESS/
 5891  056056  047516  020123  026465
 5892  056064  033062  020060  044507
 5893  056072  042526  042040  052101
 5894  056100  020101  044127  041511
 5895  056106  020110  051511  052040
 5896  056114  042510  041440  046131
 5897  056122  047111  042504  020122
 5898  056130  042101  051104  051505
 5899  056136  000123
 5900  056140  047506  041522  047111  EM71:   .ASCII  /FORCING OPI BY 3 INDEX PULSES/<15><12>
 5901  056146  020107  050117  020111
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 5902  056154  054502  031440  044440
 5903  056162  042116  054105  050040
 5904  056170  046125  042523  006523
 5905  056176     012
 5906  056177     103  052501  042523          .ASCII  /CAUSED IMPROPER REGISTER CHANGE/<15><12>
 5907  056204  020104  046511  051120
 5908  056212  050117  051105  051040
 5909  056220  043505  051511  042524
 5910  056226  020122  044103  047101
 5911  056234  042507  005015
 5912  056240  047507  042117  042040          .ASCII  /GOOD DATA GIVES WHAT SHOULD BE THERE/<15><12>
 5913  056246  052101  020101  044507
 5914  056254  042526  020123  044127
 5915  056262  052101  051440  047510
 5916  056270  046125  020104  042502
 5917  056276  052040  042510  042522
 5918  056304  005015
 5919  056306  042522  042503  053111          .ASCIZ  /RECEIVED DATA GIVES REGISTER CONTENTS AFTER 3 INDEX PULSES/
 5920  056314  042105  042040  052101
 5921  056322  020101  044507  042526
 5922  056330  020123  042522  044507
 5923  056336  052123  051105  041440
 5924  056344  047117  042524  052116
 5925  056352  020123  043101  042524
 5926  056360  020122  020063  047111
 5927  056366  000504  020130  052520
 5928  056374  000514  051505     000
 5929  056401     124  042510  042522  EM72:   .ASCII  /THERE WAS A SETUP ERROR DURING MULTIPLE WRITE/<15><12>
 5930  056406  053440  051501  040440
 5931  056414  051440  052105  050125
 5932  056422  042440  051122  051117
 5933  056430  042040  051125  047111
 5934  056436  020107  052515  052114
 5935  056444  050111  042514  053440
 5936  056452  044522  042524  005015
 5937  056460  042510  042101  051105          .ASCII  /HEADER AND DATA COMMANDS RESULTING IN AN ABORT/<15><12>
 5938  056466  040440  042116  042040
 5939  056474  052101  020101  047503
 5940  056502  046515  047101  051504
 5941  056510  051040  051505  046125
 5942  056516  044524  043516  044440
 5943  056524  020116  047101  040440
 5944  056532  047502  052122  005015
 5945  056540  043117  052040  044510          .ASCII  /OF THIS 'OPI' TEST./<15><12><15><12>
 5946  056546  020123  047447  044520
 5947  056554  020047  042524  052123
 5948  056562  006456  006412     012
 5949  056567     124  020117  051124          .ASCIZ  /TO TROUBLE SHOOT SETUP ERROR, LOOP ON THIS TEST/
 5950  056574  052517  046102  020105
 5951  056602  044123  047517  020124
 5952  056610  042523  052524  020120
 5953  056616  051105  047522  026122
 5954  056624  046040  047517  020120
 5955  056632  047117  052040  044510
 5956  056640  020123  042524  052123
 5957  056646     000
```

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 5958  056647     122  040505  020104  EM73:    .ASCII  /READ HEADER AND DATA FOR 11960 WORDS /<15><12>
 5959  056654  042510  042101  051105
 5960  056662  040440  042116  042040
 5961  056670  052101  020101  047506
 5962  056676  020122  030461  033071
 5963  056704  020060  047527  042122
 5964  056712  020123  005015
 5965  056716  044124  052101  044440          .ASCII  /THAT IS 46 SECTORS /<15><12>
 5966  056724  020123  033064  051440
 5967  056732  041505  047524  051522
 5968  056740  006440     012
 5969  056743     124  040510  020124          .ASCIZ  /THAT IS OVER 3 INDEX PULSES CAUSED AN ERROR/
 5970  056750  051511  047440  042526
 5971  056756  020122  020063  047111
 5972  056764  042504  020130  052520
 5973  056772  051514  051505  041440
 5974  057000  052501  042523  020104
 5975  057006  047101  042440  051122
 5976  057014  051117     000
 5977  057017     122  040505  020104  EM74:    .ASCII  /READ HEADER AND DATA FOR 11960 WORDS /<15><12>
 5978  057024  042510  042101  051105
 5979  057032  040440  042116  042040
 5980  057040  052101  020101  047506
 5981  057046  020122  030461  033071
 5982  057054  020060  047527  042122
 5983  057062  020123  005015
 5984  057066  044124  052101  044440          .ASCII  /THAT IS 46 SECTORS, THAT IS OVER 3 INDEX /<15><12>
 5985  057074  020123  033064  051440
 5986  057102  041505  047524  051522
 5987  057110  020054  044124  052101
 5988  057116  044440  020123  053117
 5989  057124  051105  031440  044440
 5990  057132  042116  054105  006440
 5991  057140     012
 5992  057141     120  046125  042523          .ASCIZ  /PULSES CAUSED OPI TO SET/
 5993  057146  020123  040503  051525
 5994  057154  042105  047440  044520
 5995  057162  052040  020117  042523
 5996  057170  000124
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5997
5998  057172  040503  040524  020114  CPHALT: .ASCII  /FATAL ERROR - SEE DOCUMENT LISTING <15><12>
5999  057200  051105  047522  020122
6000  057206  020055  042523  020105
6001  057214  047504  052503  042515
6002  057222  052116  046040  051511
6003  057230  044524  043516  005015
6004  057236  006440  103412  177777          .ASCII  / .<15><12><207><377><377><207><377><377><207><377><377>
6005  057244  177607  103777  177777
6006  057252  044124  020105  047503          .ASCII  /THE CONTROLLER OR DEVICE HAS GONE OFFLINE, LOST/<15><12>
6007  057260  052116  047522  046114
6008  057266  051105  047440  020122
6009  057274  042504  044526  042503
6010  057302  044040  051501  043440
6011  057310  047117  020105  043117
6012  057316  046106  047111  026105
6013  057324  046040  051517  006524
6014  057332     012
6015  057333     047  042522  042101          .ASCII  /'READY', BECOME UNAVAILABLE, OR HAS STATUS BITS/<15><12>
6016  057340  023531  020054  042502
6017  057346  047503  042515  052440
6018  057354  040516  040526  046111
6019  057362  041101  042514  020054
6020  057370  051117  044040  051501
6021  057376  051440  040524  052524
6022  057404  020123  044502  051524
6023  057412  005015
6024  057414  044127  041511  020110          .ASCIZ  /WHICH CANNOT BE CLEARED/
6025  057422  040503  047116  052117
6026  057430  041040  020105  046103
6027  057436  040505  042522  000104
6028
6029
6030
6031  057444  041520  020040  020040  DH1:    .ASCII  /PC     TEST    WAIT    BIT     REG     REG     RHCS1/<15><12>
6032  057452  020040  042524  052123
6033  057460  020040  020040  040527
6034  057466  052111  020040  020040
6035  057474  044502  020124  020040
6036  057502  020040  042522  020107
6037  057510  020040  020040  042522
6038  057516  020107  020040  020040
6039  057524  044122  051503  006461
6040  057532     012
6041  057533     040  020040  020040          .ASCIZ  /       NO      PC      EXPCTD  ADDRESS CONTENT CONTENT         /
6042  057540  020040  047040  020117
6043  057546  020040  020040  050040
6044  057554  020103  020040  020040
6045  057562  042440  050130  052103
6046  057570  020104  040440  042104
6047  057576  042522  051523  041440
6048  057604  047117  042524  052116
6049  057612  041440  047117  042524
6050  057620  052116  000011
6051  057624  041520  020040  020040  DH4:    .ASCII  /PC     TEST    WAIT    BIT     REG     TIME IN/<15><12>
6052  057632  020040  042524  052123
```

```
6053  057640  020040  020040  040527
6054  057646  052111  020040  020040
6055  057654  044502  020124  020040
6056  057662  020040  042522  020107
6057  057670  020040  020040  044524
6058  057676  042515  044440  006516
6059  057704     012
6060  057705     040  020040  020040          .ASCIZ  /       NO      PC      EXPCTD  ADDRESS 10 MSEC/
6061  057712  020040  047040  020117
6062  057720  020040  020040  050040
6063  057726  020103  020040  020040
6064  057734  042440  050130  052103
6065  057742  020104  040440  042104
6066  057750  042522  051523  030440
6067  057756  020060  051515  041505
6068  057764     000
6069  057765     120  020103  020040  DH5:    .ASCII  /PC      TEST    REG     GOOD    RECEIVED/<15><12>
6070  057772  020040  052040  051505
6071  060000  020124  020040  051040
6072  060006  043505  020040  020040
6073  060014  043440  047517  020104
6074  060022  020040  051040  041505
6075  060030  044505  042526  006504
6076  060036     012
6077  060037     040  020040  020040          .ASCIZ  /       NO      ADDRESS DATA    DATA/
6078  060044  020040  047040  020117
6079  060052  020040  020040  040440
6080  060060  042104  042522  051523
6081  060066  042040  052101  020101
6082  060074  020040  042040  052101
6083  060102  000101
6084  060104  041520  020040  020040  DH6:    .ASCII  /PC      TEST    REG     RECEIVED/<15><12>
6085  060112  020040  042524  052123
6086  060120  020040  020040  042522
6087  060126  020107  020040  020040
6088  060134  042522  042503  053111
6089  060142  042105  005015
6090  060146  020040  020040  020040          .ASCIZ  /       NO      ADDRESS DATA/
6091  060154  020040  047516  020040
6092  060162  020040  020040  042101
6093  060170  051104  051505  020123
6094  060176  040504  040524     000
6095  060203     120  020103  020040  DH7:    .ASCIZ  /PC      TEST    REG     ADDRESS/
6096  060210  020040  052040  051505
6097  060216  020124  020040  051040
6098  060224  043505  020040  020040
6099  060232  040440  042104  042522
6100  060240  051523     000
6101
6102  060243     120  020103  020040  DH10:   .ASCII  /PC      TEST    FAILING CONTENT CONTENT CONTENT CONTENT/<15><12>
6103  060250  020040  052040  051505
6104  060256  020124  020040  043040
6105  060264  044501  044514  043516
6106  060272  041440  047117  042524
6107  060300  052116  041440  047117
6108  060306  042524  052116  041440
```

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6109  060314  047117  042524  052116
6110  060322  041440  047117  042524
6111  060330  052116  005015
6112  060334  020040  020040  020040          .ASCIZ  /       NO      REG.    RHCS1   RHCS2   RHDS1   RHER1/
6113  060342  020040  047516  020040
6114  060350  020040  020040  042522
6115  060356  027107  020040  020040
6116  060364  044122  051503  020061
6117  060372  020040  044122  051503
6118  060400  020062  020040  044122
6119  060406  051504  020061  020040
6120  060414  044122  051105  000061
6121
6122  060422  041520  020040  020040  DH26:   .ASCII  /PC      TEST    CONT OF CONT OF CONT OF CONT OF CONT OF CONT OF/<15><12
6123  060430  020040  042524  052123
6124  060436  020040  020040  047503
6125  060444  052116  047440  020106
6126  060452  047503  052116  047440
6127  060460  020106  047503  052116
6128  060466  047440  020106  047503
6129  060474  052116  047440  020106
6130  060502  047503  052116  047440
6131  060510  020106  047503  052116
6132  060516  047440  006506      012
6133  060523      040  020040  020040          .ASCIZ  /       NO      RHCS1   RHCS2   RHDS1   RHER1   RHER2   RHER3   /
6134  060530  020040  047040  020117
6135  060536  020040  020040  051040
6136  060544  041510  030523  020040
6137  060552  051040  041510  031123
6138  060560  020040  051040  042110
6139  060566  030523  020040  051040
6140  060574  042510  030522  020040
6141  060602  051040  042510  031122
6142  060610  020040  051040  042510
6143  060616  031522  000011
6144
6145  060622  041520  020040  020040  DH30:   .ASCII  /PC      TEST    WORD    GOOD    BAD/<15><12>
6146  060630  020040  042524  052123
6147  060636  020040  020040  047527
6148  060644  042122  020040  020040
6149  060652  047507  042117  020040
6150  060660  020040  040502  006504
6151  060666      012
6152  060667      040  020040  020040          .ASCIZ  /       NO      NO      DATA    DATA/
6153  060674  020040  047040  020117
6154  060702  020040  020040  047040
6155  060710  020117  020040  020040
6156  060716  042040  052101  020101
6157  060724  020040  042040  052101
6158  060732  000101
6159
6160  060734  041520  020040  020040  DH51:   .ASCII  /PC      TEST    REG     GOOD    RECVD   ILLEGL/<15><12>
6161  060742  020040  042524  052123
6162  060750  020040  020040  042522
6163  060756  020107  020040  020040
6164  060764  047507  042117  020040
```

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 6165  060772  020040  042522  053103
 6166  061000  020104  020040  046111
 6167  061006  042514  046107  005015
 6168  061014  020040  020040  020040          .ASCIZ  /       NO      ADDRESS DATA    DATA    FUNCTN/
 6169  061022  020040  047516  020040
 6170  061030  020040  020040  042101
 6171  061036  051104  051505  020123
 6172  061044  040504  040524  020040
 6173  061052  020040  040504  040524
 6174  061060  020040  020040  052506
 6175  061066  041516  047124     000
 6176
 6177  061073     120  020103  020040  DH60:   .ASCII  /PC      TEST    REG     GOOD    RECVD   MODFING/<15><12>
 6178  061100  020040  052040  051505
 6179  061106  020124  020040  051040
 6180  061114  043505  020040  020040
 6181  061122  043440  047517  020104
 6182  061130  020040  051040  041505
 6183  061136  042126  020040  046440
 6184  061144  042117  044506  043516
 6185  061152  005015
 6186  061154  020040  020040  020040          .ASCIZ  /       NO      ADDRESS DATA    DATA    REG/
 6187  061162  020040  047516  020040
 6188  061170  020040  020040  042101
 6189  061176  051104  051505  020123
 6190  061204  040504  040524  020040
 6191  061212  020040  040504  040524
 6192  061220  020040  020040  042522
 6193  061226  000107
 6194  061230  041520  020040  020040  DH61:   .ASCII  /PC      TEST    PC OF   RHDS1/<15><12>
 6195  061236  020040  042524  052123
 6196  061244  020040  020040  041520
 6197  061252  047440  004506  051040
 6198  061260  042110  030523  005015
 6199  061266  020040  020040  020040          .ASCIZ  /       NO      JSR     WAS/
 6200  061274  020040  047516  020040
 6201  061302  020040  020040  051512
 6202  061310  020122  020040  020040
 6203  061316  040527  000123
 6204  061322  041520  020040  020040  DH62:   .ASCII  /PC      PC OF   RHCS1/<15><12>
 6205  061330  020040  041520  047440
 6206  061336  020106  020040  044122
 6207  061344  051503  006461     012
 6208  061351     040  020040  020040          .ASCIZ  /       JSR     WAS/
 6209  061356  020040  045040  051123
 6210  061364  020040  020040  053440
 6211  061372  051501     000
 6212  061375     120  020103  020040  DH65:   .ASCII  /PC      TEST    CONT    CONT    CONT/<15><12>
 6213  061402  020040  052040  051505
 6214  061410  020124  020040  041440
 6215  061416  047117  020124  020040
 6216  061424  041440  047117  020124
 6217  061432  020040  041440  047117
 6218  061440  006524     012
 6219  061443     040  020040  020040          .ASCIZ  /       NO      RHCS1   RHAS    RHDS1/
 6220  061450  020040  047040  020117
```

```
 6221  061456  020040  020040  051040
 6222  061464  041510  030523  020040
 6223  061472  051040  040510  020123
 6224  061500  020040  051040  042110
 6225  061506  030523     000
 6226  061511     120  020103  020040  DH66:   .ASCIZ  /PC      TEST    RHDST   RHER1   RHER2   RHER3   RHCS1   RHCS2/
 6227  061516  020040  052040  051505
 6228  061524  020124  020040  051040
 6229  061532  042110  052123  020040
 6230  061540  051040  042510  030522
 6231  061546  020040  051040  042510
 6232  061554  031122  020040  051040
 6233  061562  042510  031522  020040
 6234  061570  051040  041510  030523
 6235  061576  020040  051040  041510
 6236  061604  031123     000
 6237
 6238  061607     120  020103  020040  DH72:   .ASCIZ  /PC      TEST    RHCSI   RHCS2   RHDS1   RHDST   RHCA    RHER1   RHWC/
 6239  061614  020040  052040  051505
 6240  061622  020124  020040  051040
 6241  061630  041510  044523  020040
 6242  061636  051040  041510  031123
 6243  061644  020040  051040  042110
 6244  061652  030523  020040  051040
 6245  061660  042110  052123  020040
 6246  061666  051040  041510  020101
 6247  061674  020040  051040  042510
 6248  061702  030522  020040  051040
 6249  061710  053510  000103
 6250
 6251
 6252                                  .EVEN
 6253
 6254  061714  001116  004504  033316  DT1:    .WORD   $ERRPC,TSTNM,WAITPC,WAITBT,WAITRE,$BDDAT,CS1,0
 6255  061722  033322  033320  001126
 6256  061730  002262  000000
 6257  061734  001116  004504  004504  DT4:    .WORD   $ERRPC,TSTNM,TSTNM,WAITPC,WAITBT,WAITRE,$BDDAT,WAITTM,0
 6258  061742  033316  033322  033320
 6259  061750  001126  033324  000000
 6260  061756  001116  004504  004500  DT5:    .WORD   $ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT,0
 6261  061764  001124  001126  000000
 6262  061772  001116  004504  004500  DT6:    .WORD   $ERRPC,TSTNM,REGADR,$BDDAT,0
 6263  062000  001126  000000
 6264  062004  001116  004504  001200  DT7:    .WORD   $ERRPC,TSTNM,$TMP1,0
 6265  062012  000000
 6266  062014  001116  004504  001122  DT10:   .WORD   $ERRPC,TSTNM,$BDADR,CS1,CS2,DS1,ER1,0
 6267  062022  002262  002260  002304
 6268  062030  002264  000000
 6269  062034  001116  004504  002262  DT26:   .WORD   $ERRPC,TSTNM,CS1,CS2,DS1,ER1,ER2,ER3,0
 6270  062042  002260  002304  002264
 6271  062050  002270  002276  000000
 6272  062056  001116  004504  004502  DT30:   .WORD   $ERRPC,TSTNM,ERWORD,$GDDAT,$BDDAT,0
 6273  062064  001124  001126  000000
 6274  062072  001116  004504  004500  DT51:   .WORD   $ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT,ILLEGL,0
 6275  062100  001124  001126  002364
 6276  062106  000000
```

```
 6277  062110  001116  004504  004500  DT60:   .WORD   $ERRPC,TSTNM,REGADR,$GDDAT,$BDDAT,$BDADR,0
 6278  062116  001124  001126  001122
 6279  062124  000000
 6280  062126  001116  004504  033122  DT61:   .WORD   $ERRPC,TSTNM,PCJSR,$BDADR,0
 6281  062134  001122  000000
 6282  062140  001116  004504  033122  DT62:    WORD   $ERRPC,TSTNM,PCJSR,$BDADR,0
 6283  062146  001122  000000
 6284  062152  001116  004504  002262  DT65:   .WORD   $ERRPC,TSTNM,CS1,AS,DS1,0
 6285  062160  002300  002304  000000
 6286  062166  001116  004504  002266  DT66:   .WORD   $ERRPC,TSTNM,DST,ER1,ER2,ER3,CS1,CS2,0
 6287  062174  002264  002270  002276
 6288  062202  002262  002260  000000
 6289  062210  001116  004504  002262  DT72:   .WORD   $ERRPC,TSTNM,CS1,CS2,DS1,DST,CA,ER1,WC,0
 6290  062216  002260  002304  002266
 6291  062224  002274  002264  002254
 6292  062232  000000
 6293
 6294  062234     000     000     000  DF1:    .BYTE   0,0,0,0,0,0,0,0
 6295  062237     000     000     000
 6296  062242     000
 6297  062243     000     000     000  DF4:    .BYTE   0,0,0,0,0,1,0
 6298  062246     000     000     001
 6299  062251     000
 6300  062252     000     000     000  DF5:    .BYTE   0,0,0,0,0
 6301  062255     000     000
 6302  062257     000     000     000  DF6:    .BYTE   0,0,0,0
 6303  062262     000
 6304  062263     000     000     000  DF7:    .BYTE   0,0,0
 6305  062266     000     000     000  DF10:   .BYTE   0,0,0,0,0,0,0,0
 6306  062271     000     000     000
 6307  062274     000
 6308
 6309  062275     000     000     000  DF26:   .BYTE   0,0,0,0,0,0,0,0,0
 6310  062300     000     000     000
 6311  062303     000     000
 6312
 6313  062305     000     000     000  DF30:   .BYTE   0,0,0,0,0
 6314  062310     000     000
 6315
 6316  062312     000     000     000  DF51:   .BYTE   0,0,0,0,0,0
 6317  062315     000     000     000
 6318
 6319  062320     000     000     000  DF60:   .BYTE   0,0,0,0,0,0
 6320  062323     000     000     000
 6321  062326     000     000     000  DF61:   .BYTE   0,0,0,0
 6322  062331     000
 6323  062332     000     000     000  DF62:   .BYTE   0,0,0,0
 6324  062335     000
 6325  062336     000     000     000  DF65:   .BYTE   0,0,0,0,0
 6326  062341     000     000
 6327  062343     000     000     000  DF66:   .BYTE   0,0,0,0,0,0,0,0,0
 6328  062346     000     000     000
 6329  062351     000     000     000
 6330
 6331  062354     000     000     000  DF72:   .BYTE   0,0,0,0,0,0,0,0,0
 6332  062357     000     000     000
```

```
 6333  062362      000      000      000
 6334
 6335            062366                          .EVEN
 6336
 6337            000001                      .END
```

```
ACL    = 000040            1541#
ACU    = 100000            1501#
ADDMOD  000204              627#  1829
ADTIMO  036222             4721   4741#
AOE    = 001000            1418#  2991   3065
AS      002300             1620#  4560*  4781   6284
ATA    = 100000            1406#  2480   2549   2578   2629   2776   2821   2871   2903   2991   3065   3196   3265
                           3338   3408   3566   3652   4272
ATABLE  004566             1689#  1993
ATTENT  004644             1723#  1948*  1993*  2480   2549   2578   2629   2776   2823   2873   2903   2991   3076
                           3196   3265   3338   3408   3566   3652
AT0    = 000001            1438#
AT1    = 000002            1439#
AT2    = 000004            1440#
AT3    = 000010            1441#
AT4    = 000020            1442#
AT5    = 000040            1443#
AT6    = 000100            1444#
AT7    = 000200            1445#
A16    = 000400            1381#
A17    = 001000            1382#
BA      002256             1609#  4781
BAI    = 000010            1349#  3782
BASECH  035232              627   4714#  4743
BEGIN   004710              626   1744#  4740   4837
BEGIN1  004660              630   1738#
BEGIN2  004674              628   1741#
BIT0   = 000001             620#  2163   2201   3338   3408
BIT00  = 000001             620#
BIT01  = 000002             620#
BIT02  = 000004             620#
BIT03  = 000010             620#
BIT04  = 000020             620#
BIT05  = 000040             620#
BIT06  = 000100             620#
BIT07  = 000200             620#
BIT08  = 000400             620#  4754
BIT09  = 001000             620#  4754   4755
BIT1   = 000002             620#  3329   3399
BIT10  = 002000             620#  3329   3399   4755
BIT11  = 004000             620#  4754
BIT12  = 010000             620#
BIT13  = 020000             620#  4755
BIT14  = 040000             620#  4754
BIT15  = 100000             620#
BIT2   = 000004             620#  3329
BIT3   = 000010             620#
BIT4   = 000020             620#  4350
BIT5   = 000040             620#
BIT6   = 000100             620#
BIT7   = 000200             620#
BIT8   = 000400             620#
BIT9   = 001000             620#
BPTVEC= 000014              620#
CA      002274             1618#  4781   6289
CC      002316             1627#  4781
```

```
CHECK   033124          2096    4253#
CHECKC  033162          4257    4263#
CHECKT  033146          2159    2196    2225    2243    2289    2332    2339    2446    2474    2508    2534    2572    2614
                        2624    2658    2691    2756    2801    2840    2852    2897    2929    2986    3060    3115    3166
                        3181    3220    3259    3303    3310    3325    3381    3395    3431    3464    3561    3612    3684
                        3734    3782    3820    3835    3892    3940    3975    4021    4259#
CHREG   033756          2102    2163    2201    2480    2543    2546    2549    2578    2629    2776    2821    2823    2871
                        2873    2902    2903    2991    3065    3196    3265    3338    3408    3566    3569    3573    3652
                        4496#
CKSWR = 104407          4754    4755    4837#
CLAREA  032736          2142    2183    2232    2236    2238    2307    2389    2440    2469    2501    2529    2565    2567
                        2647    2653    2686    2736    2796    2847    2892    2924    2951    2970    3039    3041    3043
                        3108    3110    3163    3175    3213    3215    3252    3254    3301    3318    3320    3374    3378
                        3389    3426    3460    3461    3831    3881    3888    3971    4013    4017    4162#
CLDISK  033066          1948    2032    2042    2066    2096    2128    2181    2224    2228    2273    2330    2334    2435
                        2469    2497    2563    2612    2618    2643    2686    2722    2794    2837    2845    2890    2920
                        2932    3025    3044    3101    3111    3158    3170    3212    3250    3292    3299    3362    3369
                        3424    3458    3491    3520    3594    3672    3674    3705    3724    3757    3779    3810    3824
                        3875    3940    3965    4008    4232#
CLR   = 000040          1351#   2055    2061    2078    2083    4237
COMPAR  035114          2215    2323    2406    2493    2595    2679    2712    3092    3144    3243    3280    3354    3448
                        3485    3918    4035    4686#
COMREG  034064          2107    2165    2203    2252    2313    2395    2455    2482    2516    2551    2581    2631    2667
                        2700    2783    2826    2876    2906    3007    3080    3122    3200    3230    3269    3341    3411
                        3440    3477    3577    3664    4552#
CPHALT  057172          2096    2159    2196    2225    2243    2289    2332    2339    2446    2474    2508    2534    2572
                        2614    2624    2658    2691    2756    2801    2840    2852    2897    2929    2986    3060    3115
                        3166    3181    3220    3259    3303    3310    3325    3381    3395    3431    3464    3561    3612
                        3684    3734    3782    3820    3835    3892    3940    3975    4021    5998#
CR    = 000015           620#    4754
CRLF  = 000200           620#    4754
CSF   = 000002          1488#
CSU   = 000010          1490#
CS1     002262          1613#   3693*   3694    3743*   3744    3799*   3800    3854    3904    4781    6254    6266    6269
                        6284    6286    6289
CS2     002260          1610#   4781    6266    6269    6286    6289
DB      002252          1607#
DCK   = 100000          1424#
DCL   = 000100          1542#
DCLEAR  002330          1642#
DDISP = 177570           620#     642    1750
DEI   = 000040          1396#
DFF20 = 000002          1392#
DFF5  = 000001          1391#
DF1     062234           655     667     678    6294#
DF10    062266           732     746     760     776    6305#
DF26    062275           895    6309#
DF30    062305           916     935     951     968    1029    1063    1087    1123    1159    1266    1277    6313#
DF4     062243           691    6297#
DF5     062252           701     786     798     812     826     838     846     853     863     872     883     906     927
                         945     961     979     990    1004    1016    1041    1054    1076    1116    1135    1147    1172
                        1213    1225    1291    6300#
DF51    062312          1102    6316#
DF6     062257           711    6302#
DF60    062320          1189    6319#
DF61    062326          1197    6321#
```

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DF62    062332          1205    6323#
DF65    062336          1237    6325#
DF66    062343          1255    6327#
DF7     062263           719    6304#
DF72    062354          1307    1318    1325    6331#
DH1     057444           648     660     672    6031#
DH10    060243           724     738     752     768    6102#
DH26    060422           887    6122#
DH30    060622           911     933     949     966    1027    1061    1085    1121    1157    1264    1275    6145#
DH4     057624           685    6051#
DH5     057765           696     781     793     807     821     833     844     851     861     870     881     904     925
                         943     959     977     988    1002    1014    1039    1052    1074    1114    1133    1145    1170
                        1211    1223    1286    6069#
DH51    060734          1096    6160#
DH6     060104           707    6084#
DH60    061073          1183    6177#
DH61    061230          1193    6194#
DH62    061322          1201    6204#
DH65    061375          1231    6212#
DH66    061511          1247    6226#
DH7     060203           716    6095#
DH72    061607          1298    1316    1323    6238#
DIGB  = 000004          1393#
DISPLA  001142           642#   1750#   4754#   4755#
DISPRE  000174           621#   1750
DLT   = 100000          1361#
DL64  = 000020          1395#
DMD   = 000001          1428#   3626    3652
DPR   = 000400          1399#   2102    2247    2343    2627    2661    2694    3434    3472    4273
DRY   = 000200          1398#   2102    2291    2332    2617    2627    2844    3314    3823    3951    4011    4273
DST     002266          1615#   4781    6286    6289
DSWR  = 177570           620#    642    1750
DS1     002304          1622#   3852    3902    4781    6266    6269    6284    6289
DT      002306          1623#   2027#   4781
DTE   = 010000          1421#
DTSY  = 001000          1434#
DT1     061714           654     666     677    6254#
DT10    062014           731     745     759     775    6266#
DT26    062034           894    6269#
DT30    062056           915     934     950     967    1028    1062    1086    1122    1158    1265    1276    6272#
DT4     061734           690    6257#
DT5     061756           700     785     797     811     825     837     845     852     862     871     882     905     926
                         944     960     978     989    1003    1015    1040    1053    1075    1115    1134    1146    1171
                        1212    1224    1290    6260#
DT51    062072          1101    6274#
DT6     061772           710    6262#
DT60    062110          1188    6277#
DT61    062126          1196    6280#
DT62    062140          1204    6282#
DT65    062152          1236    6284#
DT66    062166          1254    6286#
DT7     062004           718    6264#
DT72    062210          1306    1317    1324    6289#
DVA   = 004000          1384#   2058    2102    2247    2342    2627    2661    2694    3434    3472    4265
ECH   = 000100          1415#
ECI   = 004000          1514#   2150    2153    2190    2193    2240    2273    2334    2442    2471    2503    2531    2568
```

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                        2655    2688    2747    2749    2798    2849    2894    2928    2980    2982    3052    3054    3113
                        3165    3177    3217    3256    3302    3321    3380    3391    3428    3462    3683    3733    3782
                        3834    3891    3974    4020
EC1     002312          1625#   4781
EC2     002314          1626#   4781
EMTVEC= 000030           620#   1750*   1811*   1840#
EM1     042566           646    4848#
EM10    043306           722    4907#
EM11    043355           735    4915#
EM12    043462           749    4927#
EM13    043570           763    4939#
EM14    043707           779    4953#
EM15    043761           789    4961#
EM16    044122           801    4979#
EM17    044250           815    4995#
EM2     042615           658    4852#
EM20    044405           829    5012#
EM21    044554           842    5031#
EM22    044627           849    5039#
EM23    044702           856    5047#
EM24    045051           866    5065#
EM25    045214           875    5083#
EM26    045376           886    5103#
EM27    045466           898    5113#
EM3     042704           670    4862#
EM30    045704           909    5139#
EM31    045764           919    5148#
EM32    046201           930    5173#
EM33    046306           938    5185#
EM34    046510           948    5209#
EM35    046534           954    5213#
EM36    046752           964    5238#
EM37    047027           971    5246#
EM4     042765           681    4871#
EM40    047244           982    5271#
EM41    047453           993    5296#
EM42    047734          1007    5328#
EM43    050212          1019    5358#
EM44    050550          1032    5397#
EM45    051042          1044    5430#
EM46    051350          1057    5465#
EM47    051474          1066    5480#
EM5     043076           694    4884#
EM50    051756          1079    5511#
EM51    052175          1090    5538#
EM52    052442          1106    5567#
EM53    052713          1119    5596#
EM54    053001          1126    5606#
EM55    053246          1138    5635#
EM56    053534          1150    5667#
EM57    053744          1162    5691#
EM6     043150           704    4891#
EM60    054236          1175    5724#
EM61    054645          1192    1200    5772#
EM63    054731          1209    5781#
EM64    055004          1217    5789#
```

```
EM65     055223            1230    5814*
EM66     055245            1241    5818*
EM67     055456            1257    5843*
EM7      043236             714    4900*
EM70     055732            1268    5875*
EM71     056140            1280    5900*
EM72     056401            1294    5929*
EM73     056647            1314    5958*
EM74     057017            1321    5977*
ERFLG$   004632            1710*   3614*   4755*
ERR    = 040000            1405*   2480    2549    2578    2776    2821    2871    2903    2991    3065    3196    3265    3338
                           3408    3566    3652    3852    3902
ERRVEC= 000004             620*    1750*   1813*   1821*   1842*   4754*
ERWORD   004502            1671*   4694*   4700*   6272
ER1      002264            1614*   3789*   3790    4781    6266    6269    6286    6289
ER2      002270            1616*   4781    6269    6286
ER3      002276            1619*   4781    6269    6286
EXT1   = 000001            1468*
EXT10  = 000010            1471*
EXT2   = 000002            1469*
EXT20  = 000020            1472*
EXT4   = 000004            1470*
EXT40  = 000040            1473*
FEN    = 000200            1494*
FER    = 000020            1413*   3196    3265
FILL     034022            4522*
FILLRE   032770            2163    2201    2249    2309    2391    2452    2480    2514    2543    2546    2549    2578    2663
                           2696    2991    2998    3000    3065    3071    3073    3120    3189    3194    3196    3225    3265
                           3338    3408    3436    3437    3474    3574    3575    3652    4184*
FINACC   004564            1683*   4325*
FINALA   004562            1682*   4326*
FIRST    004634            1712*   1760    1769*
FLHEAD   032712            2135    2138    2183    2230    2234    2307    2389    2437    2499    2565    2645    2653    2731
                           2734    2922    2944    2948    2964    2968    3031    3035    3108    3161    3299    3372    3376
                           3680    3730    3828    3885    3968    4016    4137*
FMT22  = 010000            1515*   2150    2153    2190    2193    2240    2273    2334    2442    2471    2503    2531    2568
                           2655    2688    2747    2749    2798    2849    2894    2928    2980    2982    3052    3054    3113
                           3165    3177    3217    3256    3302    3321    3380    3391    3428    3462    3600    3615    3683
                           3733    3782    3834    3891    3974    4020    4061
FUTABL   002322            1638*   3499
GNS    = ******  U          621    1766    1767    1768    1803    1828    1838    1840    1863    1885    1922    1924    1926
                           1970    1994    1996    2016    2018    2020    2034    2036    4086    4088    4607    4609    4612
                           4615    4715    4717    4730    4732    4734    4736    4738    4740    4742    4746    4781    4837
GO     = 000001            1378*   2101    2159    2196    2227    2245    2247    2281    2289    2332    2342    2346    2371
                           2448    2476    2510    2536    2574    2616    2626    2627    2660    2661    2693    2694    2758
                           2803    2843    2853    2899    2931    2988    3062    3117    3168    3183    3222    3261    3305
                           3313    3327    3383    3397    3433    3434    3467    3472    3562    3631    3686    3736    3782
                           3822    3837    3894    3950    3977    4010    4028    4350
GR.    = 000010            1394*
GTSWF  = 104406            1771    4837*
HCE    = 000200            1416*   2480    2549    2578
HCI    = 002000            1513*   2150    2153    2190    2193    2240    2273    2334    2442    2471    2503    2531    2568
                           2655    2688    2747    2749    2798    2849    2894    2928    2980    2982    3052    3054    3113
                           3165    3177    3217    3256    3302    3321    3380    3391    3428    3462    3683    3733    3782
                           3834    3891    3974    4020
HCRC   = 000400            1417*
```

```
HT     = 000011          620#  4754
HT.    = 015440         2102#  2161#  2198#  2227#  2247#  2291#  2305#  2332#  2375#  2387#  2450#  2478#  2512#
                        2538#  2576#  2617#  2627#  2661#  2694#  2759#  2804#  2844#  2854#  2900#  2932#  2989#
                        3063#  3118#  3169#  3184#  3223#  3262#  3307#  3314#  3336#  3385#  3406#  3434#  3472#
                        3564#  3688#  3738#  3785#  3823#  3845#  3895#  3951#  3983#  4011#  4029#
IAE    = 002000         1419#  2759   2776   2804   2823   2854   2873   2900   2903
IE     = 000100         1379#  2048   2072   2159   2196   2227   2245   2247   2281   2289   2332   2342   2346
                        2371   2448   2476   2510   2536   2574   2616   2626   2627   2660   2661   2693   2694
                        2758   2803   2843   2853   2899   2931   2988   3062   3117   3168   3183   3222   3261
                        3305   3313   3327   3383   3397   3433   3434   3467   3472   3562   3686   3736   3782
                        3822   3837   3894   3950   3977   4010   4028   4373   4385   4452   4475
ILF    = 000001         1409#  3566
ILLEGL   002364         1656#  3511*  3522   3533   3541   3561   3569   6274
ILR    = 000002         1410#
IOTVEC= 000020           620#  1750*
IR     = 000100         1352#  2543   2991   3196   3225   3265   3539   3550   3573   3658   3659
IXE    = 004000         1498#
KIPAR0= 172340           640#
KIPAR1= 172342           640#
KIPAR2= 172344           640#
KIPAR3= 172346           640#
KIPAR4= 172350           640#
KIPAR5= 172352           640#
KIPAR6= 172354           640#
KIPAR7= 172356           640#
KIPDR0= 172300           640#
KIPDR1= 172302           640#
KIPDR2= 172304           640#
KIPDR3= 172306           640#
KIPDR4= 172310           640#
KIPDR5= 172312           640#
KIPDR6= 172314           640#
KIPDR7= 172316           640#
LA       002320         1628#  4781
LBT    = 002000         1401#  2161   2163   2201   2991   3065   4272
LF     = 000012          620#  4754
LT.    = 000000         2102#  2161#  2198#  2227#  2247#  2291#  2305#  2332#  2375#  2387#  2450#  2478#  2512#
                        2538#  2576#  2617#  2627#  2661#  2694#  2759#  2804#  2844#  2854#  2900#  2932#  2989#
                        3063#  3118#  3169#  3184#  3223#  3262#  3307#  3314#  3336#  3385#  3406#  3434#  3472#
                        3564#  3688#  3738#  3785#  3823#  3845#  3895#  3951#  3983#  4011#  4029#
MCLK   = 000002         1429#
MCPE   = 020000         1385#
MHS    = 001000         1496#
MINX   = 000004         1430#  3627   3628   3639   3640   3643   3644   3647   3648
MMVEC  = 000250          640#
MOL    = 010000         1403#  2033   2034   2102   2247   2343   2627   2661   2694   3434   3472   4273
MPE    = 000400         1354#
MR       002302         1621#  4781
MRD    = 000020         1432#
MSE    = 000020         1491#
MSTCK  = 000010         1431#
MWR    = 000040         1433#
MXF    = 001000         1355#  3538   3548   3557   3573
NED    = 010000         1358#
NEM    = 004000         1357#
NHS    = 002000         1497#
```

```
NOPERA  002322           1639#
NOPUSH  004624           1703#  1738*  1742*  1745*
NOUNIT  004620           1699#  1899*  1932*  1939   1974*  4104*
NUNIT   004622           1701#  1939*  1940*
OCYL  = 100000           1544#
OF      002272           1617#  4781
OFREV = 000200           1512#
OFSET   033052           4227#
OFSETC  002354           1652#  4228
OFSTVL  004510           1678#
OF100 = 000004           1507#
OF200 = 000010           1508#
OF25  = 000001           1505#
OF400 = 000020           1509#
OF50  = 000002           1506#
OF800 = 000040           1510#
OPERSE  034222           4604#  4754
OPI   = 020000           1422#  3652   3790
OR    = 000200           1353#  2543   2546   2991   3196   3225   3265   3538   3548   3658   3659
PAR   = 000010           1412#
PCJSR   033122           4251#  4253*  4254*  4259*  4260*  6280   6282
PCLBUF  002246           1597#  4349*
PCLCSR  002244           1596#  4323*  4350*
PCLCTR  002250           1598#  4324
PGE   = 002000           1356#
PIP   = 020000           1404#
PIRQ  = 177772            620#
PIRQVE= 000240            620#
PKACK   002360           1654#  2096   2101   2102
PLU   = 020000           1500#
PRE   = 000020           1540#
PRITEM  040742           1800*  4103*  4606*  4771#  4781*  4799   4803*
PROG  = 001000           1400#
PRC   = 000000            620#
PR1   = 000040            620#
PR2   = 000100            620#
PR3   = 000140            620#
PR4   = 000200            620#
PR5   = 000240            620#
PR6   = 000300            620#
PR7   = 000340            620#
PS    = 177776            620#  1752*  2047*  2071*  2094*  2292*  2377*  4085*  4605*
PSEL  = 002000           1383#
PSU   = 000001           1537#
PSW   = 177776            620#
PUTREG  035010           3696   3746   3792   3802   3850   3900   4559   4634#
PWRVEC= 000024            620#  1750*  4837*
RA      000200            626#  4738
RDCHR = 104410           4754   4837#
RDLIN = 104411           4755   4837#
RDOCT = 104412           1803   4612   4615   4718   4732   4837#
RO    = 000200           1380#  2048   2058   2072   2102   2198   2227   2247   2305   2342   2375   2387   2450
                         2478   2512   2538   2576   2627   2661   2694   2932   2989   3063   3118   3169   3194
                         3223   3262   3307   3336   3385   3406   3434   3472   3564   3688   3738   3785   3845
                         3895   3983   4029   4265
READAT  002346           1649#  2190   2193   2196   2471   2476   2894   2899   3217   3222   3256   3261   3321
```

		3327	3428	3433	3434	3462	3467	3472						
READIN	002362	1655*												
RECALI	002326	1641*	2227	2616	3822	3950	4010							
REFOR	002350	1650*	2280	2370	2568	2574	2688	2693	2694	2849	2853	3052	3054	3062
		3113	3117	3782	3891	3894	4020	4028						
REGADR	004500	1670*	1852*	2102*	2247*	2350*	2364*	2627*	2661*	2694*	3434*	3472*	4568*	6260
		6262	6274	6277										
REGSAV	040576	4755*												
REGSA1	040604	1811	4755*											
REINTO	003434	1664*	2142	2190	2193	2201	2215	2238	2273	2309	2323	2334	2391	2406
		2440	2471	2493	2501	2567	2568	2578	2595	2653	2679	2686	2688	2696
		2712	2847	2849	2892	2894	3043	3052	3054	3065	3092	3110	3113	3120
		3144	3215	3217	3225	3243	3254	3256	3280	3320	3321	3338	3354	3428
		3437	3448	3461	3462	3474	3485	3782	3881	3891	3918	4013	4020	4035
RELEAS	002332	1643*												
RESVEC=	000010	620*												
RETCL	002356	1653*												
RHAS	002216	1578*	1847	1863	3468*									
RHBA	002174	1566*	2163	2201	2249	2309	2391	2452	2514	2543	2546	2578	2663	2696
		2770	2815	2865	2991	3065	3120	3189	3194	3225	3338	3408	3437	3474
		3521*	3544*	3553*	3574	3598*	3656	4658*						
RHBAE	002240	1590*	1836											
RHCA	002212	1576*	2163	2201	2998	3000	3071	3073	3616*	4200*	4218*	4655*		
RHCC	002234	1585*	2391	2998	3000	3338	3408	3474	4325	4637				
RHCS1	002200	1571*	2096*	2101*	2159*	2196*	2198	2227*	2245*	2247	2289*	2299*	2305	2309
		2332*	2346*	2387	2391	2448*	2450	2476*	2478	2480	2510*	2512	2536*	2538
		2549	2574*	2576	2578	2616*	2626*	2629	2660*	2661	2693*	2694	2758*	2774
		2803*	2819	2843*	2853*	2869	2899*	2902	2931*	2932	2988*	2989	2991	3062*
		3063	3065	3117*	3118	3168*	3169	3183*	3184	3196	3222*	3223	3261*	3262
		3265	3292	3305*	3307	3313*	3327*	3336	3338	3363	3383*	3385	3397*	3406
		3408	3433*	3434	3467*	3472	3564	3569	3631*	3652	3686*	3688	3693	3736*
		3738	3743	3782*	3785	3799	3822*	3837*	3845	3894*	3895	3950*	3977*	3983
		4010*	4028*	4029	4202*	4219*	4228*	4232	4373	4385	4452	4475	4664*	4715
		4722	4725	4734										
RHCS2	002176	1567*	1864	1905*	1982*	2543	2546	2772	2817	2867	2991	3196	3225	3265
		3573	3657	4233	4661*									
RHCS3	002242	1591*												
RHDB	002170	1564*	1816	4719										
RHDST	002204	1573*	2163	2201	2249	2296*	2309	2378*	2391	2452	2480	2514	2549	2578
		2663	2696	2776	2821	2871	2902	3004	3076	3120	3196	3225	3265	3338
		3408	3437	3474	3611*	3652	4201*	4656*						
RHDS1	002222	1580*	2102	2161	2163	2201	2227	2291	2332	2375	2480	2549	2578	2617
		2627	2629	2776	2821	2844	2871	2903	2991	3065	3196	3265	3314	3338
		3408	3566	3652	3823	3951	4011	4234						
RHDT	002224	1581*	1906	1908	1911	1913	1916	1918	1924	1983	1985	1996	2000	2002
		2005	2007	2010	2012	2025	2027							
RHEC1	002230	1583*												
RHEC2	002232	1584*												
RHER1	002202	1572*	1867	2480	2549	2578	2759	2776	2804	2823	2854	2873	2900	2903
		2991	3065	3196	3265	3338	3408	3566	3652	3789	4235			
RHER2	002206	1574*												
RHER3	002214	1577*												
RHLA	002236	1586*	4326											
RHMR	002220	1579*	3625	3652										
RHOF	002210	1575*	3615*	4227*	4662*									
RHSN	002226	1582*	1996	2024	2026									

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RHWC    002172  1565* 2099  2158  2163  2196  2201  2242  2249  2276  2309  2337  2391  2445
                2452  2473  2507  2514  2533  2543  2546  2571  2578  2622  2657  2663  2690
                2696  2755  2768  2800  2813  2851  2863  2896  2985  2991  3059  3065  3115
                3120  3180  3189  3194  3219  3225  3258  3324  3338  3394  3408  3430  3436
                3463  3474  3520* 3543* 3552* 3560  3575  3596* 3619  3655  4187  4499  4568
                4635  4637  4657*
RH70    004640  1717* 1774* 1837* 2540  3186  3492
RH70CK  006032  1772*
RMR   = 000004  1411* 3338  3408
RPTCTR  033566  4426* 4470
RPTRP1  011266  2044  2057*
RPTRP2  011374  2068  2080*
RPVEC   002166  1330* 1754  2043  2067  2100* 2159* 2196* 2226* 2244* 2288* 2298* 2332* 2339*
                2381* 2447* 2475* 2509* 2535* 2573* 2615* 2625* 2659* 2692* 2757* 2802* 2841*
                2853* 2898* 2930* 2987* 3061* 3116* 3167* 3182* 3221* 3260* 3304* 3312* 3326*
                3382* 3396* 3432* 3465* 3685* 3735* 3782* 3821* 3836* 3893* 3949* 3976* 4009*
                4022* 4730  4733* 4736  4747*
RPVECT  036306  1755  4745* 4747
RP06    004636  1715* 1981* 1988* 2131  2147  2187  2727  2742  2940  2960  2976  2994  3027
                3049  3068  3955  4048  4066
RP4VEC  004506  1673* 1799* 2100  2159  2196  2226  2244  2298  2332  2381  2447  2475  2509
                2535  2573  2615  2625  2659  2692  2757  2802  2841  2853  2898  2930  2987
                3061  3116  3167  3182  3221  3260  3304  3312  3326  3382  3396  3432  3465
                3685  3735  3782  3821  3836  3893  3949  3976  4009  4022
RTN     006516  1838  1840*
RUN     035050  2150  2153  2190  2193  2240  2273  2334  2442  2471  2503  2531  2568  2655
                2688  2747  2749  2798  2849  2894  2928  2980  2982  3052  3054  3113  3165
                3177  3217  3256  3302  3321  3380  3391  3428  3462  3683  3733  3782  3834
                3891  3974  4020  4655*
RUNCTR  004642  1720* 3632* 3635*
RUNWAT  027414  3632*
SAVER   033234  2099  2158  2196  2242  2276  2337  2445  2473  2507  2533  2571  2622  2657
                2690  2755  2800  2851  2896  2985  3059  3115  3180  3219  3258  3324  3394
                3430  3463  3560  3619  4294*
SAVERE  004512  1681* 2099  2107  2158  2165  2196  2203  2242  2252  2276  2313  2337  2395
                2445  2455  2473  2480* 2482  2507  2516  2533  2549* 2551  2571  2578* 2581
                2622  2629* 2631  2657  2667  2690  2700  2755  2768* 2770* 2772* 2774* 2776*
                2783  2800  2813* 2815* 2817* 2819* 2821* 2823* 2826  2851  2863* 2865* 2867*
                2869* 2871* 2873* 2876  2896  2902* 2903* 2906  2985  2991* 3004* 3007  3059
                3076* 3080  3115  3122  3180  3196* 3200  3219  3225* 3230  3258  3265* 3269
                3324  3338* 3341  3394  3408* 3411  3430  3440  3463  3477  3560  3566* 3569*
                3577  3619  3652* 3655* 3656* 3659* 3660* 3664  4188* 4502* 4504* 4560
SC      100000  1387* 2480  2549  2578  2629  2902  2991  3065  3196  3265  3338  3408  3525
                3535  3545  3554  3569  3652  3694  3744  3800
SC1   = 000100  1474*
SC10  = 001000  1477*
SC2   = 000200  1475*
SC20  = 002000  1478*
SC4   = 000400  1476*
SEECOM  002352  1651* 2332  2843  3313  4219
SEEKCY  033036  2332  2842  3311  4218*
SELECT  004626  1705* 1739* 1741* 1744* 1802  1943  1955  4092
SELTST  007700  1881  1943*
SERCH   002334  1644* 2273  2289  2334  2340  2346  2626  2627  4202
SKI   = 040000  1543*
SN      002310  1624* 2026* 4781
```

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SND1     005774            1763    1769#
SRCH     033016            2340    2620    4200#
SR0    = 177572             640#
SR1    = 177574             640#
SR2    = 177576             640#
SR3    = 172516             640#
SST1     031126            3877#
SST2     031134            3880#   3881    3938
SST3     031154            3871*   3884#   3932*
SST4     031174            3872*   3887#   3933*
SST5     031206            3873*   3890#   3934*
STACK  = 001000             620#   1750    1810    1845    1948    2041    2065    2096    2128    2224    2330    2435    2497
                           2612    2643    2722    2794    2837    2890    2920    3158    3250    3292    3362    3458    3491
                           3594    3674    3724    3810    3940
START    004720            1740    1743    1748#
STKLMT=  177774             620#
ST22     024150            3298#   3360
ST22A    022546            3121#
ST23     024726            3354    3358#
ST24     025000            3368#   3455
ST28     026014            3448    3453#
SWR      001140             642#   1750#   1771    1772    1825    1861    1879    4572    4703    4754*   4755    4773    4837*
SWREG    000176             621#   1750    1771    4754
SW0    = 000001             620#
SW00   = 000001             620#
SW01   = 000002             620#
SW02   = 000004             620#
SW03   = 000010             620#
SW04   = 000020             620#
SW05   = 000040             620#
SW06   = 000100             620#   4775
SW07   = 000200             620#   4574    4705
SW08   = 000400             620#
SW09   = 001000             620#
SW1    = 000002             620#
SW10   = 002000             620#
SW11   = 004000             620#
SW12   = 010000             620#   1772
SW13   = 020000             620#   1825    1861    1879
SW14   = 040000             620#
SW15   = 100000             620#
SW2    = 000004             620#
SW3    = 000010             620#
SW4    = 000020             620#
SW5    = 000040             620#
SW6    = 000100             620#
SW7    = 000200             620#
SW8    = 000400             620#
SW9    = 001000             620#
TBITVE=  000014             620#
TDF    = 000040            1492#
TESTAD   034220            4603#
TIMCNT   033564            2050    2074    4362    4367    4425#   4441    4446
TIME1    033266            4323#
TIME2    033300            1799    4325#
TKVEC  = 000060             620#   4754#
```

```
TMP0     004650            1726#  2282*  2299   2370*  2371*  2381   3292*  3328   3331*  3343   3363*  3398   3401*
                           3413
TMP1     004652            1727#  3676*  3718*  3726*  3770*
TMP4     004654            1728#
TMP5     004656            1729#  2283*  2296   2372*  2378   3293*  3358*  3364*  3453*
TN     = 000037            1948#  2096#  2128#  2224#  2330#  2435#  2497#  2612#  2643#  2722#  2794#  2837#  2890#
                           2920#  3158#  3250#  3292#  3362#  3458#  3491#  3594#  3674#  3724#  3810#  3940#
TOTALA   004646            1724#  1872*  1874*
TPVEC  = 000064             620#
TRAPVE = 000034             620#  1750*  1753*  2351*  2365*  2376*
TRE    = 040000            1386#  2480   2549   2578   2902   2991   3065   3196   3265   3535   3545   3554   3652
                           3854   3904
TRK1   = 004000            1479#
TRK10  = 040000            1482#
TRK2   = 010000            1480#
TRK20  = 100000            1483#
TRK4   = 020000            1481#
TRP      006460            1835   1839#
TRTVEC = 000014             620#
TSTNM    004504            1672#  1810*  1858*  1948*  2029*  2041*  2065*  2096*  2128*  2224*  2330*  2435*  2497*
                           2612#  2643#  2722#  2794#  2837#  2890#  2920#  3158#  3250#  3292#  3362#  3458#  3491#
                           3594#  3674#  3724#  3810#  3940#  4607   6254   6257   6260   6262   6264   6266   6269
                           6272   6274   6277   6280   6282   6284   6286   6289
TST1     006176            1803   1807   1810#  4122
TST10    011404            2079   2089#
TST11    011650            2128#
TST12    012524            2224#
TST13    013504            2330#
TST14    014252            2435#
TST15    014760            2497#
TST16    016110            2612#
TST17    016442            2643#
TST2     006532            1845#
TST20    017330            2722#
TST21    017710            2794#
TST22    020166            2837#
TST23    020524            2890#
TST24    020772            2920#
TST25    022612            3158#
TST26    023566            3250#
TST27    024114            3292#
TST3     006600            1850   1857#
TST30    024744            3360   3362#
TST31    026032            3455   3458#
TST32    026376            3491#
TST33    027224            3494   3594#
TST34    027652            3674#
TST35    030134            3724#
TST36    030572            3750   3810#
TST37    031404            3938   3940#
TST4     007714            1944   1947#  4101   4112
TST40    032336            4085#
TST5     010642            2029#
TST6     011174            2034   2040#
TST7     011304            2056   2059   2064#
^UF    = 000100            1493#
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TYPDS = 104405          1923    1931    1995    4087    4089    4099    4122    4825    4837*
TYPE  = 104401          1766    1767    1768    1803    1828    1838    1840    1863    1885    1922    1924    1926    1929
                        1970    1994    1996    2016    2018    2020    2034    2036    2096    2159    2196    2225    2243
                        2289    2332    2339    2446    2474    2508    2534    2572    2614    2624    2658    2691    2756
                        2801    2840    2852    2897    2929    2986    3060    3115    3166    3181    3220    3259    3303
                        3310    3325    3381    3395    3431    3464    3561    3612    3684    3734    3782    3820    3835
                        3892    3940    3975    4021    4086    4088    4097    4100    4122    4607    4609    4611    4612
                        4615    4715    4717    4730    4732    4734    4736    4738    4740    4742    4746    4754    4755
                        4781    4784    4806    4808    4811    4813    4828    4837*
TYPERR  041704          4778    4783*
TYPOC = 104402          1831    1925    1996    4608    4610    4716    4731    4735    4737    4739    4746    4754    4781
                        4792    4821    4837*
TYPON = 104404          4837*
TYPOS = 104403          4837*
UNIB  = 000020          1350*
UNIT    004616          1698*   1805*   1807*   1938*   1944*   1950    1973*   1976    1994    4086    4106    4111*   4238
                        4659
UNITS   004576          1697*   1893    1897    1938    1962    4107
UNITSL  004630          1706*   1806*   1807    1944
UNLOAD  002324          1640*
UNC   = 040000          1423*
UPC   = 020000          1359*
US1   = 000001          1346*
US2   = 000002          1347*
US4   = 000004          1348*
UWR   = 000010          1539*
VUF   = 000002          1538*
VU30  = 010000          1499*
VV    = 000100          1397*   2102    2247    2343    2627    2661    2694    3434    3472    4256    4273
WAITBT  033322          4346*   4355*   4363    4368    4435*   4442    4447    6254    6257
WAITPC  033316          4344*   4352*   4353*   4432*   4433*   6254    6257
WAITRE  033320          4345*   4354*   4363    4368    4372    4384    4434*   4442    4447    4451    4477    6254    6257
WAITTM  033324          4324*   4347*   4348*   4392    4402    6257
WAIT.P  033326          4348*
WAIT.T  033570          4429*   4837
WAT   = 104413          2102    2161    2198    2227    2247    2291    2305    2332    2375    2387    2450    2478    2512
                        2538    2576    2617    2627    2661    2694    2759    2804    2844    2854    2900    2932    2989
                        3063    3118    3169    3184    3223    3262    3307    3314    3336    3385    3406    3434    3472
                        3564    3688    3738    3785    3823    3845    3895    3951    3983    4011    4029    4837*
WC      002254          1608*   2107    2165    2203    2252    2313    2395    2455    2482    2516    2551    2581    2631
                        2667    2700    2783    2826    2876    2906    3007    3080    3122    3200    3230    3269    3341
                        3411    3440    3477    3577    3664    4636    4781    6289
WCE   = 040000          1360*
WCF   = 000040          1414*
WCU   = 000001          1487*
WLE   = 004000          1420*
WRCHDT  002340          1646*
WRCHEK  002336          1645*
WRFROM  002370          1663*   2135    2138    2150    2153    2163    2183    2215    2230    2232    2234    2236    2240
                        2249    2307    2323    2389    2406    2437    2442    2452    2469    2493    2499    2503    2514
                        2529    2531    2543    2546    2565    2595    2645    2647    2655    2663    2679    2712    2731
                        2734    2736    2747    2749    2796    2798    2922    2924    2928    2944    2948    2951    2964
                        2968    2970    2980    2982    2991    3031    3035    3039    3041    3092    3108    3144    3161
                        3163    3165    3175    3177    3189    3194    3213    3243    3252    3280    3299    3301    3302
                        3318    3354    3372    3374    3376    3378    3380    3389    3391    3408    3426    3448    3460
                        3485    3544    3546    3597    3680    3683    3730    3733    3828    3831    3834    3885    3888
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		3918	3968	3971	3974	4016	4017	4035					
WRIDAT	002342	1647*	2531	2536	2798	2803	3177	3183	3391	3397			
WRIFOR	002344	1648*	2150	2153	2159	2240	2245	2247	2442	2448	2503	2510	2655	2660
		2661	2747	2749	2758	2928	2931	2980	2982	2988	3165	3168	3302	3305
		3380	3383	3612	3683	3686	3733	3736	3834	3837	3974	3977		
WRL =	004000	1402*												
WRU =	000400	1495*												
WSU =	000004	1489*												
XE2	007342	1877	1891*											
$AUTOB	001134	642*	1771*	4754										
$BDADR	001122	642*	3344*	3414*	4268*	4275*	6266	6277	6280	6282				
$BDDAT	001126	642*	1850*	2102*	2247*	2348*	2362*	2627*	2661*	2694*	3434*	3472*	4372*	4384*
		4451*	4477*	4567*	4699*	6254	6257	6260	6262	6272	6274	6277		
$BELL	001216	642*	4754	4755										
$CHARC	037310	4754**												
$CKSWR	037622	4754*	4837											
$CMTAG	001100	642*	1750											
$CM1 =	000006	642*												
$CM2 =	000014	642*												
$CM3 =	000006	642*												
$CM4 =	000006	642*												
$CNTLC	040373	4754*												
$CNTLG	040405	4754*												
$CNTLU	040400	4754*												
$CRLF	001223	642*	1929	4611	4754	4755	4784	4808	4813					
$DBLK	037064	4754*												
$DOAGN	032666	4122*												
$DTBL	037054	4754*												
$ENDAD	032656	622	4122*											
$ENDCT	032624	4122*												
$ENDMG	032675	4097	4122*											
$ENULL	032672	4100	4122*											
$EOP	032570	1833	1886	4105	4122*									
$EOPCT	032616	4122*												
$ERFLG	001103	642*	4754*	4755*										
$ERMAX	001115	642*	1750*	4754*										
$ERROR	040574	1750	1840	4755*										
$ERRPC	001116	642*	4755*	4790	6254	6257	6260	6262	6264	6266	6269	6272	6274	6277
		6280	6282	6284	6286	6289								
$ERRTB	001226	642*	4798											
$ERRTY	040744	4755	4773*											
$ERTTL	001112	642*	4088	4090*	4755*									
$ESCAP	001214	642*	1750*	4754*	4755									
$FILLC	001156	642*	4754											
$FILLS	001155	642*	4754											
$GDADR	001120	642*												
$GDDAT	001124	642*	1851*	2102*	2247*	2349*	2363*	2627*	2661*	2694*	3434*	3472*	4566*	4698*
		6260	6272	6274	6277									
$GET42	032646	4122*												
$GTSWR	037712	4754*	4837											
$HD =	000000	595												
$HIOCT	040572	4755**												
$ICNT	001104	642*	4754*											
$ILLUP	042550	4837*												
$INTAG	001135	642*	4754*											
$ITEMB	001114	642*	4755*	4787										

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$LF     001224            642#  4754  4755
$LPADR  001106            642#  1750* 1947* 4614* 4617  4754*
$LPERR  001110            642#  1750* 3516* 3881* 3998* 4609  4616* 4754* 4755
$MAIL = ****** U         1750   1771  4754  4755
$MNEW   040423           4754#
$MSWR   040412           4754#
$MXCNT  036646           4754#
$NULL   001154            642#  4754
$NWTST= 000001           1810#  1845* 1857* 1947* 2029* 2040* 2064* 2089* 2128* 2224* 2330* 2435* 2497*
                         2612#  2643# 2722# 2794# 2837# 2890# 2920# 3158# 3250# 3292# 3362# 3458# 3491#
                         3594#  3674# 3724# 3810# 3940# 4085#
$OCNT   042314           4837#*
$OMODE  042316           4837#*
$OVER   036632           4754#
$PASS   001100            642#  4096* 4098  4122* 4754
$POWER  042556           4837#
$PWRAD  042544           4837#
$PWRDN  042404           1750   4837#
$PWRMG  042540           4837#
$PWRUP  042456           4837#
$QUES   001222            642#  4754  4755
$RDCHR  040164           4754#  4837
$RDDEC= ****** U         483
$RDLIN  040254           4754#  4837
$RDOCT  040434           4755#  4837
$RDSZ = 000011           4754#
$REGAD  001160            642#
$REG0   001162            642#
$REG1   001164            642#
$REG2   001166            642#
$REG3   001170            642#
$REG4   001172            642#
$REG5   001174            642#
$RTNAD  032670           4122#
$R2A  = ****** U         4837
$SAVRE= ****** U         4837
$SAVR6  042554           4837#*
$SCOPE  036376           1750   4754#
$SETUP= 000117           1749#  1750  1771  4122  4754  4755
$SSI  = 000000           1751#
$STUP = 177777           1749#
$SVLAD  036604           4754#
$SVPC = 000200            622#
$SWP  = 167770            595#   619   642  1750  1810  1845  1857  1947  2029  2040  2064  2089  2128
                         2224   2330  2435  2497  2612  2643  2722  2794  2837  2890  2920  3158  3250
                         3292   3362  3458  3491  3594  3674  3724  3810  3940  4085  4122  4754  4755
                         4837
$SWPMK= 000000            619  4754
$TIMES  001212            642#  1750* 1810* 1845* 1857* 1947* 4085* 4122* 4754*
$TKB    001146            642#  4754
$TKCNT  037314           4754#*
$TKINT  037234           1759   1859  2093  4717  4754#
$TKQEN= 037333           4754#
$TKQIN  037316           4754#*
$TKQOU  037320           4754#*
$TKQSR  037322           4754#
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$TKS    001144            642#  4754#
$TKSRV  037404           4754#
$TMP0   001176            642#  1901#  1902#
$TMP1   001200            642#  1823#  2050#  2051#  2074#  2075#  3498#  3501   3503#  3507   3511   3512#  3816#
                         3867#  3877#  3936#  3959#  3962#  3990#  3999#  4043   4045#  4052   4054   4058#  4059
                         4060   4063   4070   4073   4077#  6264
$TMP2   001202            642#
$TMP3   001204            642#
$TMP4   001206            642#
$TMP5   001210            642#
$TN   = 000041            595#  1803   1807   1810#  1845#  1850   1857#  1858   1944   1947#  1948   2029#  2034
                         2040#  2041   2056   2059   2064#  2065   2079   2089#  2096   2128#  2224#  2330#  2435#
                         2497#  2612#  2643#  2722#  2794#  2837#  2890#  2920#  3158#  3250#  3292#  3360   3362#
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                         1767#  1838#  1840#  1863#  1885#  1922#  1924#  1926#  1970#  1994#  2016#  2018#  2020#
                         2034#  2036#  4086#  4088#  4122   4612#  4615#  4730#  4734#  4736#  4738#  4746#  4754#
                         4755   4781#  4835#  4837   6335#
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	4755	4837													
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	3810	3940	4085	4122											
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	4754	4755	4837												
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VECSET	619#	2100	2159	2196	2226	2244	2298	2332	2381	2447	2475	2509	2535	2573	2615
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WTT              619#   2102    2161    2198    2227    2247    2291    2305    2332    2375    2387    2450    2478    2512    2538
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 ERRORS DETECTED:  0

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 RUN-TIME RATIO: 588/76=7.7
 CORE USED:  28K  (55 PAGES)
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N13