RP07

RP07 FCTNL TEST
CZRJLB0

AH-F959B-MC
FICHE 1 OF 1

APR 1984
digital
Made In USA

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IDENTIFICATION

PRODUCT CODE: AC F958B MC

PRODUCT NAME: CZRJLB0 RP07 FUNCTIONAL TEST

PRODUCT DATE: DECEMBER 1, 1983

MAINTAINER: 'CX DIAGNOSTIC ENGINEERING

A.THOR: MIKE LEAVITT

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TABLE OF CONTENT

1.0 GENERAL INFORMATION

1.1 PROGRAM ABSTRACT

THE RP07 FUNCTIONAL DRIVE TEST CONTAINS A SERIES OF TESTS THAT WILL VERIFY THAT THE DISK IS CAPABLE OF PERFORMING SEEKS, THAT THE SEEKS AND ACCESS TIMES ARE WITHIN TOLERANCE, THAT THE ADDRESSING CIRCUITRY OPERATES PROPERLY, AND THAT WRITE AND READ DATA CAPABILITIES ARE FUNCTIONAL.

THIS DIAGNOSTIC HAS BEEN WRITTEN FOR USE WITH THE DIAGNOSTIC RUNTIME SERVICES SOFTWARE (SUPERVISOR). THESE SERVICES PROVIDE THE INTERFACE TO THE OPERATOR AND TO THE SOFTWARE ENVIRONMENT. THIS PROGRAM CAN BE USED WITH XXDP+, ACT, APT, SLIDE AND PAPER TAPE. FOR A COMPLETE DESCRIPTION OF THE RUNTIME SERVICES, REFER TO THE XXDP+ USER'S MANUAL. THERE IS A BRIEF DESCRIPTION OF THE RUNTIME SERVICES IN SECTION 2 OF THIS DOCUMENT.

1.2 SYSTEM REQUIREMENTS

THIS PROGRAM WILL REQUIRE THE FOLLOWING SYSTEM HARDWARE:

1. AN XXDP+ LOAD MEDIUM
2. A CONSOLE KEYBOARD/PRINTER
3. 28K WORDS OF MAIN MEMORY
4. A PDP 11 PROCESSOR WHICH HAS THE THROUGHPUT CAPABILITY EQUAL TO AT LEAST 2.2 MBYTES/SEC FOR OPERATION IN NON INTERLEAVED MODE OR 1.3 MBYTES/SECOND FOR OPERATION IN INTERLEAVED MODE.
5. ONE RH70 OR RH11 CONTROLLER
6. A PROGRAMMABLE CLOCK (KW11-P)

1.3 RELATED DOCUMENTS AND STANDARDS

XXDP+ USER'S MANUAL (CHQUS)
RP07 PURCHASE SPECIFICATIONS (A-PS 3015478 0 0)

1.4 DIAGNOSTIC HIERARCY PREREQUISITES

RP07 FRONT END DIAGNOSTIC.
RP07 PDP11 FORMATTER.

1.5 RESTRICTIONS

THIS PROGRAM WILL NOT BE ABLE TO RUN ANY OF THE AVAILABLE RP07 RESIDENT MICRODIAGNOSTICS.

THIS PROGRAM WILL NOT RUN ON LSI-11 CPU'S.

THE COMMANDS: NOP, DIAGNOSTIC, FORMAT TRACK, AND READ/WRITE TRACK DESCRIPTOR ARE NOT USED.

IF A KW11 P SYSTEM CLOCK IS NOT INSTALLED ON THE SYSTEM, THE TIMING TESTS WILL NOT BE EXECUTED.

THE PROGRAM DOES NOT PROVIDE MODULE CALLOUT IN THE ERROR PRINTOUT.

2.0 OPERATING INSTRUCTIONS

THIS SECTION CONTAINS A BRIEF DESCRIPTION OF THE RUNTIME SERVICES. FOR DETAILED INFORMATION, REFER TO THE XXDP+ USER'S MANUAL (CHQUS).

2.1 COMMANDS

THERE ARE ELEVEN LEGAL COMMANDS FOR THE DIAGNOSTIC RUNTIME SERVICES (SUPERVISOR). THIS SECTION LISTS THE COMMANDS AND GIVES A VERY BRIEF DESCRIPTION OF THEM. THE XXDP+ USER'S MANUAL HAS MORE DETAILS.

COMMAND	EFFECT
START	START THE DIAGNOSTIC FROM AN INITIAL STATE
RESTART	START THE DIAGNOSTIC WITHOUT INITIALIZING
CONTINUE	CONTINUE AT TEST THAT WAS INTERRUPTED (AFTER ↑C)
PROCEED	CONTINUE FROM AN ERROR HALT
EXIT	RETURN TO XXDP+ MONITOR (XXDP+ OPERATION ONLY!)
ADD	ACTIVATE A UNIT FOR TESTING (ALL UNITS ARE CONSIDERED TO BE ACTIVE AT START TIME
DROP	DEACTIVATE A UNIT
PRINT	PRINT STATISTICAL INFORMATION (IF IMPLEMENTED BY THE DIAGNOSTIC - SECTION 4.0)
DISPLAY	TYPE A LIST OF ALL DEVICE INFORMATION
FLAGS	TYPE THE STATE OF ALL FLAGS (SEE SECTION 2.3)
ZFLAGS	CLEAR ALL FLAGS (SEE SECTION 2.3)

A COMMAND CAN BE RECOGNIZED BY THE FIRST THREE CHARACTERS. SO YOU MAY, FOR EXAMPLE, TYPE "STA" INSTEAD OF "START".

2.2 SWITCHES

THERE ARE SEVERAL SWITCHES WHICH ARE USED TO MODIFY SUPERVISOR OPERATION. THESE SWITCHES ARE APPENDED TO THE LEGAL COMMANDS. ALL OF THE LEGAL SWITCHES ARE TABULATED BELOW WITH A BRIEF DESCRIPTION OF EACH. IN THE DESCRIPTIONS BELOW, A DECIMAL NUMBER IS DESIGNATED BY "DDDDD'.

SWITCH	EFFECT
/TESTS:LIST	EXECUTE ONLY THOSE TESTS SPECIFIED IN THE LIST. LIST IS A STRING OF TEST NUMBERS, FOR EXAMPLE - /TESTS:1:5:7-10. THIS LIST WILL CAUSE TESTS 1,5,7,8,9,10 TO BE RUN. ALL OTHER TESTS WILL NOT BE RUN.
/PASS:DDDDD	EXECUTE DDDDD PASSES (DDDDD = 1 TO 64000)
/FLAGS:FLGS	SET SPECIFIED FLAGS. FLAGS ARE DESCRIBED IN SECTION 2.3.
/EOP:DDDDD	REPORT END OF PASS MESSAGE AFTER EVERY DDDDD PASSES ONLY. (DDDDD = 1 TO 64000)
/UNITS:LIST	TEST/ADD/DROP ONLY THOSE UNITS SPECIFIED

IN THE LIST. LIST EXAMPLE - /UNITS:0:5:10-12
USE UNITS 0,5,10,11,12 (UNIT NUMBERS = 0-63)

EXAMPLE OF SWITCH USAGE:

START/TESTS:1-5/PASS:1000/EOP:100

THE EFFECT OF THIS COMMAND WILL BE: 1) TESTS 1 THROUGH 5 WILL BE EXECUTED, 2) ALL UNITS WILL TESTED 1000 TIMES AND 3) THE END OF PASS MESSAGES WILL BE PRINTED AFTER EACH 100 PASSES ONLY. A SWITCH CAN BE RECOGNIZED BY THE FIRST THREE CHARACTERS. YOU MAY, FOR EXAMPLE, TYPE "/TES:1-5" INSTEAD OF '/TESTS:1 5'.

BELOW IS A TABLE THAT SPECIFIES WHICH SWITCHES CAN BE USED BY EACH COMMAND.

	TESTS	PASS	FLAGS	EOP	UNITS
START	X	X	X	X	X
RESTART	X	X	X	X	X
CONTINUE		X	X	X	
PROCEED			X		
DROP					X
ADD					X
PRINT					
DISPLAY					X
FLAGS					
ZFLAGS					
EXIT					

2.3 FLAGS

FLAGS ARE USED TO SET UP CERTAIN OPERATIONAL PARAMETERS SUCH AS LOOPING ON ERROR. ALL FLAGS ARE CLEARED AT STARTUP AND REMAIN CLEARED UNTIL EXPLICITLY SET USING THE FLAGS SWITCH. FLAGS ARE ALSO CLEARED AFTER A START COMMAND UNLESS SET USING THE FLAG SWITCH. THE ZFLAGS COMMAND MAY ALSO BE USED TO CLEAR ALL FLAGS. WITH THE EXCEPTION OF THE START AND ZFLAGS COMMANDS, NO COMMANDS AFFECT THE STATE OF THE FLAGS; THEY REMAIN SET OR CLEARED AS SPECIFIED BY THE LAST FLAG SWITCH.

FLAG	EFFECT
HOE	HALT ON ERROR - CONTROL IS RETURNED TO RUNTIME SERVICES COMMAND MODE
LOE	LOOP ON ERROR
IER*	INHIBIT ALL ERROR REPORTS
IBR*	INHIBIT ALL ERROR REPORTS EXCEPT FIRST LEVEL (FIRST LEVEL CONTAINS ERROR TYPE, NUMBER PC, TEST AND UNIT)
IXR*	INHIBIT EXTENDED ERROR REPORTS (THOSE CALLED BY PRINTX MACRO'S)
PRI	DIRECT MESSAGES TO LINE PRINTER
PNT	PRINT TEST NUMBER AS TEST EXECUTES
BOE	"BELL" ON ERROR
UAM	UNATTENDED MODE (NO MANUAL INTERVENTION)

ISR	INHIBIT STATISTICAL REPORTS (DOES NOT APPLY TO DIAGNOSTICS WHICH DO NOT SUPPORT STATISTICAL REPORTING)
IDR	INHIBIT PROGRAM DROPPING OF UNITS
ADR	EXECUTE AUTODROP CODE
LOT	LOOP ON TEST
EVL	EXECUTE EVALUATION (ON DIAGNOSTICS WHICH HAVE EVALUATION SUPPORT)

* ERROR MESSAGES ARE DESCRIBED IN SECTION 3.1

SEE THE XXDP* USER'S MANUAL FOR MORE DETAILS ON FLAGS. YOU MAY SPECIFY MORE THAN ONE FLAG WITH THE FLAG SWITCH. FOR EXAMPLE, TO CAUSE THE PROGRAM TO LOOP ON ERROR, INHIBIT ERROR REPORTS AND TYPE A 'BELL" ON ERROR, YOU MAY USE THE FOLLOWING STRING:

```
/FLAGS:LOE:IER:BOE
```

2.4 HARDWARE QUESTIONS

WHEN A DIAGNOSTIC IS STARTED, THE RUNTIME SERVICES WILL PROMPT THE USER FOR HARDWARE INFORMATION BY TYPING "CHANGE HW (L) ?" YOU MUST ANSWER "Y" AFTER A START COMMAND UNLESS THE HARDWARE INFORMATION HAS BEEN "PRELOADED' USING THE SETUP UTILITY (SEE CHAPTER 6 OF THE XXDP* USER'S MANUAL). WHEN YOU ANSWER THIS QUESTION WITH A "Y", THE RUNTIME SERVICES WILL ASK FOR THE NUMBER OF UNITS (IN DECIMAL). YOU WILL THEN BE ASKED THE FOLLOWING QUESTIONS FOR EACH UNIT.

```
UNIT 0
RPCS1 ADRS (O)  176700 ?
VECTOR ADRS (O)  254 ?
BR LEVEL (O)  5 ?
DRIVE # (O)  0 ?
```

THE 1ST QUESTION "RPCS1 ADRS" REQUIRES THAT THE USER INPUT THE ADDRESS OF RPCS1 OF THE CONTROLLER WHICH IS CONNECTED TO THE DRIVE UNDER TEST. DEFAULT IS 176700 (OCTAL).

THE 2ND QUESTION "VECTOR ADRS" REQUIRES THE USER TO INPUT THE INTERRUPT VECTOR ADDRESS OF THE RHXX CONTROLLER. DEFAULT IS 254 (OCTAL).

THE 3RD QUESTION "BR LEVEL" REQUIRES THE USER TO INPUT THE CONTROLLER INTERRUPT PRIORITY LEVEL. DEFAULT IS LEVEL 5.

THE 4TH QUESTION "DRIVE #" REQUIRES THE USER TO SPECIFY THE DRIVE NUMBER OF THE DRIVE TO BE TESTED. DEFAULT IS 0 (OCTAL).

2.5 SOFTWARE QUESTIONS

AFTER YOU HAVE ANSWERED THE HARDWARE QUESTIONS OR AFTER A RESTART OR CONTINUE COMMAND, THE RUNTIME SERVICES WILL ASK FOR SOFTWARE PARAMETERS. THESE PARAMETERS WILL GOVERN SOME DIAGNOSTIC SPECIFIC

OPERATION MODES. YOU WILL BE PROMPTED BY "CHANGE SW (L) ?", IF YOU WISH TO CHANGE ANY PARAMETERS, ANSWER BY TYPING "Y". THE SOFTWARE QUESTIONS AND THE DEFAULT VALUES ARE DESCRIBED AS FOLLOWS:

CHANGE DRIVE PARAMETER (L) N ?

IF THE RESPONSE TO THE PREVIOUS QUESTION IS 'N' THE FOLLOWING DRIVE PARAMETER QUESTIONS WILL BE SKIPPED AND PROGRAM WILL PROCEED AS NORMAL. A 'Y' RESPONSE WILL ALLOW THE USER TO ANSWER THE FOLLOWING DRIVE PARAMETER QUESTIONS.

```
STARTING  CYL (D)  0 ?       **(TESTS 2-4,6-8,11,13,14,17,18)
ENDING    CYL (D)  629 ?     **(TESTS 2 4,6,8,10,14,17,18)
INCREMENT CYL (D)  1 ?       **(TESTS 2)
STARTING  TRK (D)  0 ?       **(TESTS 2-7,11,13,16,17)
ENDING    TRK (D)  31 ?      **(TESTS 3-6,11,14,16-18)
INCREMENT TRK (D)  1 ?       **(TESTS 11,16,17)
STARTING  SEC (D)  0 ?       **(TESTS 2,5-7,13)
ENDING    SEC (D)  49 ?      **(TESTS 5,6,14,18)
DATA  PATTERN (O)  030221 ?  **(TESTS 16,17,18)
```

IF THE FIELD VERSION OF THIS PROGRAM IS BEING RUN, THE FOLLOWING QUESTION WILL BE ASKED.

DO YOU WANT TO WRITE ANYWHERE ON MEDIA (L) N ?

IF THE RESPONSE TO THE PREVIOUS QUESTION IS 'N', THE FOLLOWING QUESTION WILL BE SKIPPED AND PROGRAM WILL PROCEED AS NORMAL. A 'Y' RESPONSE WILL PRINT THE FOLLOWING WARNING MESSAGE TO THE OUTPUT DEVICE AND ASK THE FOLLOWING QUESTION.

! CUSTOMER DATA WILL BE OVERWRITTEN !

CONTINUE (L) ?
**(TESTS 17,18)

IF THE RESPONSE TO THE PREVIOUS QUESTION IS 'N', THE FOLLOWING QUESTION WILL BE SKIPPED AND THE PROGRAM WILL NOT ALLOW TESTS 17-18 TO BE SELECTED FOR TESTING. A 'Y' RESPONSE WILL ASK THE FOLLOWING QUESTION.

USE RANDOM DATA PATTERNS FOR RANDOM WRITE TEST (L) N ?
**(TESTS 18)

PERFORM READ HEADER & DATA DURING SEEKS (L) Y ?
**(TESTS 2-6)

TYPE TIME REPORTS (L) N ?
**(TESTS 7-10,14,18)

INHIBIT SOFTWARE TIMEOUTS (L) N ?
**(ALL TESTS)

TIMING TESTS, STALL BETWEEN SEEKS: RANDOM INSTEAD OF 2 MSEC (L) N ?
**(TESTS 7-10,14,18)

STALL AFTER EVERY DRIVE FUNCTION IN NON TIMING TESTS (L) N ?

**(TESTS 1 6,11,13,14-18)

*USE RANDOM STALL TIMES (L) N ?
**(TESTS 1-6,11,13,14-18)

* THAT QUESTION IS ASKED WHEN YES IS ANSWERED TO THE QUESTION.
** INDICATES NOT PART OF THE DIALOGUE.

STALL DEFINITIONS

THERE ARE TWO DISTINCT STALLS :

1. SELECTABLE STALL, VIA SOFTWARE (SW) DIALOGUE: 10. MSEC OR RANDOM (1-64 MSEC) STALL TIME AFTER EVERY DRIVE FUNCTION IN NON-TIMING TESTS.

2. NON-SELECTABLE, 2 MSEC OR RANDOM STALL BETWEEN SEEKS IN TIMING TESTS 8. THRU 10.

A 'N' RESPONSE TO THE SUPERVISOR QUESTION "CHANGE SW (L)?" WILL ASSUME THE ASSIGNED SOFTWARE (SW) DEFAULT CONDITIONS: REPEATS = 1, STARTING CYLINDER = 0, ENDING CYLINDER = 629, STARTING TRACK = 0, ENDING TRACK = 31, INCREMENT TRACK = 1, STARTING SECTOR = 0, ENDING SECTOR = 49, PATTERN = 030221, WRITE ON ALL CYLINDERS WITHIN SPECIFIED LIMITS, RUN TESTS 1-18, DO READ HEADER AND DATA COMMAND IN SEEK TESTS 2 6, NO STALL, NO TIME REPORTS, SOFTWARE TIMEOUTS ENABLED.

NOTE

IF RUNNING THE FIELD VERSION OF THIS PROGRAM, TESTS 17 AND 18 WILL ONLY BE RUN WHEN THE "WRITE DATA ANYWHERE ON THE MEDIA" OPTION IS SELECTED BY THE OPERATOR.

2.6 EXTENDED P-TABLE DIALOGUE

WHEN YOU ANSWER THE HARDWARE QUESTIONS, YOU ARE BUILDING ENTRIES IN A TABLE THAT DESCRIBES THE DEVICES UNDER TEST. THE SIMPLEST WAY TO BUILD THIS TABLE IS TO ANSWER ALL QUESTIONS FOR EACH UNIT TO BE TESTED. IF YOU HAVE A MULTIPLEXED DEVICE SUCH AS A MASS STORAGE CONTROLLER WITH SEVERAL DRIVES OR A COMMUNICATION DEVICE WITH SEVERAL LINES, THIS BECOMES TEDIOUS SINCE MOST OF THE ANSWERS ARE REPETITIOUS.

TO ILLUSTRATE A MORE EFFICIENT METHOD, SUPPOSE YOU ARE TESTING A FICTIONAL DEVICE, THE XY11. SUPPOSE THIS DEVICE CONSISTS OF A CONTROL MODULE WITH EIGHT UNITS (SUB-DEVICES) ATTACHED TO IT. THESE UNITS ARE DESCRIBED BY THE OCTAL NUMBERS 0 THROUGH 7. THERE IS ONE HARDWARE PARAMETER THAT CAN VARY AMONG UNITS CALLED THE Q-FACTOR. THIS Q-FACTOR MAY BE 0 OR 1. BELOW IS A SIMPLE WAY TO BUILD A TABLE FOR ONE XY11 WITH EIGHT UNITS.

\# UNITS (D) ? 8<CR>

UNIT 1

```
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  0<CR>
        Q-FACTOR (O) O ?  1<CR>

        UNIT 2
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  1<CR>
        Q-FACTOR (O) 1 ?  0<CR>

        UNIT 3
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  2<CR>
        Q-FACTOR (O) O ?  <CR>

        UNIT 4
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  3<CR>
        Q-FACTOR (O) O ?  <CR>

        UNIT 5
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  4<CR>
        Q-FACTOR (O) O ?  <CR>

        UNIT 6
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  5<CR>
        Q-FACTOR (O) O ?  <CR>

        UNIT 7
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  6<CR>
        Q FACTOR (O) O ?  1<CR>

        UNIT 8
        CSR ADDRESS (O)  160000<CR>
        SUB-DEVICE # (O) ?  7<CR>
        Q-FACTOR (O) 1 ?  <CR>
```

NOTICE THAT THE DEFAULT VALUE FOR THE Q-FACTOR CHANGES WHEN A NON DEFAULT RESPONSE IS GIVEN. BE CAREFUL WHEN SPECIFYING MULTIPLE UNITS!

AS YOU CAN SEE FROM THE ABOVE EXAMPLE, THE HARDWARE PARAMETERS DO NOT VARY SIGNIFICANTLY FROM UNIT TO UNIT. THE PROCEDURE SHOWN IS NOT VERY EFFICIENT.

THE RUNTIME SERVICES CAN TAKE MULTIPLE UNIT SPECIFICATIONS HOWEVER. LET'S BUILD THE SAME TABLE USING THE MULTIPLE SPECIFICATION FEATURE.

```
        # UNITS (D) ?  8<CR>

        UNIT 1
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  0,1<CR>
        Q FACTOR (O) O ?  1,0<CR>
```

```
UNIT 3
CSR ADDRESS (O) ?  160000<CR>
SUB-DEVICE # (O) ?  2-5<CR>
Q-FACTOR (O) O ?  0<CR>

UNIT 7
CSR ADDRESS (O) ?  160000<CR>
SUB DEVICE # (O) ?  6,7<CR>
Q-FACTOR (O) O ?  1<CR>
```

AS YOU CAN SEE IN THE ABOVE DIALOGUE, THE RUNTIME SERVICES WILL BUILD AS MANY ENTRIES AS IT CAN WITH THE INFORMATION GIVEN IN ANY ONE PASS THROUGH THE QUESTIONS. IN THE FIRST PASS, TWO ENTRIES ARE BUILT SINCE TWO SUB-DEVICES AND Q-FACTORS WERE SPECIFIED. THE SERVICES ASSUME THAT THE CSR ADDRESS IS 160000 FOR BOTH SINCE IT WAS SPECIFIED ONLY ONCE. IN THE SECOND PASS, FOUR ENTRIES WERE BUILT. THIS IS BECAUSE FOUR SUB-DEVICES WERE SPECIFIED. THE "-" CONSTRUCT TELLS THE RUNTIME SERVICES TO INCREMENT THE DATA FROM THE FIRST NUMBER TO THE SECOND. IN THIS CASE, SUB-DEVICES 2, 3, 4 AND 5 WERE SPECIFIED. (IF THE SUB-DEVICE WERE SPECIFIED BY ADDRESSES, THE INCREMENT WOULD BE BY 2 SINCE ADDRESSES MUST BE ON AN EVEN BOUNDARY.) THE CSR ADDRESSES AND Q-FACTORS FOR THE FOUR ENTRIES ARE ASSUMED TO BE 160000 AND 0 RESPECTIVELY SINCE THEY WERE ONLY SPECIFIED ONCE. THE LAST TWO UNITS ARE SPECIFIED IN THE THIRD PASS.

THE WHOLE PROCESS COULD HAVE BEEN ACCOMPLISHED IN ONE PASS AS SHOWN BELOW.

```
# UNITS (D) ?  8<CR>

UNIT 1
CSR ADDRESS (O) ?  160000<CR>
SUB DEVICE # (O) ?  0 7<CR>
Q FACTOR (O) O ?  0,1,0,,,,1,1<CR>
```

AS YOU CAN SEE FROM THIS EXAMPLE, NULL REPLIES (COMMAS ENCLOSING A NULL FIELD) TELL THE RUNTIME SERVICES TO REPEAT THE LAST REPLY.

2.7 QUICK START-UP PROCEDURE (XXDP+)

TO START-UP THIS PROGRAM:

1. BOOT XXDP+
2. GIVE THE DATE AND ANSWER THE LSI AND 50HZ (IF THERE IS A CLOCK) QUESTIONS
3. TYPE "R NAME", WHERE NAME IS THE NAME OF THE BIN OR BIC FILE FOR THIS PROGRAM
4. TYPE "START"
5. ANSWER THE "CHANGE HW" QUESTION WITH "Y"

6. ANSWER ALL THE HARDWARE QUESTIONS

7. ANSWER THE "CHANGE SW" QUESTION WITH "N"

WHEN YOU FOLLOW THIS PROCEDURE YOU WILL BE USING ONLY THE DEFAULTS FOR FLAGS AND SOFTWARE PARAMETERS. THESE DEFAULTS ARE DESCRIBED IN SECTIONS 2.3 AND 2.5.

3.0 ERROR INFORMATION

3.1 TYPES OF ERROR MESSAGES

THERE ARE THREE LEVELS OF ERROR MESSAGES THAT MAY BE ISSUED BY A DIAGNOSTIC: GENERAL, BASIC AND EXTENDED. GENERAL ERROR MESSAGES ARE ALWAYS PRINTED UNLESS THE "IER" FLAG IS SET (SECTION 2.3). THE GENERAL ERROR MESSAGE IS OF THE FORM:

```
NAME  TYPE  NUMBER  ON UNIT NUMBER  TST NUMBER PC:XXXXXX
ERROR MESSAGE
```

```
,WHERE; NAME = DIAGNOSTIC NAME
        TYPE = ERROR TYPE (SYS FATAL, DEV FATAL, HARD OR SOFT)
        NUMBER = ERROR NUMBER
        UNIT NUMBER = 0 - N (N IS LAST UNIT IN PTABLE)
        TST NUMBER = TEST AND SUBTEST WHERE ERROR OCCURRED
        PC:XXXXXX = ADDRESS OF ERROR MESSAGE CALL
```

BASIC ERROR MESSAGES ARE MESSAGES THAT CONTAIN SOME ADDITIONAL INFORMATION ABOUT THE ERROR. THESE ARE ALWAYS PRINTED UNLESS THE "IER" OR "IBR" FLAGS ARE SET (SECTION 2.3). THESE MESSAGES ARE PRINTED AFTER THE ASSOCIATED GENERAL MESSAGE.

EXTENDED ERROR MESSAGES CONTAIN SUPPLEMENTARY ERROR INFORMATION SUCH AS REGISTER CONTENTS OR GOOD/BAD DATA. THESE ARE ALWAYS PRINTED UNLESS THE "IER", "IBR" OR "IXR" FLAGS ARE SET (SECTION 2.3). THESE MESSAGES ARE PRINTED AFTER THE ASSOCIATED GENERAL ERROR MESSAGE AND ANY ASSOCIATED BASIC ERROR MESSAGES.

3.2 ERROR PRINTOUT

THE ERROR PRINTOUT WILL CONTAIN A ONE LINE ERROR DESCRIPTION FOLLOWED BY COLUMN HEADINGS AND COLUMNS OF REGISTER CONTENTS IN OCTAL.

EXAMPLE:

```
CZRXXX  HRD  ERR  00XXX  ON UNITXX  TSTXX  SUBXX  PCXXXXX
RP07 ADDRESSING ERROR (IAE AOE)
CYL XXX.  TRK XX.  SEC XX.     RPER2  (HEX) XXXX

DRIVE  RPCS1  RPWC   RPBA   RPDA   RPCS2  RPDS
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX
RPER1  RPAS   RPLA   RPDB   RPMR1  RPDT   RPSN
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX
RP0F   RPDC   RPCC   RPER2  RPER3  RPEC1  RPEC2
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX
```

THE FIRST LINE OF THE ERROR MESSAGE IS PRODUCED BY THE DIAGNOSTIC SUPERVISOR. THERE ARE SEVEN ITEMS REPRESENTED IN THE FIRST LINE OF OUTPUT. THEY ARE: 1) THE MAINDEC NUMBER, 2) THE TYPE OF ERROR, IE: HARD, DEVICE FATAL, 3) THE ERROR MESSAGE NUMBER, 4) THE FAILING LOGICAL UNIT NUMBER, 5) THE NUMBER OF THE FAILING TEST, 6) THE NUMBER OF THE FAILING SUB TEST, 7) THE ACTUAL PROGRAM COUNT OF THE FAILURE MESSAGE.

THE SECOND LINE PRODUCES INFORMATION ABOUT THE SPECIFIC FAILURE MODE. THE BALANCE OF THE ERROR REPORT CONTAINS REGISTER STATUS TO AID THE F.E. IN FAULT DETECTION AND POSSIBLE ISOLATION.

3.3 SPECIFIC ERROR MESSAGES

INIT CODE ERRORS

ON A START COMMAND OR ON A NEW PASS, THE DRIVE AVAILABILITY IS CHECKED IN THE INIT CODE, BEFORE RUNNING THE TESTS. A DRIVE NOT AVAILABLE IS APPROPRIATELY REPORTED AND THE CURRENT PASS ABORTED FOR THAT UNIT:

```
    DRIVE N UNSAFE
    DRIVE N NON-EXISTENT
    DRIVE N OFF-LINE
    DRIVE N NOT A RP07
```

WHERE 'N' IS THE DRIVE NUMBER THAT FAILED

NUMBERED ERROR LIST

```
    1:   RHXX CONTROL BUS PARITY ERROR MCPE=1
    2:   RHXX DATA BUS PARITY ERROR MDPE=1
    3:   RHXX ILLEGAL CONDITIONS SET (NED,NEM,PGE,MXF)
    4:   WRITE CHECK ERROR
    5:   DATA LATE ERROR
    6:   DRIVE PROGRAMMING ERROR (PGE)
    7:   LOSTS BIT CLOCK (LBC)
    11:  WRITE CLOCK FAILS
    12:  WRITE LOCK ERROR
    13:  DATA ERROR (DCK)
    14:  DRIVE BUS PARITY ERROR (DPE)
    15:  ILLEGAL CONDITIONS SET (ILF,ILR,RMR)
    16:  ADDRESSING ERROR (IAE,AOE)
    17:  SEEK ERROR (SKI,LCE)
    20:  CLOCK (KW11-P) OVERFLOW IN TIMING TEST
    21:  EARLY WARNING (EWN)
    22:  READ AND WRITE HEAD FAILS
    23:  DATA FORMAT BIT ERROR (FER)
    24:  HEADER INFORMATION ERROR (HCE)
    25:  DRIVE HAS BECOME NON-EXISTENT                       (1)
    26:  DRIVE HAS NOT RESPONDED TO PORT REQUEST
    27:  SOFTWARE TIMEOUT ON THIS DRIVE
    30:  FATAL MASSBUS PARITY ERROR (MCPE=1 OR PAR=1)        (1)
    31:  OFFLINE OR UNSAFE DRIVE REQUESTED                   (1)
    32:  WRITE READY UNSAFE
```

```
33:  DC POWER UNSAFE
34:  INDEX UNSAFE
35:  PROCESSOR HANDSHAKE FAILURE
36:  DRIVE OFF LINE OR NOT A RP07                                    (1)
41:  OPERATION INCOMPLETE (OPI)
42:  IMPROPER HEADER DATA                                            (2)
43:  ECC LOGIC FAILURE
44:  MISC DRIVE ERROR: RPER1, RPER2, RPER3
45:  DRIVE TIMING ERROR (DTE)
46:  HEADER CRC ERROR (HCRC)
47:  UNCORRECTABLE ECC ERROR
50:  LAST BLOCK TFR LBT NOT SET WHEN READING LAST SECTOR             (4)
51:  AD OVFL AOE NOT SET WHEN READING PAST LAST SECTOR               (4)
52:  HARD ERROR -                                                    (3)
53:  SOFT ERROR -                                                    (3)
54:  OM OF RPDS NOT SET ON OFFSET CMD                                (4)
55:  OM OF RPDS NOT RESET ON RET CENTER CMD                          (4)

MOST OF THE NUMBERED ERRORS ABOVE WILL ALSO CAUSE A DUMP OF THE
FORMAT BELOW, CONSISTING OF 2 PARTS, A BASIC, THEN AN EXTENDED
ERROR MESSAGE, BOTH CONTROLLED BY IBR AND IXR FLAGS:

    CYL XXX.  TRK XX.  SEC XX.     RPER2  (HEX) XXXX

    DRIVE  RPCS1  RPWC   RPBA   RPDA   RPCS2  RPDS
    XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX
    RPER1  RPAS   RPLA   RPDB   RPMR1  RPDT   RPSN
    XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX
    RPOF   RPDC   RPCC   RPER2  RPER3  RPEC1  RPEC2
    XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX

EXCEPTIONS:

    (1)  DRIVE N

    (2)  DRV CYL TRK SEC
         XXX XXX XXX XXX
         GDCYL GDTRK GDSEC BDCYL BDTRK BDSEC
         XXX   XXX   XXX   XXX   XXX   XXX

    (3)  # OF OPERATIONS WITH A LOST REVOLUTION:  XXXX
         XXXX OPERATIONS TIMED

         ALLOWABLE OPERATION TIME LIMIT
         MAX= XXXXX US

    (4)  NO ADDITIONAL MESSAGES

    (5)  TIMING TESTS 7, 14, 18:

         UNRECOVERABLE SEARCH ERROR
         ABORT TEST

         SEARCH FAILED AFTER 16 RETRIES
         ABORT TEST
```

(6) TIMING TESTS 8 10, 14, 18:

POSITION ERROR: ABORT TEST

3.4 ERROR TYPE

THE FIRST LINE OF ERROR MESSAGES PRODUCED BY THE DIAGNOSTIC SUPERVISOR IDENTIFIES THE TYPE OF ERROR REPORTED. THEY ARE CLASSIFIED BY THE DIAGNOSTICS IN 3 CATEGORIES:

1. 'SFT' SOFT: THE FIRST LOST DISC REVOLUTION IN THE ADDRESS MARK DETECTION TESTS.

2. 'HRD' - HARD: ALL ERRORS, EXCEPT DEVICE FATAL ERRORS AND SOFT ERRORS.

3. 'DVC FTL - DEVICE FATAL: AN ERROR THAT FAILS THE DEVICE; DEVICE NOT READY, NON-EXISTENT OR NOT AN RP07.

4.0 PERFORMANCE AND PROGRESS REPORTS

AT THE END OF EACH PASS, THE PASS COUNT IS GIVEN ALONG WITH THE TOTAL NUMBER OF ERRORS REPORTED SINCE THE DIAGNOSTIC WAS STARTED. THE "EOP" SWITCH CAN BE USED TO CONTROL HOW OFTEN THE END OF PASS MESSAGE IS PRINTED. SECTION 2.2 DESCRIBES SWITCHES.

5.0 TEST SUMMARIES

TEST 1: RECAL TEST

THIS TEST EXECUTES A RECALIBRATE COMMAND, THEN EXECUTES A READ HEADER AND DATA COMMAND TO VERIFY CORRECT POSITION.

NOTE

IN SEEK TESTS 2-6, SEEK POSITIONING IS VERIFIED VIA READ HEADER AND DATA COMMAND, UNSUPERSEDED BY SOFTWARE (SW) DIALOGUE, IN WHICH CASE SEEK POSITIONING IS NOT VERIFIED.

TEST 2: INCREMENTAL SEEK TEST

THIS TEST EXECUTES FORWARD SEEKS TO ADVANCE THE FIRST(STARTING) CYLINDER ADDRESS TO THE LAST(ENDING) CYLINDER ADDRESS INCREMENTALLY. WHEN THE LAST(ENDING) CYLINDER IS REACHED, THE TEST IS REPEATED IN THE REVERSE DIRECTION. THE INCREMENT/DECREMENT VALUE IS 1 BY DEFAULT, CHANGEABLE VIA SW DIALOGUE.

TEST 3: RANDOM SEEK TEST

THIS TEST EXECUTES 1024. SEEK OPERATIONS RANDOMLY BETWEEN THE GIVEN FIRST(STARTING) CYLINDER ADDRESS AND LAST(ENDING) CYLINDER ADDRESS.

TEST 4: RECAL/RANDOM SEEK TEST

THIS TEST EXECUTES A RECALIBRATE COMMAND, FOLLOWED BY A SEEK TO A RANDOMLY SELECTED CYLINDER. THIS SEQUENCE IS REPEATED 10. TIMES.

TEST 5: SEEK DIFFERENTIAL TEST

THIS TEST CONSISTS OF 3 SUBTESTS TO TEST THE HEAD POSITIONER AND SERVO SYSTEM RESPONSE TO 3 UNIQUE DIFFERENTIAL SEEK PROFILES:

1. 6 CYLINDER DIFFERENTIAL SEEK: FORCES A SLEW RATE CHANGE BY SEEKING FROM CYLINDER 0 TO 5, 1 TO 6, 2 TO 7, ... 624 TO 629, TO TEST THE POSITIONAL LOGIC.

2. 33 CYLINDER DIFFERENTIAL SEEK: WORST CASE SEEK OVERSHOOT TEST, FORCED BY SEEKING FROM CYLINDER 0 TO 32, 1 TO 33, 2 TO 34, ... 597 TO 629.

3. 400 CYLINDER DIFFERENTIAL SEEK: FORCES MAXIMUM ACCELERATION AND DECELERATION OF CARRIAGE ASSEMBLY, FORCED BY SEEKING FROM CYLINDER 0 TO 399, 1 TO 400, 2 TO 401, ... 230 TO 629.

TEST 6: OSCILLATING SEEK TEST

THIS TEST SHALL EXECUTE A SERIES OF SEEK OPERATIONS TO CAUSE AN OSCILLATING MOVEMENT OF THE HEAD POSITIONER. THAT MOVEMENT SHALL RESULT FROM SEEKING TO THE FOLLOWING PATTERN OF DESIRED CYLINDERS: FROM THE MAXIMUM DISTANCE SEEK OF CYLINDER 0 TO LAST(ENDING) CYLINDER (LC), FROM CYLINDER 1 TO LC 1, FROM CYLINDER 2 TO LC-2, ... DOWN TO THE MEDIAN CYLINDER, THEN, REVERSING THE ORDER OF THOSE SEEKS FROM THE MEDIAN CYLINDER BACK UP TO THE MAXIMUM DISTANCE SEEK OF CYLINDER 0 TO LC.

NOTE

THE TESTS NUMBERED 7-10., 14., 18. CONTAIN TIMING TESTS. THEY REQUIRE THAT A KW11P P-CLOCK BE INSTALLED ON THE SYSTEM IN-ORDER TO RUN. AT THE COMPLETION OF EACH OF THE TIMING TESTS, THE MAXIMUM AND THE MINIMUM TIMES, AND THE AVERAGE SEEK TIME FOR EACH TEST ARE CHECKED AGAINST THE TOLERANCES GIVEN BY THE ENGINEERING SPECS. THE PROGRAM WILL PRINT THE MEASURED TIMES IF THEY ARE OVER THE TIMING TOLERANCES. IF THE PRINT REPORT WAS REQUESTED VIA SOFTWARE (SW) DIALOGUE, THE TIMING INFO WILL ALWAYS BE PRINTED. IF A SYSTEM CLOCK IS NOT FOUND TO BE PRESENT, TIMING TESTS WILL NOT BE EXECUTED. THE OPERATOR WILL BE NOTIFIED VIA A

MESSAGE.

TEST 7: ROTATIONAL SPEED TIMING TEST

THIS TEST EXECUTES A SEARCH COMMAND TO CYLINDER FC, TRACK FT AND SECTOR FS. AS SOON AS THE SEARCH OPERATION IS DONE, THE TEST SETS THE "GO' BIT TO EXECUTE ANOTHER SEARCH COMMAND WITH THE SAME RHXX/RP07 REGISTER CONTENTS. THE TIME INTERVAL IS MEASURED AGAINST A TOLERANCE OF 16.515 MSEC +-3%. REPEAT THIS SEQUENCE 10 TIMES. IN CASE ANY RECOVERABLE READ ERROR EXISTS, THE PROGRAM WILL EXECUTE THE SEARCH COMMAND 16 TIMES. IF THE RETRY SEQUENCE FAILS THE PROGRAM WILL ABORT THE TEST, GENERATING A MESSAGE TELLING WHY THE PROGRAM WAS ABORTED.

TEST 8: ONE CYLINDER SEEK TIMING TEST

THIS TEST EXECUTES FORWARD SEEK FROM THE FIRST(STARING) CYLINDER TO THE FIRST(STARTING) CYLINDER + 1 AND THE OPERATION IS TIMED AGAINST A TOLERANCE OF 5 MSEC.. AFTER EXECUTING THE TEST CYCLE, THE FIRST(STARING) CYLINDER ADDRESS IS INCREMENTED BY ONE. THIS PROCEDURE CONTINUES UNTIL THE FIRST(STARTINC) CYLINDER ADDRESS REACHES 629 THE USER SPECIFIED ENDING CYLINDER, THEN THE TEST IS REPEATED IN THE REVERSE DIRECTION. DO THIS SEQUENCE TWICE. THE AVERAGE ONE CYLINDER SEEK TIME WILL BE COMPUTED AND REPORTED WHEN THE "TYPE TIME REPORTS (L)" QUESTION IS RESPONDED TO IN THE AFFIRMATIVE OR IF A TIMING LIMIT IS EXCEEDED. THE AVERAGE SEEK TIME FOR A SINGLE CYLINDER SEEK IS COMPUTED PER FORMULA:

$$T(AVG) = \frac{T1 + T2 + \ldots T629 + T629 + \ldots T2 + T1}{629 + 629}$$

WHERE TX IS THE SINGLE CYLINDER SEEK TIME.

TEST 9: AVERAGE SEEK TIME MEASUREMENT

THIS TEST WILL MEASURE THE AVERAGE SEEK TIME BY USING THE FOLLOWING CALCULATION:

$$T(AVG) = \frac{2 \times [\,(T1 \times 629) + (T2 \times 628) + \ldots + (T629 \times 1)\,]}{629 \times 629}$$

WHERE:
THE TX IS THE FORWARD (REVERSE) SEEK TIME FROM CYLINDER 0 TO CYLINDER X (CYLINDER X TO CYLINDER 0). THE NUMBER 2X629 IS THE TOTAL NUMBER OF SEEKS EXECUTED.
AVERAGE SEEK TIME TOLERANCE IS 23 MSEC.

TEST 10: MAXIMUM SEEK TIMING TEST

THIS TEST EXECUTES FORWARD SEEK FROM CYLINDER 0 TO THE LAST(ENDING) CYLINDER, THEN A REVERSE SEEK FROM THE LAST(ENDING) CYLINDER TO CYLINDER 0. BOTH SEEKS ARE TIMED AGAINST A TOLERANCE OF 46 MSEC.. A TOTAL NUMBER OF 1024

SEEKS WILL BE EXECUTED TO CALCULATE THE MAXIMUM SEEK TIME(512 FORWARD, 512 REVERSE).

TEST 11: MID TRANSFER SEEK TEST

THIS TEST EXECUTES READ DATA COMMANDS FOR EVERY TRACK ON THE FIRST (STARTING) CYLINDER, WITH WORD COUNT BEING SET TO EQUAL A FULL TRACK PLUS ONE SECTOR. THIS TEST ENSURES THAT EACH READ HEAD WORKS PROPERLY AND ALSO ENSURES THAT THE SPIRAL READ DATA OPERATION, REQUIRING A MID-TRANSFER SEEK, WORKS PROPERLY.

TEST 12: ERROR REGISTER BIT TEST

EXECUTE A READ DATA COMMAND ON THE LAST USER ADDRESSABLE SECTOR, TESTING FOR THE ASSERTION OF LAST BLOCK TRANSFERRED (LBT) BIT OF THE STATUS REG RPDS. REISSUE READ DATA COMMAND TO LAST SECTOR WITH A WORD COUNT GREATER THAN 256 WORDS, TESTING FOR THE ASSERTION OF THE ADDRESS OVERFLOW ERROR (AOE) BIT OF THE ERROR REG. RPER1.

TEST 13: OFFSET/RETURN TO CENTER LINE TEST

VERIFY THAT THE OFFSET AND RETURN TO CENTER LINE COMMAND WORK PROPERLY.

ISSUE AN OFFSET COMMAND, PROCESS THE ATTENTION INTERRUPT AND CHECK FOR ERRORS, VERIFY THE ASSERTION OF THE OFFSET MODE (OM) BIT OF RPDS.

ISSUE A RETURN TO CENTER LINE COMMAND, PROCESS THE ATTENTION INTERRUPT AND CHECK FOR ERRORS, VERIFY THE RESETTING OF OM.

TEST 14: RANDOM READ TEST / ADDRESS MARK DETECTION TEST

IF THERE IS NO P-CLOCK, THIS TEST RANDOMLY SELECTS A SECTOR, THEN EXECUTES A READ DATA COMMAND TO THIS SECTOR TO VERIFY THAT NO DATA TRANSFER ERROR OCCURS. REPEAT 1024 TIMES.

IF THERE IS A P-CLOCK, THE ADDRESS MARK DETECTION TIMING TEST VERIFIES THAT DATA CAN BE READ CORRECTLY WITHIN THE SAME REVOLUTION AS A SECTOR DETECTION. THE TEST RANDOMLY SELECTS A SECTOR, SEARCHES FOR THE PRECEDING LOGICAL SECTOR, THEN READS THE SELECTED SECTOR. THE TIME INTERVAL SEARCH DONE - READ DONE IS MEASURED AND CHECKED TO BE WITHIN THE SAME DISC REVOLUTION. REPEAT THIS SEQUENCE 1024 TIMES. AT THE END OF THE TEST, AN ERROR MESSAGE SHALL INDICATE THE NUMBER OF OPERATIONS WITH A REVOLUTION LOST, IF ANY.

TEST 15: FE CYLINDER ADDRESS TEST

THIS TEST EXECUTES READ-HEADER AND DATA COMMANDS TO VERIFY THE ADDRESSING OF SECTOR 0 ON ALL TRACKS OF THE FIRST FE CYLINDER, THEN EXECUTES AN EXPLICIT SEEK TO ACCESS THE SECOND FE CYLINDER.

TEST 16: FE CYLINDER WRITE AND WRITE-CHECK TEST

THIS TEST WILL WRITE ON THE FIRST FE CYLINDER FROM THE FIRST(STARTING) TO THE LAST(ENDING) TRACK TO VERIFY THAT THE DRIVE CAN WRITE DATA WITHOUT DETECTABLE ERROR. THE TEST WRITES THE DEFAULT DATA PATTERN 030221 OR A USER SPECIFIED DATA PATTERN ONTO THE MEDIA, FOLLOWED BY EXECUTING A WRITE-CHECK COMMAND. THE TEST CHANGES THE DATA PATTERN TO ITS COMPLEMENT VALUE AND REPEATS THE TEST CYCLE. THE WORD COUNT IS SET TO DO TWO HALF TRACK DATA TRANSFERS.

TEST 17: WRITE TEST

IF RUNNING THE FIELD VERSION OF THIS PROGRAM, THIS TEST IS ONLY RUN IF THE "WRITE DATA ANYWHERE ON THE MEDIA" OPTION IS SELECTED BY THE OPERATOR, IN THE SOFTWARE PARAMETER QUESTIONS.

THIS TEST WRITES DATA AND WRITE CHECKS DATA ON EVERY TRACK FROM THE FIRST(STARTING) TO LAST(ENDING) TRACK OF THE FIRST (STARTING) CYLINDER FC AND THE LAST(ENDING) CYLINDER. THE WORD COUNT IS SET TO DO TWO HALF TRACK DATA TRANSFERS.

TEST 18: RANDOM WRITE TEST /ADDRESS MARK DETECTION TEST

IF RUNNING THE FIELD VERSION OF THIS PROGRAM, THIS TEST IS ONLY RUN IF THE "WRITE DATA ANYWHERE ON THE MEDIA" OPTION IS SELECTED BY THE OPERATOR, IN THE SOFTWARE PARAMETER QUESTIONS.

IF THERE IS NO P-CLOCK, THIS TEST WRITES DATA AND WRITE CHECKS DATA RANDOMLY ON THE MEDIA, WITH A TRANSFER SIZE OF 1 SECTOR, 1024 TIMES. THE DATA PATTERN IS RANDOM OR A SPECIFIED PATTERN.

IF THERE IS A P-CLOCK, THE ADDRESS MARK DETECTION TIMING TEST VERIFIES THAT DATA CAN BE WRITTEN CORRECTLY WITHIN THE SAME REVOLUTION AS A SECTOR DETECTION. THE TEST RANDOMLY SELECTS A SECTOR, SEARCHES FOR THE PRECEDING SECOND LOGICAL SECTOR, THEN WRITES THE SELECTED SECTOR. THE TIME INTERVAL SEARCH DONE - WRITE DONE IS MEASURED AND CHECKED TO BE WITHIN THE SAME DISC REVOLUTION. A WRITE CHECK DATA IS THEN ISSUED ON THE SELECTED SECTOR. REPEAT 1024 TIMES. AT THE END OF THE TEST, AN ERROR MESSAGE SHALL INDICATE THE NUMBER OF OPERATIONS WITH A REVOLUTION LOST, IF ANY.

```
.REM @

        VERSION (CZRJL A 0)

            1.  THIS VERSION IS THE STARTING POINT FOR CX DIAGNOSTIC SUPPORT OF
                THE RP07 DISK DRIVE.

        VERSION (CZRJL B 0)

            1.  WHEN A BAD SECTOR ERROR (BSE) OCCURS DURING A WRITE CHECK
                COMMAND, THE MASSBUS DATA BUS PARITY (MDPE) BIT IS ALSO SET
                FOR SOME UNKNOWN REASON.  TO REMEDY THIS PROBLEM, THE BSE BIT
                IS ALSO CHECKED AFTER THE MDPE BIT IS DETECTED AND IS TREATED
                AS A NORMAL BAD SECTOR.

            2.  MODIFIED THE PROGRAM TO REPORT THE SEEK TIMES OF THE TIMING
                TESTS (7-10,14,18), ONLY IF THE TEST FAILS A TIMING SPEC OR IF
                THE APPROPRIATE SOFTWARE QUESTION IS ANSWERED AFFIRMATIVE.

            3.  THE ADDRESS MARK TESTS (14 & 18) WILL NOW REPORT A LOST
                REVOLUTION ERROR AS IT OCCURS, INSTEAD OF WHEN THE TEST HAS
                COMPLETED.
@
```

```
HISTORY

      1                                 ;*LAST REVISION 25-MAY 83
      2
    270                                 .TITLE  CZRJLB0 RP07 FCTNL TEST
    272                                 .SBTTL  PROGRAM HEADER
    298
    300 000000                                  .ENABL  AMA,ABS
    301         002000                          .       =       2000
    303
    305                                 ;++
    306                                 ; THE PROGRAM HEADER IS THE INTERFACE BETWEEN
    307                                 ; THE DIAGNOSTIC PROGRAM AND THE SUPERVISOR.
    308                                 ;
    309
    311
    319
    323 002000                          L$NAME::                ;DIAGNOSTIC NAME
        002000      103                         .ASCII /C/
        002001      132                         .ASCII /Z/
        002002      122                         .ASCII /R/
        002003      112                         .ASCII /J/
        002004      114                         .ASCII /L/
        002005      000                         .BYTE   0
        002006      000                         .BYTE   0
        002007      000                         .BYTE   0
        002010                          L$REV::                 ;REVISION LEVEL
        002010      102                         .ASCII  /B/
        002011                          L$DEPO::                ;0
        002011      060                         .ASCII  /0/
        002012                          L$UNIT::                ;NUMBER OF UNITS
        002012  000001                          .WORD   T$PTHV
        002014                          L$TIML::                ;LONGEST TEST TIME
        002014  000060                          .WORD   60
        002016                          L$HPCP::                ;POINTER TO H.W. QUES.
        002016  041200                          .WORD   L$HARD
        002020                          L$SPCP::                ;POINTER TO S.W. QUES.
        002020  041316                          .WORD   L$SOFT
        002022                          L$HPTP::                ;PTR. TO DEF. H.W. PTABLE
        002022  002172                          .WORD   L$HW
        002024                          L$SPTP::                ;PTR. TO S.W. PTABLE
        002024  002204                          .WORD   L$SW
        002026                          L$LADP::                ;DIAG. END ADDRESS
        002026  074766                          .WORD   L$LAST
        002030                          L$STA::                 ;RESERVED FOR APT STATS
        002030  000000                          .WORD   0
        002032                          L$CO::
        002032  000000                          .WORD   0
        002034                          L$DTYP::                ;DIAGNOSTIC TYPE
        002034  000000                          .WORD   0
        002036                          L$APT::                 ;APT EXPANSION
        002036  000000                          .WORD   0
        002040                          L$DTP::                 ;PTR. TO DISPATCH TABLE
        002040  002124                          .WORD   L$DISPATCH
        002042                          L$PRIO::                ;DIAGNOSTIC RUN PRIORITY
        002042  000000                          .WORD   0
        002044                          L$ENVI::                ;FLAGS DESCRIBE HOW IT WAS SETUP
        002044  000000                          .WORD   0
        002046                          L$EXP1::                ;EXPANSION WORD
```

```
002046  000000                  .WORD   0
002050                  L$MREV::                ;SVC REV AND EDIT #
002050     003                  .BYTE   C$REVISION
002051     003                  .BYTE   C$EDIT
002052                  L$EF::                  ;DIAG. EVENT FLAGS
002052  000000                  .WORD   0
002054  000000                  .WORD   0
002056                  L$SPC::
002056  000000                  .WORD   0
002060                  L$DEVP::                ; POINTER TO DEVICE TYPE LIST
002060  003030                  .WORD   L$DVTYP
002062                  L$REPP::                ;PTR. TO REPORT CODE
002062  000000                  .WORD   0
002064                  L$EXP4::
002064  000000                  .WORD   0
002066                  L$EXP5::
002066  000000                  .WORD   0
002070                  L$AUT::                 ;PTR. TO ADD UNIT CODE
002070  000000                  .WORD   0
002072                  L$DUT::                 ;PTR. TO DROP UNIT CODE
002072  000000                  .WORD   0
002074                  L$LUN::                 ;LUN FOR EXERCISERS TO FILL
002074  000000                  .WORD   0
002076                  L$DESP::                ;POINTER TO DIAG. DESCRIPTION
002076  003036                  .WORD   L$DESC
002100                  L$LOAD::                ;GENERATE SPECIAL AUTOLOAD EMT
002100  104035                  EMT     E$LOAD
002102                  L$ETP::                 ;POINTER TO ERRTBL
002102  000000                  .WORD   0
002104                  L$ICP::                 ;PTR. TO INIT CODE
002104  025632                  .WORD   L$INIT
002106                  L$CCP::                 ;PTR. TO CLEAN-UP CODE
002106  026656                  .WORD   L$CLEAN
002110                  L$ACP::                 ;PTR. TO AUTO CODE
002110  026654                  .WORD   L$AUTO
002112                  L$PRT::                 ;PTR. TO PROTECT TABLE
002112  025624                  .WORD   L$PROT
002114                  L$TEST::                ;TEST NUMBER
002114  000000                  .WORD   0
002116                  L$DLY::                 ;DELAY COUNT
002116  000000                  .WORD   0
002120                  L$HIME::                ;PTR. TO HIGH MEM
002120  000000                  .WORD   0
325
```

```
                        .SBTTL  DISPATCH TABLE

                        ;++
                        ; THE DISPATCH TABLE CONTAINS THE STARTING ADDRESS OF EACH TEST.
                        ; IT IS USED BY THE SUPERVISOR TO DISPATCH TO EACH TEST.
                        ;-

002122  000022                  .WORD   18
002124                  L$DISPATCH::
002124  026762                  .WORD   T1
002126  027032                  .WORD   T2
002130  027140                  .WORD   T3
002132  027372                  .WORD   T4
002134  027606                  .WORD   T5
002136  030036                  .WORD   T6
002140  030144                  .WORD   T7
002142  031222                  .WORD   T8
002144  032212                  .WORD   T9
002146  033130                  .WORD   T10
002150  034004                  .WORD   T11
002152  034210                  .WORD   T12
002154  034436                  .WORD   T13
002156  034626                  .WORD   T14
002160  036144                  .WORD   T15
002162  036422                  .WORD   T16
002164  037010                  .WORD   T17
002166  037332                  .WORD   T18
```

DEFAULT HARDWARE P TABLE

```
                                .SBTTL  DEFAULT HARDWARE P TABLE

                                ;++
                                ; THE DEFAULT HARDWARE P TABLE CONTAINS DEFAULT VALUES OF
                                ; THE TEST-DEVICE PARAMETERS.  THE STRUCTURE OF THIS TABLE
                                ; IS IDENTICAL TO THE STRUCTURE OF THE HARDWARE P-TABLES.
                                ;--

002170  000004                         .WORD   L10000-L$HW/2
002172                          L$HW::
002172                          DFPTBL::
002172  176700                          .WORD 176700    ;RPCS1 BASE REGISTER ADDRESS
002174  000254                          .WORD 254       ;VECTOR ADDRESS
002176  000240                          .WORD 240       ;BR LEVEL 5 DEVICE
002200  000000                          .WORD 0         ;DRIVE NUMBER


002202                          L10000:
```

```
                                .SBTTL  SOFTWARE P TABLE

                                ;++
                                ; THE SOFTWARE P-TABLE CONTAINS THE VALUES OF THE PROGRAM
                                ; PARAMETERS THAT CAN BE CHANGED BY THE OPERATOR.
                                ;--

002202  000016                          .WORD   L10001-L$SW/2
002204                          L$SW::
002204                          SFPTBL::
002204  000000                  FC:     .WORD   0       ;FIRST CYLINDER         ;TESTS: 2 4,6 8,11,13,14,17,18
002206  001165                  LC:     .WORD   629.    ;LAST  CYLINDER         ;TESTS: 2 4,6,8-10,14,17,18
002210  000001                  IC:     .WORD   1       ;INCREMENT CYLINDER     ;TESTS: 2
002212  000000                  FT:     .WORD   0       ;FIRST TRACK            ;TESTS: 2-7,11,13,16,17
002214  000037                  LT:     .WORD   31.     ;LAST TRACK             ;TESTS: 3-6,11,14,16-18
002216  000001                  IT:     .WORD   1       ;INCREMENT TRACK        ;TESTS: 11,16,17
002220  000000                  FS:     .WORD   0       ;FIRST SECTOR           ;TESTS: 2,5 7,13
002222  000061                  LS:     .WORD   49.     ;LAST SECTOR            ;TESTS: 5,6,14,18
002224  030221                  PAT:    .WORD   030221  ;WRITE DATA PATTERN     ;TESTS: 16-18 (WORST CASE)

002226     001                  REDHDR: .BYTE   1       ;READ HEADER AND DATA CMD FLAG - DEFAULT: YES - SEEK TESTS 2-6
002227     000                  TIMTYP: .BYTE   0       ;TYPE TIME - DEFAULT: NO - TIMING TESTS 7-10,14,18
002230     000                  TIMSTL: .BYTE   0       ;TIMING TESTS,STALL BETWEEN SEEKS: RANDOM INSTEAD OF 2 MSEC
002231     000                  STALLF: .BYTE   0       ;STALL FLAG: AFTER EVERY DRIVE FUNCTION - DEFAULT: NO
                                                        ;NON-TIMING TESTS 1-6,11,14-18
002232     000                  STALRD: .BYTE   0       ;RANDOM STALL FLAG - DEFAULT: NO - PREREQUISITE: STALLF=1
002233     000                  STOFLG: .BYTE   0       ;SOFTWARE TIMEOUT INHIBIT FLAG - DEFAULT: NO - ALL TESTS
002234     000                  RANPAT: .BYTE   0       ;RANDOM WRITE PATTERN - DEFAULT: NO - TEST: 18
002235     000                  WRTALL: .BYTE   0       ;WRITE DATA ALL OVER THE MEDIA FLAG - DEFAULT: NO
                                                        ;TESTS: 17,18
002236     000                  CHANGE: .BYTE   0       ;CHANGE DRIVE PARAMETER FLAG

                                        .EVEN

002240                          L10001:
```

```
                                .SBTTL  GLOBAL EQUATES SECTION


                                ;++
                                ; THE GLOBAL EQUATES SECTION CONTAINS PROGRAM EQUATES THAT
                                ; ARE USED IN MORE THAN ONE TEST.
                                ;--

                                ;
                                ; BIT DEFINITIONS
                                ;
100000                          BIT15== 100000
040000                          BIT14== 40000
020000                          BIT13== 20000
010000                          BIT12== 10000
004000                          BIT11== 4000
002000                          BIT10== 2000
001000                          BIT09== 1000
000400                          BIT08== 400
000200                          BIT07== 200
000100                          BIT06== 100
000040                          BIT05== 40
000020                          BIT04== 20
000010                          BIT03== 10
000004                          BIT02== 4
000002                          BIT01== 2
000001                          BIT00== 1
                                ;
001000                          BIT9==  BIT09
000400                          BIT8==  BIT08
000200                          BIT7==  BIT07
000100                          BIT6==  BIT06
000040                          BIT5==  BIT05
000020                          BIT4==  BIT04
000010                          BIT3==  BIT03
000004                          BIT2==  BIT02
000002                          BIT1==  BIT01
000001                          BIT0==  BIT00
                                ;
                                ; EVENT FLAG DEFINITIONS
                                ;   EF32:EF17 RESERVED FOR SUPERVISOR TO PROGRAM COMMUNICATION
                                ;
000040                          EF.START==      32.                             ; START COMMAND WAS ISSUED
000037                          EF.RESTART==    31.                             ; RESTART COMMAND WAS ISSUED
000036                          EF.CONTINUE==   30.                             ; CONTINUE COMMAND WAS ISSUED
000035                          EF.NEW==        29.                             ; A NEW PASS HAS BEEN STARTED
000034                          EF.PWR==        28.                             ; A POWER-FAIL/POWER-UP OCCURRED
                                ;
                                ;
                                ; PRIORITY LEVEL DEFINITIONS
                                ;
000340                          PRI07== 340
000300                          PRI06== 300
000240                          PRI05== 240
000200                          PRI04== 200
000140                          PRI03== 140
000100                          PRI02== 100
```

N2


```
000040                  PRIO1== 40
000000                  PRIO0== 0
                        ;
                        ;OPERATOR FLAG BITS
                        ;
000004                  EVL==       4
000010                  LOT==      10
000020                  ADR==      20
000040                  IDU==      40
000100                  ISR==     100
000200                  UAM==     200
000400                  BOE==     400
001000                  PNT==    1000
002000                  PRI==    2000
004000                  IXE==    4000
010000                  IBE==   10000
020000                  IER==   20000
040000                  LOE==   40000
100000                  HOE==  100000
```

```
                                .SBTTL  RHXX REGISTERS

                                ;CONTROL AND STATUS REGISTER 1 (RPCS1)

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


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


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


                                ;CONTROL AND STATUS REGISTER 2 (RPCS2)

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


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


                                .SBTTL  RP07 REGISTERS

                                ;CONTROL AND STATUS 1 REGISTER. (#00)

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

```
                                ;DRIVE STATUS REGISTER (RPDS) (#01)

000001                  OM      == 1                    ;OFFSET MODE
000002                  EWN     == 2                    ;ERROR WARNING
000004                  ILV     == 4                    ;SECTOR INTERLEAVE MODE IS ENABLED TM. H.W
                        ;VV     == 100                  ;VOLUME VALID (BIT #6)
                        ;DRY    == 200                  ;DRIVE READY (BIT #7)
                        ;DPR    == 400                  ;DRIVE PRESENT (BIT #8)
                        ;PGM    == 1000                 ;PROGRAMABLE (BIT #9)
002000                  LST     == 2000                 ;LAST SECTOR TRANSFERRED (BIT #10)
                        ;WRL    == 4000                 ;WRITE LOCK (BIT #11)
                        ;MOL    == 10000                ;MEDIUM ON-LINE (BIT #12)
                        ;PIP    == 20000                ;POSITIONING OPERATION IN PROGRESS (BIT #13)
040000                  ERR     == 40000                ;COMPOSITE ERROR (BIT #14)
100000                  ATA     == 100000               ;ATTENTION ACTIVE (BIT #15)


                                ;ERROR REGISTER #01 (RPER1) (#02)

000001                  ILF     == 1                    ;ILLEGAL FUNCTION (BIT #0)
000002                  ILR     == 2                    ;ILLEGAL REGISTER (BIT #1)
000004                  RMR     == 4                    ;REGISTER MODIFICATION REFUSED (BIT #2)
                        ;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 #01 (RPMR1)(#03)

100000                  DMD     == 100000               ;DIAGNOSTIC MODE


                        ;ATTENTION SUMMARY PSEUDO-REGISTER (RPAS) (#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 (RPDA) (#05)
```

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


                                ;DRIVE TYPE REGISTER (RPDT) (#06)

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


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

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


                                ;RP07 ERROR REGISTER #02 (RPER2) (#10)

000400                          WRYUNS   == 400                 ;WRITE OFF TRACK CENTER (WRITE UNSAFE)
001000                          WOR      == 1000                ;WRITE OVERRUN ERROR
002000                          RWU1     == 2000                ;W/R UNSAFE ERROR 1 (WRITE ERROR)
004000                          RWU2     == 4000                ;W/R UNSAFE ERROR 2 (READ OR WRITE ERROR)
010000                          RWU3     == 10000               ;W/R UNSAFE ERROR 3 (WRITE ERROR)
100000                          PGE      == 100000              ;PROGRAM ERROR


                                ;RP07 ERROR REGISTER #03 (RPER3)

                                ;DGE     == 1                   ;DIAGNOSTIC COMMAND
000010                          DPE      == 10                  ;DATA PARITY  DURING WRITE
000020                          SDF      == 20                  ;SERDES DATA FAILURE
000040                          DCU      == 40                  ;DC LOW UNSAFE
000100                          IXU      == 100                 ;INDEX PULSE UNSAFE
000200                          DVC      == 200                 ;DRIVE CHECK
000400                          PHF      == 400                 ;TACH CALIBRATE FAILURE
001000                          LCE      == 1000                ;LOST CYLINDER (POSITIONER IN GUARD BAND)
002000                          LBC      == 2000                ;LOST BIT CLOCK
040000                          SKI      == 40000               ;SEEK INCOMPLETE
100000                          BSE      == 100000              ;BAD SECTOR


                                ;OFFSET REGISTER (RPOF) (#11)

002000                          HCI      == 2000                ;HEADER COMPARE INHIBIT (BIT #10)
```

```
                        004000          ECI     = 4000                  ;ERROR CORRECTION CODE INHIBIT (BIT #11)
                        010000          FMT16   = 10000                 ;FORMAT BIT (BIT #12
                        100000          CMOD    = 100000                ;COMMAND MODIFIER BIT (BIT #13)


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


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


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


                                        ;ECC POSITION REGISTER (RPEC1) (#16)
                                        ;(EACH BIT IS CALLED BY BIT NUMBER)


                                        ;ECC PATTERN REGISTER (RPEC2) (#17)
                                        ;(EACH BIT IS CALLED BY BIT NUMBER)


                                        .SBTTL  RP07 DRIVER COMMANDS

                        000101          NOOP    = 101                   ;NO OPERATION
                        000105          SEEK    = 105                   ;SEEK
                        000107          RECAL   = 107                   ;RECALIBRATE
                        000111          DRVCLR  = 111                   ;DRIVE CLEAR
                        000113          RELSE   = 113                   ;RELEASE
                        000115          OFFSET  = 115                   ;OFFSET
                        000117          RTC     = 117                   ;RETURN TO CENTER LINE
                        000121          READIN  = 121                   ;READ IN PRESET
                        000131          SEARCH  = 131                   ;SEARCH
                        000135          DIAG    = 135                   ;DIAGNOSTIC MODE
                        000143          ILLCMD  = 143                   ;ILLEGAL COMMAND
                        000151          WCKD    = 151                   ;WRITE CHECK DATA
                        000153          WCKHD   = 153                   ;WRITE CHECK HEADER AND DATA
                        000161          WRTDAT  = 161                   ;WRITE DATA
                        000163          FMTRK   = 163                   ;FORMAT TRACK
                        000165          WRTTD   = 165                   ;WRITE TRACK DSFCRIPTOR
                        000171          RDDAT   = 171                   ;READ DATA
                        000173          RDHD    = 173                   ;READ HEADER AND DATA
                        000175          RDTD    = 175                   ;READ TRACK DSECRIPTOR

                        177400          SCTRWC  =   256.                ;DEFAULT WORD COUNT

                                        ;THE FOLLOWING ARE SPECIAL DRIVER COMMANDS (NOT CONTROLLER COMMANDS)

                        000141          GETREG  = 141   ;READ RPCS1, RPWC, RPBA, RPDA AND STORE THEM AT ADDRESS
                                                        ;POINTED TO BY 'DPB'+6.
                        000145          MAINT   = 145   ;WRITE MAINTENANCE REGISTER RPMR1
                        000147          SETFORM = 147   ;SET FORMAT PSEUDO CMD:  WRITE OFFSET REGISTER.  SETFORM
                                                        ;FIRST READS RPOF, EXTRACT ITS LO BYTE, CHANGES ITS HI BYTE
                                                        ;PER 'DPB', MERGES BOTH BYTES TO WRITE RPOF.  HENCE SETFORM
```

```
                                        ;WRITES RP0F WITH HI BYTE PER  DPB', LO BYTE UNCHANGED. THE
                                        ;COMMAND OFFSET DOES THE OPPOSITE.
```

```
                                .SBTTL  GLOBAL DATA SECTION

                                ;++
                                ; THE GLOBAL DATA SECTION CONTAINS DATA THAT ARE USED
                                ; IN MORE THAN ONE TEST.
                                ;-

002240  000000                 TEMPO:: .WORD   0               ;TEMPORARY LOST REVOLUTION COUNT
002242  000001                 TYTIME::.WORD   1               ;TYPE SEEK TIMES IF =1
002244  000001                 ITCNT:: .WORD   1               ;TEST ITERATION COUNTER
002246  000000                 ISRCNT:: .WORD  0               ;INTERRUPT SERVICE COUNTER
002250  002000                 XTIMES:: .WORD  1024.           ;TEST ITERATION COUNT;          TESTS 14. & 18.
002252  000000                 SRHSEC:: .WORD  0               ;SEARCH SECTOR;                 TESTS 14. & 18.
002254  000000                 TRGSEC:: .WORD  0               ;TARGET SECTOR;                 TESTS 14. & 18.
002256  000000                 DOTWO:: .WORD   0               ;USED TO FORCE TWO ITERATIONS OF AN OPERATION
002260  000000                 CLKSTA:: .WORD  0               ;CLOCK STATUS (NO CLOCK= 0,KW11-P= 1 OR KW11-L=  1
002262  000000                 BYPASS:: .WORD  0               ;BYPASS ROUTE ADR; SET IN CALL ERRABO
                                                               ;CALLERS;  CALL.A/B/C, DRVCAL, SRCHOO.
002264  000000                 SVSTAT:: .WORD  0               ;STATUS/ERROR INDICATOR IS;  SAVED HERE ON AN ERROP

002266  001165                 NC1::   .WORD   629.            ;LAST PHYSICAL CYL
002270  001166                 NC2::   .WORD   630.            ;FIRST FE CYL
002272  000037                 NT1::   .WORD   31.             ;LAST PHYSICAL TRK
002274  000061                 NS1::   .WORD   49.             ;LAST PHYSICAL SEC

002276  000000                 CYL.RD:: .WORD  0               ;CYLINDER READ
002300  000000                 TRK.RD:: .WORD  0               ;TRACK READ
002302  000000                 SEC.RD:: .WORD  0               ;SECTOR READ
002304  000000                 CYL.DS:: .WORD  0               ;CYLINDER DESIRED
002306  000000                 SEC.DS:: .WORD  0               ;SECTOR DESIRED
002310  000000                 TRK.DS:: .WORD  0               ;TRACK DESIRED

002312  000000                 TIM.UP:: .WORD  0               ;MINIMUM TIME
002314  000000                         .WORD   0               ;NUMBER OF COUNTS BELOW MIN. LIMIT
002316  000000                         .WORD   0               ;MAXIMUM TIME
002320  000000                         .WORD   0               ;NUMBER OF COUNTS ABOVE MAX. LIMIT
002322  000000  000000                 .WORD   0,0             ;TOTAL TIME OF ALL SEEKS
002326  000000                         .WORD   0               ;NUMBER OF SEEKS PERFORMED

002330  000000                 TIM.DN:: .WORD  0               ;MINIMUM TIME
002332  000000                         .WORD   0               ;NUMBER OF COUNTS BELOW MIN. LIMIT
002334  000000                         .WORD   0               ;MAXIMUM TIME
002336  000000                         .WORD   0               ;NUMBER OF COUNTS ABOVE MAX. LIMIT
002340  000000  000000                 .WORD   0,0             ;TOTAL TIME OF ALL SEEKS
002344  000000                         .WORD   0               ;NUMBER OF SEEKS PERFORMED
002346  000000                 TIM.PT:: .WORD  0               ;POINTS TO TABLE OF TIMES
002350  000000                 WCEFLG:: .WORD  0               ;FATAL WRITE CHECK ERROR FLAG
002352  000000                 DELTA:: .WORD   0               ;MEMORY SIZING SCRATCH LOCATION
002354  163400                 TRKWC:: .WORD    <256.*25.>     ;WORD COUNT FOR HALF A TRACK IN 16 BIT MODE
002356  000012                 STALL1:: .WORD  10.             ;10 MILLISECONDS STALL
002360  000012                 STALL2:: .WORD  10.             ;10 MILLISECONDS STALL

                                ;BIT TABLE
002362  000001                 BITS::  .WORD   BIT00
002364  000002                         .WORD   BIT01
002366  000004                         .WORD   BIT02
002370  000010                         .WORD   BIT03
```

```
     58 002372  000020                          .WORD   BIT04
     59 002374  000040                          .WORD   BIT05
     60 002376  000100                          .WORD   BIT06
     61 002400  000200                          .WORD   BIT07
     62 002402  000400                          .WORD   BIT08
     63 002404  001000                          .WORD   BIT09
     64 002406  002000                          .WORD   BIT10
     65 002410  004000                          .WORD   BIT11
     66 002412  010000                          .WORD   BIT12
     67 002414  020000                          .WORD   BIT13
     68 002416  040000                          .WORD   BIT14
     69 002420  100000                          .WORD   BIT15
     70 002422  000001                          .WORD   BIT00
     71 002424  000002                          .WORD   BIT01
     72 002426  000004                          .WORD   BIT02
     73 002430  000010                          .WORD   BIT03
     74 002432  000020                          .WORD   BIT04
     75 002434  000040                          .WORD   BIT05
     76 002436  000100                          .WORD   BIT06
     77 002440  000200                          .WORD   BIT07
```

```
                                .SBTTL  TIMING MESSAGE AND LIMITS TABLES

                                ;ROTATIONAL TEST TABLES FOR RP07 DRIVE
                                ;50HZ AND 60HZ TABLE

002442  004674                  T7A::   .WORD   ROTATE          ;1ST MESSAGE
002444  000000                          .WORD   0               ;2ND MESSAGE    (NONE)
002446  003103                          .WORD   1603.           ;LO LIMIT       (16.515MS + 3%)
002450  003246                          .WORD   1702.           ;HI LIMIT       (16.515MS - 3%)

                                ;SEEK TEST TABLES

002452  004736                  TIMT10:: .WORD  ONECYL          ;1ST MESSAGE
002454  005204                          .WORD   REV             ;2ND MESSAGE
002456  000000                          .WORD   0               ;LO LIMIT       (NONE)
002460  000764                          .WORD   500.            ;HI LIMIT       (5.0MS)

002462  005010                  TIMT11:: .WORD  AVERGE          ;1ST MESSAGE
002464  005204                          .WORD   REV             ;2ND MESSAGE
002466  000000                          .WORD   0               ;LO LIMIT       (NONE)
002470  004374                          .WORD   2300.           ;HI LIMIT       (23.0MS)

002472  005055                  TIMT12:: .WORD  MXSEEK          ;1ST MESSAGE
002474  005204                          .WORD   REV             ;2ND MESSAGE
002476  000000                          .WORD   0               ;LO LIMIT       (NONE)
002500  010770                          .WORD   4600.           ;HI LIMIT       (46.0MS)

002502  005122                  T1418:: .WORD   MARK            ;1ST MESSAGE
002504  000000                          .WORD   0               ;2ND MESSAGE    (NONE)
002506  000000                          .WORD   0               ;LO LIMIT       (NONE)
002510  003246                          .WORD   1702.           ;HI LIMIT       (16.515MS   3%)
```

```
                                .SBTTL  TIMING LIMIT(S) TABLES

                                ;SPECS. MESSAGE TABLES FOR ROTATIONAL AND TIMING TESTS

                                ;ROTATIONAL MESSAGE AND LO/HI LIMITS
                                ;50HZ AND 60HZ TABLE

002512  005221                  SP7::   .WORD   MSGLMT          ;LIMIT(S) MESSAGE
002514  003103                          .WORD   1603.           ;LO LIMIT (16.515MS + 3%)
002516  003246                          .WORD   1702.           ;HI LIMIT (16.515MS - 3%)

                                ;TIMING TEST MESSAGES AND LO/HI LIMITS

002520  005221                  SP10::  .WORD   MSGLMT          ;LIMIT(S) MESSAGE
002522  000000                          .WORD   0               ;NO LO LIMIT
002524  000764                          .WORD   500.            ;HI LIMIT (5.0MS)

002526  005221                  SP11::  .WORD   MSGLMT          ;LIMIT(S) MESSAGE
002530  000000                          .WORD   0               ;NO LO LIMIT
002532  004374                          .WORD   2300.           ;HI LIMIT (23.0MS)

002534  005221                  SP12::  .WORD   MSGLMT          ;LIMIT(S) MESSAGE
002536  000000                          .WORD   0               ;NO LO LIMIT
002540  010770                          .WORD   4600.           ;HI LIMIT (46.0MS)

002542  005221                  SP1418::.WORD   MSGLMT          ;LIMIT(S) MESSAGE
002544  000000                          .WORD   0               ;NO LO LIMIT
002546  003246                          .WORD   1702.           ;HI LIMIT (16.515MS - 3%)
```

DRIVE PARAMETER BLOCKS

```
                                .SBTTL  DRIVE PARAMETER BLOCKS

002550      000         DPB.A:: .BYTE   0               ;(0) DRIVE NUMBER
002551      000                 .BYTE   0               ;(1) OFFSET VALUE OR FMT16, ECI, AND HCI
002552      000                 .BYTE   0               ;(2) COMMAND
002553      000                 .BYTE   0               ;(3) PSEL AND A17 AND A16
002554   000000                 .WORD   0               ;(4) WORD COUNT (MUST BE NEG.)
002556   042762                 .WORD   DBUFF           ;(6) BUFFER ADDRESS OR
                                                        ;REGISTER TABLE POINTER
002560      000                 .BYTE   0               ;(10) SECTOR ADDRESS OR
                                                        ;FIRST REG. INDEX
002561      000                 .BYTE   0               ;(11) TRACK ADDRESS OR
                                                        ;LAST REG. INDEX
002562   000000                 .WORD   0               ;(12) CYLINDER ADDRESS
002564   002754                 .WORD   REG             ;(14) ERROR TABLE POINTER
                                                        ;POINTS TO THE FIRST OF TWENTY
                                                        ;LOCATIONS OF WHERE THE DRIVER
                                                        ;IS TO STORE THE RHXX/RP07
                                                        ;REGISTERS ON AN ERROR. IF LEFT
                                                        ;ZERO REGISTERS ARE NOT SAVED.
002566   000000                 .WORD   0               ;(16) STATUS/ERROR INDICATOR
                                                        ;BIT15=1=>ERROR OCCURRED
                                                        ;BIT07=1=>DONE
                                                        ;BIT14-BIT09 AND BIT06-BIT03
                                                        ;INDICATE TYPE OF ERROR

002570      000         DPB.B:: .BYTE   0               ;(0) DRIVE NUMBER
002571      000                 .BYTE   0               ;(1) OFFSET VALUE OR FMT16, ECI, AND HCI
002572      000                 .BYTE   0               ;(2) COMMAND
002573      000                 .BYTE   0               ;(3) PSEL AND A17 AND A16
002574   177776                 .WORD   -2              ;(4) WORD COUNT (MUST BE NEG.)
002576   042762                 .WORD   DBUFF           ;(6) BUFFER ADDRESS OR
                                                        ;REGISTER TABLE POINTER
002600      000                 .BYTE   0               ;(10) SECTOR ADDRESS OR
                                                        ;FIRST REG. INDEX
002601      000                 .BYTE   0               ;(11) TRACK ADDRESS OR
                                                        ;LAST REG. INDEX
002602   000000                 .WORD   0               ;(12) CYLINDER ADDRESS
002604   002754                 .WORD   REG             ;(14) ERROR TABLE POINTER
                                                        ;POINTS TO THE FIRST OF TWENTY
                                                        ;LOCATIONS OF WHERE THE DRIVER
                                                        ;IS TO STORE THE RHXX/RP07
                                                        ;REGISTERS ON AN ERROR. IF LEFT
                                                        ;ZERO REGISTERS ARE NOT SAVED.
002606   000000                 .WORD   0               ;(16) STATUS/ERROR INDICATOR
                                                        ;BIT15=1=>ERROR OCCURRED
                                                        ;BIT07=1=>DONE
                                                        ;BIT14-BIT09 AND BIT06-BIT03
                                                        ;INDICATE TYPE OF ERROR

002610      000         DPB.C:: .BYTE   0               ;(0) DRIVE NUMBER
002611      000                 .BYTE   0               ;(1) OFFSET VALUE OR FMT16, ECI, AND HCI
002612      000                 .BYTE   0               ;(2) COMMAND
002613      000                 .BYTE   0               ;(3) PSEL AND A17 AND A16
002614   177776                 .WORD    2              ;(4) WORD COUNT (MUST BE NEG.)
002616   042762                 .WORD   DBUFF           ;(6) BUFFER ADDRESS OR
                                                        ;REGISTER TABLE POINTER
```

DRIVE PARAMETER BLOCKS

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002620  000                         .BYTE   0               ;(10) SECTOR ADDRESS OR
                                                            ;FIRST REG. INDEX
002621  000                         .BYTE   0               ;(11) TRACK ADDRESS OR
                                                            ;LAST REG. INDEX
002622  000000                      .WORD   0               ;(12) CYLINDER ADDRESS
002624  002754                      .WORD   REG             ;(14) ERROR TABLE POINTER
                                                            ;POINTS TO THE FIRST OF TWENTY
                                                            ;LOCATIONS OF WHERE THE DRIVER
                                                            ;IS TO STORE THE RHXX/RP07
                                                            ;REGISTERS ON AN ERROR. IF LEFT
                                                            ;ZERO REGISTERS ARE NOT SAVED.
002626  000000                      .WORD   0               ;(16) STATUS/ERROR INDICATOR
                                                            ;BIT15=1=>ERROR OCCURRED
                                                            ;BIT07=1=>DONE
                                                            ;BIT14-BIT09 AND BIT06-BIT03
                                                            ;INDICATE TYPE OF ERROR

002630  000               DTADPB::  .BYTE   0               ;(0) DRIVE NUMBER
002631  000                         .BYTE   0               ;(1) OFFSET VALUE OR FMT16, ECT, AND HCI
002632  000                         .BYTE   0               ;(2) COMMAND
002633  000                         .BYTE   0               ;(3) PSEL AND A17 AND A16
002634  000000                      .WORD   0               ;(4) WORD COUNT (MUST BE NEG.)
002636  042762                      .WORD   DBUFF           ;(6) BUFFER ADDRESS OR
                                                            ;REGISTER TABLE POINTER
002640  000                         .BYTE   0               ;(10) SECTOR ADDRESS OR
                                                            ;FIRST REG. INDEX
002641  000                         .BYTE   0               ;(11) TRACK ADDRESS OR
                                                            ;LAST REG. INDEX
002642  000000                      .WORD   0               ;(12) CYLINDER ADDRESS
002644  002754                      .WORD   REG             ;(14) ERROR TABLE POINTER
                                                            ;POINTS TO THE FIRST OF TWENTY
                                                            ;LOCATIONS OF WHERE THE DRIVER
                                                            ;IS TO STORE THE RHXX/RP07
                                                            ;REGISTERS ON AN ERROR. IF LEFT
                                                            ;ZERO REGISTERS ARE NOT SAVED.
002646  000000                      .WORD   0               ;(16) STATUS/ERROR INDICATOR
                                                            ;BIT15=1=>ERROR OCCURRED
                                                            ;BIT07=1=>DONE
                                                            ;BIT14-BIT09 AND BIT06-BIT03
                                                            ;INDICATE TYPE OF ERROR
```

DRIVE AND REGISTER STORAGE

```
                                .SBTTL  DRIVE AND REGISTER STORAGE

002650  000000                  UNIT::  .WORD   0               ;USED TO SELECT A UNIT FOR TEST
002652  176700                  RPADR:: .WORD   176700          ;CONTAINS RPCS1 BASE ADDRESS
002654  000254  000240          RPVEC:: .WORD   254,5*32.       ;CONTAINS VECTOR ADDRESS & BR LEVEL
002660  000050                  RHEXT:: .WORD   50              ;CONTAINS RH70 OFFSET TO RPBAE
002662  000000                  RHTYPE::.WORD   0               ;CONTAINS RHXX TYPE; RH11= 0, RH70= 1
002664  000000                  DRVNO:: .WORD   0               ;DRIVE NUMBER
002666  000000                  DRVSN:: .WORD   0               ;STORAGE FOR EACH S/N DIGIT

002670  176700                  RPCS1:: .WORD   176700          ;BASE ADDRESS USED FOR THE DRIVE
002672  176702                  RPWC::  .WORD   176702          ;WORD COUNT REGISTER
002674  176704                  RPBA::  .WORD   176704          ;BYTE ADDRESS REGISTER
002676  176706                  RPDA::  .WORD   176706          ;DESIRED SECTOR/TRACK ADDRESS
002700  176710                  RPCS2:: .WORD   176710          ;RP07 STATUS REGISTER
002702  176712                  RPDS::  .WORD   176712          ;RP07 DRIVE STATUS
002704  176714                  RPER1:: .WORD   176714          ;RP07 ERROR REGISTER #1
002706  176716                  RPAS::  .WORD   176716          ;RP07 ATTENTION SUMMARY PSEUDO REGISTER
002710  176720                  RPLA::  .WORD   176720          ;RP07 LOOK AHEAD REGISTER
002712  176722                  RPDB::  .WORD   176722          ;RP07 DATA BUFFER
002714  176724                  RPMR1:: .WORD   176724          ;RP07 MAINTENANCE REGISTER #1
002716  176726                  RPDT::  .WORD   176726          ;DRIVE TYPE REGISTER
002720  176730                  RPSN::  .WORD   176730          ;RP07 SERIAL NUMBER
002722  176732                  RPOF::  .WORD   176732          ;RP07 OFFSET REGISTER
002724  176734                  RPDC::  .WORD   176734          ;RP07 DESIRED CYLINDER
002726  176736                  RPCC::  .WORD   176736          ;RP07 CURRENT CYLINDER
002730  176740                  RPER2:: .WORD   176740          ;RP07 ERROR REGISTER #2
002732  176742                  RPER3:: .WORD   176742          ;RP07 ERROR REGISTER #3
002734  176744                  RPEC1:: .WORD   176744          ;RP07 ERROR POSITION
002736  176746                  RPEC2:: .WORD   176746          ;RP07 ERROR PATTERN
002740  176750                  RPBAE:: .WORD   176750          ;RH70 REGISTER
002742  176752                  RPCS3:: .WORD   176752          ;RH70 REGISTER

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

002744      001                 ATABIT::.BYTE   1       ;DRIVE 0
002745      002                         .BYTE   2       ;DRIVE 1
002746      004                         .BYTE   4       ;DRIVE 2
002747      010                         .BYTE   10      ;DRIVE 3
002750      020                         .BYTE   20      ;DRIVE 4
002751      040                         .BYTE   40      ;DRIVE 5
002752      100                         .BYTE   100     ;DRIVE 6
002753      200                         .BYTE   200     ;DRIVE 7

                                ; STORAGE FOR DEVICE REGISTERS
                                ;
002754                          REG::   .BLKW 22.               ;SAVE REGISTERS HERE
```

```
                                .SBTTL  GLOBAL TEXT SECTION

                                ;++
                                ; THE GLOBAL TEXT SECTION CONTAINS FORMAT STATEMENTS,
                                ; MESSAGES, AND ASCII INFORMATION THAT ARE USED IN
                                ; MORE THAN ONE TEST.
                                ;--

                                ;NAMES OF DEVICES SUPPORTED BY PROGRAM
                                ;
003030                          L$DVTYP::
003030  122     120     060             .ASCIZ  /RP07/
                                        .EVEN

                                ; TEST DESCRIPTION
                                ;
003036                          L$DESC::
003036  122     120     060             .ASCIZ  /RP07 FUNCTIONAL TEST/
                                        .EVEN

                                ; FORMAT STATEMENTS USED IN PRINT CALLS
                                ;
003064  045     116     000     CRLF::  .ASCIZ  /%N/
003067  045     101     104     DH25A:: .ASCIZ  /%ADRIVE %O1%N/

003105  045     101     103     DH44A:: .ASCIZ  /%ACYL %D3%A.  TRK %D2%A.  SEC %D2%A.  /
003154  045     101     122     DH44D:: .ASCIZ  /%ARPER2 (HEX) %T%T%T%T/
003203  045     116     045     DH44E:: .ASCIZ  /%N%ADRIVE   RPCS1   RPWC    RPBA    RPDA    RPCS2   RPDS/
003274  045     116     045     DH44F:: .ASCIZ  /%N%O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6/
003354  045     116     045     DH44G:: .ASCIZ  /%N%ARPER1   RPAS    RPLA    RPDB    RPMR1   RPDT    RPSN/
003445  045     116     045     DH44H:: .ASCIZ  /%N%O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6/
003525  045     116     045     DH44I:: .ASCIZ  /%N%ARPOF    RPDC    RPCC    RPER2   RPER3   RPEC1   RPEC2/
003617  045     116     045     DH44J:: .ASCIZ  /%N%O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6%N/
003701  045     101     122     DH44K:: .ASCIZ  /%ARPBAE   RPCS3/
003721  045     116     045     DH44L:: .ASCIZ  /%N%O6%A  %O6%N/

003740  045     101     104     DH45A:: .ASCIZ  /%ADRIVE  CYL  TRK  SEC%N/
003771  045     117     065     DH45B:: .ASCIZ  /%O5%A  %D3%A. %D3%A. %D3%A.%N/
004027  045     101     107     DH45C:: .ASCIZ  /%AGDCYL  GDTRK  GDSEC  BDCYL  BDTRK  BDSEC%N/
004104  045     104     063     DH45D:: .ASCIZ  /%D3%A.%S3%D3%A.%S3%D3%A.%S3%D3%A.%S3%D3%A.%S3%D3%A.%N/

004172  045     101     104     DH52A:: .ASCIZ  /%ADRIVE  CYL  TRK  SEARCH-SEC  TARGET-SEC%N/
004246  045     117     065     DH52B:: .ASCIZ  /%O5%A  %D3%A. %D3%A.%S8%D3%A.%S8%D3%A.%N/

004317  045     116     045     NOCLK:: .ASCIZ  /%N%ANO P-CLOCK, TIMING TESTS WILL NOT BE EXECUTED%N/
004403  045     116     045     DSNMSG:: .ASCIZ /%N%ADRIVE %O1%A, PG/
004427  045     124     000     SNDIGT:: .ASCIZ /%T/
004432  045     116     045     WRTENM:: .ASCIZ /%N%ATEST %D2%A. SKIPPED, NOT ENABLED BY USER%N/
004511  045     101     125     SEAERR:: .ASCIZ /%AUNRECOVERABLE SEARCH ERROR%N/
004550  045     101     123     SEABAD:: .ASCIZ /%ASEARCH FAILED AFTER 16. RETRIES%N/
004614  045     101     101     ABOTST:: .ASCIZ /%AABORT TEST%N/
004633  045     101     120     POSERR:: .ASCIZ /%APOSITION ERROR, TEST ABORTED%N/

004674  045     116     045     ROTATE:: .ASCIZ /%N%AROTATIONAL SPEED TIMES%N%A * /
```

```
004736  045  116  045  ONECYL:: .ASCIZ /%N%AONE CYLINDER SEEK TIMES%N%A • FORWARD/
005010  045  116  045  AVERGE:: .ASCIZ /%N%AAVERAGE SEEK TIMES%N%A • FORWARD/
005055  045  116  045  MXSEEK:: .ASCIZ /%N%AMAXIMUM SEEK TIMES%N%A • FORWARD/
005122  045  116  045  MARK::   .ASCIZ /%N%AADDRESS MARK DETECT TIMES%N%A • /
005167  045  101  040  FWD::    .ASCIZ /%A • FORWARD/
005204  045  101  040  REV::    .ASCIZ /%A • REVERSE/
005221  045  101  040  MSGLMT:: .ASCIZ /%A • LIMIT(S)/

005237  045  116  045  UNSMSG:: .ASCIZ /%N%ADRIVE %01%A UNSAFE%N/
005270  045  116  045  NEDMSG:: .ASCIZ /%N%ADRIVE %01%A NON-EXISTENT%N/
005327  045  116  045  OFLMSG:: .ASCIZ /%N%ADRIVE %01%A OFF-LINE%N/
005362  045  116  045  NOTMSG:: .ASCIZ /%N%ADRIVE %01%A NOT AN RP07%N/

                       .SBTTL  GLOBAL ASCII MESSAGE SECTION

005420  122  110  130  EM1::    .ASCIZ /RHXX CONTROL BUS PARITY ERROR MCPE=1/
005465  122  110  130  EM2::    .ASCIZ /RHXX DATA BUS PARITY ERROR MDPE=1/
005527  122  110  130  EM3::    .ASCIZ /RHXX ILLEGAL CONDITIONS SET (NED,NEM,PGE,MXF)/
005605  127  122  111  EM4::    .ASCIZ /WRITE CHECK ERROR/
005627  104  101  124  EM5::    .ASCIZ /DATA LATE ERROR/
005647  104  122  111  EM6::    .ASCIZ /DRIVE PROGRAMMING ERROR (PGE)/
005705  114  117  123  EM7::    .ASCIZ /LOSTS BIT CLOCK (LBC)/

005733  127  122  111  EM11::   .ASCIZ /WRITE CLOCK FAILS/
005755  127  122  111  EM12::   .ASCIZ /WRITE LOCK ERROR/
005776  104  101  124  EM13::   .ASCIZ /DATA ERROR (DCK)/
006017  104  122  111  EM14::   .ASCIZ /DRIVE BUS PARITY ERROR (DPE)/
006054  111  114  114  EM15::   .ASCIZ /ILLEGAL CONDITIONS SET (ILF,ILR,RMR)/
006121  101  104  104  EM16::   .ASCIZ /ADDRESSING ERROR (IAE,AOE)/
006154  123  105  105  EM17::   .ASCIZ /SEEK ERROR (SKI,LCE)/

006201  103  114  117  EM20::   .ASCIZ @CLOCK (KW11-P) OVERFLOW IN TIMING TEST@
006250  105  101  122  EM21::   .ASCIZ /EARLY WARNING (EWN)/
006274  122  105  101  EM22::   .ASCIZ /READ & WRITE HEAD FAILS/
006324  104  101  124  EM23::   .ASCIZ /DATA FORMAT BIT ERROR (FER)/
006360  110  105  101  EM24::   .ASCIZ /HEADER INFORMATION ERROR (HCE)/
006417  104  122  111  EM25::   .ASCIZ @DRIVE HAS BECOME NON-EXISTENT@
006455  104  122  111  EM26::   .ASCIZ @DRIVE HAS NOT RESPONDED TO PORT REQUEST@
006525  123  117  106  EM27::   .ASCIZ @SOFTWARE TIMEOUT ON THIS DRIVE@

006564  106  101  124  EM30::   .ASCIZ @FATAL MASSBUS PARITY ERROR (MCPE=1 OR PAR=1)@
006641  117  106  106  EM31::   .ASCIZ @OFFLINE OR UNSAFE DRIVE REQUESTED@
006703  127  122  111  EM32::   .ASCIZ /WRITE-READY UNSAFE/
006726  104  103  040  EM33::   .ASCIZ /DC POWER UNSAFE/
006746  111  116  104  EM34::   .ASCIZ /INDEX UNSAFE/
006763  120  122  117  EM35::   .ASCIZ /PROCESSOR HANDSHAKE FAILURE/
007017  104  122  111  EM36::   .ASCIZ /DRIVE OFFLINE OR NOT AN RP07/

007054  117  120  105  EM41::   .ASCIZ /OPERATION INCOMPLETE (OPI)/
007107  111  115  120  EM42::   .ASCIZ /IMPROPER HEADER DATA/
007134  105  103  103  EM43::   .ASCIZ /ECC LOGIC FAILURE/
007156  115  111  123  EM44::   .ASCIZ /MISC DRIVE ERROR; RPER1, RPER2, RPER3/
007224  104  122  111  EM45::   .ASCIZ /DRIVE TIMING ERROR (DTE)/
007255  110  105  101  EM46::   .ASCIZ /HEADER CRC ERROR (HCRC)/
007305  125  116  103  EM47::   .ASCIZ /UNCORRECTABLE ECC ERROR/

007335  114  101  123  EM50::   .ASCIZ /LAST BLOCK TRANSF 'LBT' NOT SET AFTER READING LAST SECTOR/
```

C4


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    128 007427      101     104     122  EM51::  .ASCIZ  /ADRS OVERFLOW BIT 'AOE' NOT SET AFTER READING LAST SECTOR/
    129 007521      114     117     123  EM52::  .ASCIZ  /LOST REVOLUTION ERROR/
    130 007547      122     120     104  EM54::  .ASCIZ  /RPDS, 'OM  NOT SET ON OFFSET CMD/
    131 007610      122     120     104  EM55::  .ASCIZ  /RPDS, 'OM' NOT RESET ON RETURN TO CENTER LINE CMD/
    132
    133                                      .EVEN
    147
    148
```

```
                                .SBTTL  GLOBAL ERROR REPORT SECTION

                                DH44::
007672  013746  002302                  MOV     SEC.RD, (SP)
007676  013746  002300                  MOV     TRK.RD, (SP)
007702  013746  002276                  MOV     CYL.RD, (SP)
007706  012746  003105                  MOV     #DH44A, (SP)
007712  012746  000004                  MOV     #4, (SP)
007716  010600                          MOV     SP,R0
007720  104414                          TRAP    C$PNTB
007722  062706  000012                  ADD     #12,SP
007726  013746  003014                  MOV     REG+40, (SP)    ;PRINT RPER2 ERROR CODE IN HEX
007732  042716  177400                  BIC     #177400,(SP)
007736  004737  011532                  JSR     PC,OCTHEX
007742  012746  011674                  MOV     #PSTACK+6,-(SP)
007746  012746  011672                  MOV     #PSTACK+4, (SP)
007752  012746  011670                  MOV     #PSTACK+2,-(SP)
007756  012746  011666                  MOV     #PSTACK,-(SP)
007762  012746  003154                  MOV     #DH44D,-(SP)
007766  012746  000005                  MOV     #5,-(SP)
007772  010600                          MOV     SP,R0
007774  104414                          TRAP    C$PNTB
007776  062706  000014                  ADD     #14,SP
                                                                ;PRINT 'DRIVE  RPCS1  RPWC   RPBA   RPDA   RPCS2  RPDS'
010002  012746  003203                  MOV     #DH44E,-(SP)
010006  012746  000001                  MOV     #1,-(SP)
010012  010600                          MOV     SP,R0
010014  104415                          TRAP    C$PNTX
010016  062706  000004                  ADD     #4,SP
010022  013746  002766                  MOV     REG+12,-(SP)
010026  013746  002764                  MOV     REG+10,-(SP)
010032  013746  002762                  MOV     REG+06,-(SP)
010036  013746  002760                  MOV     REG+04,-(SP)
010042  013746  002756                  MOV     REG+02,-(SP)
010046  013746  002754                  MOV     REG,-(SP)
010052  013746  002664                  MOV     DRVNO,-(SP)
010056  012746  003274                  MOV     #DH44F,-(SP)
010062  012746  000010                  MOV     #10,-(SP)
010066  010600                          MOV     SP,R0
010070  104415                          TRAP    C$PNTX
010072  062706  000022                  ADD     #22,SP
                                                                ;PRINT 'RPER1  RPAS   RPLA   RPDB   RPMR1  RPDT   RPSN
010076  012746  003354                  MOV     #DH44G,-(SP)
010102  012746  000001                  MOV     #1,-(SP)
010106  010600                          MOV     SP,R0
010110  104415                          TRAP    C$PNTX
010112  062706  000004                  ADD     #4,SP
010116  013746  003004                  MOV     REG+30,-(SP)
010122  013746  003002                  MOV     REG+26,-(SP)
010126  013746  003000                  MOV     REG+24,-(SP)
010132  013746  002776                  MOV     REG+22,-(SP)
010136  013746  002774                  MOV     REG+20,-(SP)
010142  013746  002772                  MOV     REG+16,-(SP)
010146  013746  002770                  MOV     REG+14,-(SP)
010152  012746  003445                  MOV     #DH44H,-(SP)
010156  012746  000010                  MOV     #10,-(SP)
010162  010600                          MOV     SP,R0
```

```
                010164  104415                  TRAP    C$PNTX
                010166  062706  000022          ADD     #22,SP
15                                                      ;PRINT 'RPOF    RPDC    RPCC    RPER2  RPER3  RPEC1  RPEC2'
16              010172  012746  003525          MOV     #DH44I,(SP)
                010176  012746  000001          MOV     #1,-(SP)
                010202  010600                  MOV     SP,R0
                010204  104415                  TRAP    C$PNTX
                010206  062706  000004          ADD     #4,SP
17              010212  013746  003022          MOV     REG+46,-(SP)
                010216  013746  003020          MOV     REG+44,-(SP)
                010222  013746  003016          MOV     REG+42,-(SP)
                010226  013746  003014          MOV     REG+40,-(SP)
                010232  013746  003012          MOV     REG+36,-(SP)
                010236  013746  003010          MOV     REG+34,-(SP)
                010242  013746  003006          MOV     REG+32,-(SP)
                010246  012746  003617          MOV     #DH44J,(SP)
                010252  012746  000010          MOV     #10,-(SP)
                010256  010600                  MOV     SP,R0
                010260  104415                  TRAP    C$PNTX
                010262  062706  000022          ADD     #22,SP
18              010266  005737  002662          TST     RHTYPE          ;IS IT RH70 CONTROLLER ?
19              010272  001424                  BEQ     1$              ;BR IF NO
20                                                      ;PRINT 'RPBAE  RPCS3'
21              010274  012746  003701          MOV     #DH44K,-(SP)
                010300  012746  000001          MOV     #1,-(SP)
                010304  010600                  MOV     SP,R0
                010306  104415                  TRAP    C$PNTX
                010310  062706  000004          ADD     #4,SP
22              010314  013746  003026          MOV     REG+52,-(SP)
                010320  013746  003024          MOV     REG+50,-(SP)
                010324  012746  003721          MOV     #DH44L,-(SP)
                010330  012746  000003          MOV     #3,-(SP)
                010334  010600                  MOV     SP,R0
                010336  104415                  TRAP    C$PNTX
                010340  062706  000010          ADD     #10,SP
23              010344                  1$:                             ;CR LF
24              010344  012746  003064          MOV     #CRLF,(SP)
                010350  012746  000001          MOV     #1,-(SP)
                010354  010600                  MOV     SP,R0
                010356  104414                  TRAP    C$PNTB
                010360  062706  000004          ADD     #4,SP
25              010364                  L10002:
                010364  104423                  TRAP    C$MSG
26
27              010366                  DH45::
28              010366  012746  003740          MOV     #DH45A,-(SP)
                010372  012746  000001          MOV     #1,-(SP)
                010376  010600                  MOV     SP,R0
                010400  104414                  TRAP    C$PNTB
                010402  062706  000004          ADD     #4,SP
29              010406  013746  002306          MOV     SEC.DS,-(SP)
                010412  013746  002310          MOV     TRK.DS,-(SP)
                010416  013746  002304          MOV     CYL.DS,-(SP)
                010422  013746  002664          MOV     DRVNO,-(SP)
                010426  012746  003771          MOV     #DH45B,-(SP)
                010432  012746  000005          MOV     #5,-(SP)
                010436  010600                  MOV     SP,R0
```

```
        010440  104414                          TRAP    C$PNTB
        010442  062706  000014                  ADD     #14,SP
     30 010446  012746  004027                  MOV     #DH45C,-(SP)
        010452  012746  000001                  MOV     #1,-(SP)
        010456  010600                          MOV     SP,R0
        010460  104415                          TRAP    C$PNTX
        010462  062706  000004                  ADD     #4,SP
     31 010466  013746  002302                  MOV     SEC.RD,-(SP)
        010472  013746  002300                  MOV     TRK.RD,-(SP)
        010476  013746  002276                  MOV     CYL.RD,-(SP)
        010502  013746  002306                  MOV     SEC.DS,-(SP)
        010506  013746  002310                  MOV     TRK.DS,-(SP)
        010512  013746  002304                  MOV     CYL.DS,-(SP)
        010516  012746  004104                  MOV     #DH45D,-(SP)
        010522  012746  000007                  MOV     #7,-(SP)
        010526  010600                          MOV     SP,R0
        010530  104415                          TRAP    C$PNTX
        010532  062706  000020                  ADD     #20,SP
     32                                                         ;CR-LF
     33 010536  012746  003064                  MOV     #CRLF,(SP)
        010542  012746  000001                  MOV     #1,-(SP)
        010546  010600                          MOV     SP,R0
        010550  104414                          TRAP    C$PNTB
        010552  062706  000004                  ADD     #4,SP
     34 010556                          L10003:
        010556  104423                          TRAP    C$MSG
     35
     36 010560                          DH52::
     37 010560  013737  002642  002304          MOV     DTADPB+12,CYL.DS ;GET DESIRED CYLINDER
     38 010566  113737  002641  002310          MOVB    DTADPB+11,TRK.DS ;GET DESIRED TRACK
     39 010574  012746  004172                  MOV     #DH52A,-(SP)
        010600  012746  000001                  MOV     #1,-(SP)
        010604  010600                          MOV     SP,R0
        010606  104414                          TRAP    C$PNTB
        010610  062706  000004                  ADD     #4,SP
     40 010614  013746  002254                  MOV     TRGSEC,-(SP)
        010620  013746  002252                  MOV     SRHSEC,-(SP)
        010624  013746  002310                  MOV     TRK.DS,-(SP)
        010630  013746  002304                  MOV     CYL.DS,-(SP)
        010634  013746  002664                  MOV     DRVNO,-(SP)
        010640  012746  004246                  MOV     #DH52B,(SP)
        010644  012746  000006                  MOV     #6,-(SP)
        010650  010600                          MOV     SP,R0
        010652  104414                          TRAP    C$PNTB
        010654  062706  000016                  ADD     #16,SP
     41                                                         ;CR-LF
     42 010660  012746  003064                  MOV     #CRLF,-(SP)
        010664  012746  000001                  MOV     #1,-(SP)
        010670  010600                          MOV     SP,R0
        010672  104414                          TRAP    C$PNTB
        010674  062706  000004                  ADD     #4,SP
     43 010700                          L10004:
        010700  104423                          TRAP    C$MSG
     44
     45 010702                          DH25::
     46 010702  013746  002664                  MOV     DRVNO,-(SP)
        010706  012746  003067                  MOV     #DH25A,(SP)
```

```
        010712  012746  000002                  MOV     #2, (SP)
        010716  010600                           MOV     SP,R0
        010720  104414                           TRAP    C$PNTB
        010722  062706  000006                  ADD     #6,SP
47
48      010726  012746  003064                  MOV     #CRLF, (SP)     ;CR LF
        010732  012746  000001                  MOV     #1, (SP)
        010736  010600                           MOV     SP,R0
        010740  104414                           TRAP    C$PNTB
        010742  062706  000004                  ADD     #4,SP
49      010746                          L10005:
        010746  104423                           TRAP    C$MSG
50
```

```
                                .SBTTL  GLOBAL SUBROUTINES SECTION

                                ;*SAVE R0-R5
                                ;*CALL:
                                ;*      JSR     PC,SAVREG
010750                          SAVREG:
010750  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
010752  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
010754  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
010756  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
010760  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
010762  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
010764  016646  000020                  MOV     20(SP),-(SP)    ;;SAVE PUSHED PARAMETER
010770  016646  000020                  MOV     20(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
010774  016646  000020                  MOV     20(SP),-(SP)    ;;SAVE PC OF SAVREG CALL
011000  000207                          RTS     PC

                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      JSR     PC,RESREG
011002                          RESREG:
011002  012666  000020                  MOV     (SP)+,20(SP)    ;;RESTORE PC OF RESREG CALL
011006  012666  000020                  MOV     (SP)+,20(SP)    ;;RESTORE PC OF MAIN FLOW
011012  012666  000020                  MOV     (SP)+,20(SP)    ;;RESTORE PUSHED PARAMETER
011016  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
011020  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
011022  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
011024  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
011026  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
011030  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
011032  000207                          RTS     PC
```

```
                                        ;AUTO SIZE FOR RH70 CONTROLLER AND DETERMINE IF IT IS JUMPERED FOR 22 OP
                                        ;32 REGISTERS
                                        ;CALL
                                        ;       JSR     PC,SIZE70       ;CALL ROUTINE
                                        ;
                                        ;R5 MUST CONTAIN POINTER TO NEW RPCS1 BASE ADDRESS

 011034  005037  002660         SIZE70: CLR     RHEXT           ;CLEAR RPBAE OFFSET
 011040  005037  002662                 CLR     RHTYPE          ;CLEAR RHXX TYPE REGISTER (RH11)
 011044  013746  000004                 MOV     ERRVEC,-(SP)    ;SAVE CONTENTS OF ERROR VECTOR
 011050  012737  011120  000004         MOV     #2$,ERRVEC      ;SETUP 'TRAP' RETURN ADDRESS
 011056  011500                         MOV     (R5),R0         ;GET RPCS1 ADDRESS
 011060  062700  000050                 ADD     #50,R0          ;GET REGISTER OFFSET FOR RH70
 011064  012702  000012                 MOV     #10.,R2         ;GET NUMBER OF REGISTERS TO CHECK
 011070  005720                         TST     (R0)+           ;TRAP IF NOT A VALID RPBAE
 011072  005720                         TST     (R0)+           ;TRAP IF NOT A VALID RPCS3
 011074  012737  000050  002660         MOV     #50,RHEXT       ;LOAD OFFSET FOR RPBAE (22 REGISTER RH)
 011102  005720                 1$:     TST     (R0)+           ;TRAP IF NOT A VALID REGISTER
 011104  005302                         DEC     R2              ;DONE WITH ALL 32 REGISTERS ?
 011106  001375                         BNE     1$              ;BR IF NO
 011110  012737  000074  002660         MOV     #74,RHEXT       ;LOAD OFFSET FOR RPBAE (32 REGISTER RH)
 011116  000403                         BR      3$
 011120  012716  011126         2$:     MOV     #3$,(SP)        ;SETUP RETURN ADDRESS
 011124  000002                         RTI
                                 3$:     MOV     (R5),R0         ;GET RPCS1 REGISTER
 011130  013702  002660                 MOV     RHEXT,R2        ;GET RPBAE REGISTER OFFSET
 011134  001415                         BEQ     4$              ;BR IF NONE
 011136  060002                         ADD     R0,R2           ;GET RPBAE REGISTER
 011140  052710  001400                 BIS     #A17!A16,(R0)   ;SET EXTENDED ADDRESS BITS IN RPCS1
 011144  022712  000003                 CMP     #3,(R2)         ;ARE THE EXTENDED BITS SET IN RPBAE ?
 011150  001007                         BNE     4$              ;BR IF NO
 011152  005012                         CLR     (R2)            ;CLEAR EXTENDED ADDRESS BITS IN RPBAE
 011154  011046                         MOV     (R0), (SP)      ;SAVE RPCS1 REG CONTENTS
 011156  042726  176377                 BIC     #^C<A17!A16>,(SP)+      ;ARE THE EXTEND BITS CLEAR IN RPCS1 ?
 011162  001002                         BNE     4$              ;BR IF NO
 011164  005237  002662                 INC     RHTYPE          ;SET RHXX TYPE REGISTER (RH70)
 011170  012637  000004         4$:     MOV     (SP)+,ERRVEC    ;RESTORE CONTENTS OF ERROR VECTOR
 011174  000207                         RTS     PC
```

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

011176  005046                  $DIV:   CLR     -(SP)   ;;CLEAR DIV STATUS WORD: RESERVED TO SET C AND V BITS
011200  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
011202  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
011204  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
011206  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
011210  005046                          CLR     -(SP)           ;;SAVE A PLACE FOR SIGNS
011212  012746  000021                  MOV     #17.,-(SP)      ;;SETUP THE ITERATION COUNTER
011216  016601  000024                  MOV     24(SP),R1       ;;PICKUP THE DIVIDEND
011222  016600  000022                  MOV     22(SP),R0
011226  100005                          BPL     1$              ;;CHECK THE SIGN
011230  105366  000003                  DECB    3(SP)           ;;KEEP TRACK OF THE SIGN
011234  005400                          NEG     R0              ;;AND NEGATE THE ORIGINAL
011236  005401                          NEG     R1              ;;NUMBER
011240  005600                          SBC     R0
011242  016602  000020          1$:     MOV     20(SP),R2       ;;PICKUP THE DIVISOR
011246  002407                          BLT     2$              ;;CHECK THE SIGN
011250  003011                          BGT     3$              ;;DIVISOR OF 0 IS A NO-NO
011252  052766  000003  000014          BIS     #3,14(SP)       ;;SET "V" & "C" IN DIV STAT WORD
011260  012700  177777                  MOV     #-1,R0          ;;SET REMAINDER TO ALL ONES
011264  000424                          BR      7$              ;;EXIT
011266  005266  000002          2$:     INC     2(SP)           ;;KEEP TRACK OF DIVISORS SIGN
011272  000401                          BR      4$
011274  005402                  3$:     NEG     R2              ;;NEGATE THE ORIGINAL NUMBER
011276  000241                  4$:     CLC                     ;;CLEAR "C" IN PSW
011300  000405                          BR      6$              ;;START FORMING QUOTIENT
011302  006100                  5$:     ROL     R0              ;;POSITION MSB'S
011304  010003                          MOV     R0,R3           ;;COPY
011306  060203                          ADD     R2,R3           ;;COMPARE DIVIDEND & DIVISOR
011310  103001                          BCC     6$              ;;BR IF DIVIDEND > DIVISOR
011312  010300                          MOV     R3,R0           ;;REMAINDER AFTER THIS LOOP
011314  006101                  6$:     ROL     R1              ;;QUOTIENT BIT ENTERS HERE
011316  005316                          DEC     (SP)            ;;DONE?
011320  001370                          BNE     5$              ;;BR IF NO
```

```
     58 011322  005701                          TST     R1              ;;OVERFLOW?
     59 011324  100005                          BPL     8$              ;;BR IF NO
     60 011326  052766  000002  000014          BIS     #2,14(SP)       ;;SET "V" IN DIV STATUS WORD
     61 011334  005000                          CLR     R0              ;;SET REMAINDER TO ALL ZEROS
     62 011336  010001                  7$:     MOV     R0,R1           ;;COPY REMAINDER INTO QUOTIENT
     63 011340  005726                  8$:     TST     (SP)+           ;;CLEAR COUNTER FROM STACK
     64 011342  005716                          TST     (SP)            ;;REMAINDER SIGN CORRECTION NEEDED?
     65 011344  002004                          BGE     9$              ;;BR IF NO
     66 011346  005400                          NEG     R0              ;;NEGATE REMAINDER
     67 011350  105066  000001                  CLRB    1(SP)           ;;CLEAR SIGN
     68 011354  005316                          DEC     (SP)            ;;BUT DON'T FORGET QUOTIENT
     69 011356  005726                  9$:     TST     (SP)+           ;;QUOTIENT SIGN CORRECTION NEEDED?
     70 011360  001401                          BEQ     10$             ;;BR IF NO
     71 011362  005401                          NEG     R1              ;;NEGATE QUOTIENT
     72 011364  010166  000020          10$:    MOV     R1,20(SP)       ;;RETURN QUOTIENT AND
     73 011370  010066  000016                  MOV     R0,16(SP)       ;;REMAINDER TO USER
     74 011374  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
     75 011376  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
     76 011400  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
     77 011402  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
     78 011404  006226                          ASR     (SP)+           ;;COPY C IN PSW PER C IN DIV STAT WORD
     79 011406  000242                          CLV                     ;;CLEAR V IN PSW
     80 011410  001401                          BEQ     11$             ;;V=0 IN DIV STAT WORD, EXIT
     81 011412  000262                          SEV                     ;;V=1 IN DIV STAT WORD, COPY V IN PSW
     82 011414  012616                  11$:    MOV     (SP)+,(SP)      ;;MOVE RETURN ADR UP ONE PLACE, OVERRIDING DIVISOR
     83 011416  000207                          RTS     PC              ;;RETURN WITH SP POINTING TO REMAINDER
```

```
                                ;       INTEGER MULTIPLY ROUTINE
                                ;
                                ;*CALL
                                ;*      MOV     MULTIPLER,-(SP)
                                ;*      MOV     MULTIPLICAND,-(SP)
                                ;*      JSR     PC,$MULT
                                ;*      RETURN                  ;;PRODUCT IS ON THE STACK
                                ;*
                                ;*      STACK   PRODUCT
                                ;*       - --   ---- --
                                ;*      TOP     LSB'S
                                ;*      +2      MSB'S
                                $MULT:  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
                                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
                                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
                                        CLR      (SP)           ;;CLEAR THE SIGN KEY
                                        MOV     12(SP),R1       ;;GET THE MULTIPLICAND
                                        BPL     1$              ;;BR IF PLUS
                                        INC     (SP)            ;;SET THE SIGN KEY
                                        NEG     R1              ;;MAKE THE MULTIPLICAND POSTIVE
                                1$:     MOV     14(SP),R2       ;;GET THE MULTIPLIER
                                        BPL     2$              ;;BR IF PLUS
                                        DEC     (SP)            ;;UPDATE THE SIGN KEY
                                        NEG     R2              ;;MAKE THE MULTIPLIER POSTIVE
                                2$:     MOV     #17.,-(SP)      ;;SET THE LOOP COUNT
                                        CLR     R0              ;;SETUP FOR THE MULTIPLY LOOP
                                3$:     BCC     4$              ;;DON'T ADD IF MULTIPLICAND = 0
                                        ADD     R2,R0
                                4$:     ROR     R0              ;;POSITION THE PARITIAL PRODUCT AND
                                        ROR     R1              ;;THE MULTIPLICAND
                                        DEC     (SP)            ;;HAS ALL BITS OF THE MULTIPLICAND BEEN DONE?
                                        BNE     3$              ;;BR IF NO
                                        CMP     (SP)+,(SP)      ;;SHOULD PRODUCT BE NEGATIVE?
                                        BEQ     5$              ;;GO TO EXIT IF NO
                                        NEG     R0              ;;YES--SO MAKE IT SO
                                        NEG     R1
                                        SBC     R0
                                5$:     TST     (SP)+           ;;CLEAR SIGN INFO. OFF OF STACK
                                        MOV     R0,12(SP)       ;;PUT THE PRODUCT ON THE STACK (MSB'S)
                                        MOV     R1,10(SP)       ;;LSB'S
                                        MOV     (SP)+,R2        ;;POP STACK INTO R2
                                        MOV     (SP)+,R1        ;;POP STACK INTO R1
                                        MOV     (SP)+,R0        ;;POP STACK INTO R0
                                        RTS     PC
```

```
 1
 2                                ;OCTAL TO HEXADECIMAL CONVERSION ROUTINE
 3
 4 011532  010146                 OCTHEX: MOV     R1,-(SP)        ;SAVE R1
 5 011534  010246                         MOV     R2,-(SP)        ;SAVE R2
 6 011536  012700  011666                 MOV     #PSTACK,R0      ;SET UP THE BUFFER ADDRESS
 7 011542  012702  000004                 MOV     #4,R2           ;GET THE ITERATION VALUES
 8 011546  012701  000004         1$:     MOV     #4,R1           ;AND DUPLICATE FOR TWO LOOPS
 9 011552  005010                         CLR     (R0)            ;INITIALIZE THE BUFFER
10 011554  006310                 2$:     ASL     (R0)            ;MOVE THE PREVIOUS BIT(S) OVER
11 011556  000241                         CLC                     ;CARRY = 0
12 011560  006366  000006                 ASL     6(SP)           ;ROTATE A BIT FROM THE TEST VALUE
13 011564  103002                         BCC     3$              ;IF ZERO, SKIP NEXT INSTRUCTION
14 011566  052710  000001                 BIS     #BIT0,(R0)      ;MARK THE BIT AS BEING SET
15 011572  005301                 3$:     DEC     R1              ;ONE LESS ITERATION TO GO
16 011574  003367                         BGT     2$              ;BUT NOT DONE UNTIL = 0!
17 011576  005720                         TST     (R0)+           ;NEXT BUFFER LOCATION
18 011600  005302                         DEC     R2              ;ONE LESS ITERATION TO-GO
19 011602  003361                         BGT     1$              ;IF NOT ZERO, KEEP GOING!
20 011604  012702  000004                 MOV     #4,R2           ;GET THE NEW ITERATION COUNT
21 011610  012700  011666                 MOV     #PSTACK,R0      ;AND GET THE BUFFER ADDRESS AGAIN
22 011614  005710                 4$:     TST     (R0)            ;CONTENTS ZERO?
23 011616  003005                         BGT     5$              ;IF NOT, SKIP NEXT
24 011620  012720  000060                 MOV     #60,(R0)+       ;SET THIS CHARACTER = NULL
25 011624  005302                         DEC     R2              ;ONE LESS CHARACTER TO GO
26 011626  003372                         BGT     4$              ;IF NOT ZERO, KEEP GOING
27 011630  000412                         BR      8$              ;DONE, RETURN!
28 011632  021027  000011         5$:     CMP     (R0),#11        ;ALPHA OR NUMERIC CHARACTER?
29 011636  101003                         BHI     6$              ;IF > 11, ALPHA!
30 011640  062720  000060                 ADD     #60,(R0)+       ;MAKE NUMERIC ASCII
31 011644  000402                         BR      7$              ;AND GO-ON
32 011646  062720  000067         6$:     ADD     #55.,(R0)+      ;MAKE HEX ASCII
33 011652  005302                 7$:     DEC     R2              ;ONE LESS ITERATION TO-GO
34 011654  003366                         BGT     5$              ;ONE LESS ITERATION, IF NOT ZERO
35 011656  012602                 8$:     MOV     (SP)+,R2        ;RESTORE R2
36 011660  012601                         MOV     (SP)+,R1        ;AND R1
37 011662  012616                         MOV     (SP)+,(SP)      ;MOVE STACK OVER INPUT VALUE
38 011664  000207                         RTS     PC              ;AND RETURN
39
40 011666                        PSTACK: .BLKW   10.     ;SOTWARE PSEUDO STACK
```

```
 1
 2                                          ;SUBR TO GENERATE A PSEUDO RANDOM NUMBER
 3                                          ;THE NUMBER IS RETURNED IN $RP1
 4                                          ;THERE ARE 3 SEED VALUES THAT CAN BE SAVED
 5                                          ;TO GENERATE THE PSEUDO RANDOM NUMBER
 6
 7 011712  010046                  RAND:   MOV     R0,-(SP)        ;SAVE R0
 8 011714  013700  011774                  MOV     $RP1,R0         ;GET A SEED
 9 011720  000241                          CLC                     ;
10 011722  005337  011772                  DEC     $RNCON  ;
11 011726  006100                          ROL     R0
12 011730  006100                          ROL     R0
13 011732  063700  011772                  ADD     $RNCON,R0
14 011736  063700  011776                  ADD     $RP2,R0
15 011742  010037  011774                  MOV     R0,$RP1
16 011746  006100                          ROL     R0
17 011750  006100                          ROL     R0
18 011752  063700  011776                  ADD     $RP2,R0
19 011756  006100                          ROL     R0
20 011760  006100                          ROL     R0
21 011762  010037  011776                  MOV     R0,$RP2
22 011766  012600                          MOV     (SP)+,R0        ;RESTORE R0
23 011770  000207                          RTS     PC
24
25 011772  000000                  $RNCON: 0
26 011774  001233                  $RP1:   1233
27 011776  007622                  $RP2:   7622
```

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

012000  005037  002260          ST.CLK: CLR     CLKSTA          ;ASSUME "NO CLOCK"
012004  005037  012244                  CLR     HERTZ           ;ASSUME "UNKNOWN" HERTZ
                                                                ;IS THERE A P CLOCK PRESENT ?
012010  012700  000120                  MOV     #P,R0
012014  104462                          TRAP    C$CLCK
012016  010005                          MOV     R0,R5
                                                                ;GO TO 1$ IF NO
012020  103031                          BCC     1$

                                        ;SET P-CLOCK P-TABLE & START P-CLOCK

012022  010537  012220                  MOV     R5,PCLKTB       ;SAVE P-CLOCK TABLE ADDRESS
012026  011537  012222                  MOV     (R5),PKCS       ;GET 'CSR' ADDRESS
012032  011537  012224                  MOV     (R5),PKB        ;MAKE PKB ADDRESS BY
012036  062737  000002  012224          ADD     #2,PKB          ;ADDING 2
012044  012537  012226                  MOV     (R5)+,PKC       ;MAKE PKC ADDRESS BY
012050  062737  000004  012226          ADD     #4,PKC          ;ADDING 4
012056  005725                          TST     (R5)+           ;SKIP OVER 'BR LEVEL'
012060  012537  012230                  MOV     (R5)+,PKV       ;GET 'VECTOR' ADDRESS
012064  012537  012244                  MOV     (R5)+,HERTZ     ;GET 'HERTZ' LINE FREQUENCY
012070  012737  000001  002260          MOV     #1,CLKSTA       ;SET P-CLOCK FLAG
012076  004737  012246                  JSR     PC,ST.PCLK      ;START P-CLOCK AS A WATCH DOG TIMER
012102  000423                          BR      2$
012104                          1$:                             ;IS THERE A L CLOCK PRESENT ?
012104  012700  000114                  MOV     #'L,R0
012110  104462                          TRAP    C$CLCK
012112  010005                          MOV     R0,R5
                                                                ;GO TO 3$ IF NO
012114  103036                          BCC     3$

                                        ;SET L CLOCK P-TABLE, START L-CLOCK

012116  010537  012234                  MOV     R5,LCLKTB       ;SAVE L-CLOCK TABLE ADDRESS
012122  012537  012236                  MOV     (R5)+,LKS       ;GET 'CSR' ADDRESS
012126  005725                          TST     (R5)+           ;SKIP OVER 'BR LEVEL'
012130  012537  012240                  MOV     (R5)+,LKV       ;GET 'VECTOR' ADDRESS
012134  012537  012244                  MOV     (R5)+,HERTZ     ;GET 'HERTZ' LINE FREQUENCY
012140  012737  177777  002260          MOV     #-1,CLKSTA      ;L-CLOCK FLAG
012146  004737  012320                  JSR     PC,ST.LCLK      ;START L-CLOCK AS A WATCH DOG TIMER

                                        ;GET THE CLOCK TICK COUNT

012152  012737  000024  012214  2$:     MOV     #20.,TICKMS     ;ASSUME 20.0 MSEC &
012160  012737  047040  012216          MOV     #20000.,TICKUS  ;20000.0 USEC
012166  023727  012244  000062          CMP     HERTZ,#50.      ;IS IT 50 HERTZ LINE FREQUENCY ?
```

```
 54 012174  001406                          BEQ     3$              ;BR IF YES
 55 012176  012737  000020  012214          MOV     #16.,TICKMS     ;MUST BE 60HZ, 16.666 MSEC &
 56 012204  012737  040432  012216          MOV     #16666.,TICKUS  ;16666.0 USEC
 57 012212  000207                  3$:     RTS     PC
 58
 59 012214  000020                  TICKMS: .WORD   16.             ;16 MILLISECONDS PER CLOCK TICK
 60 012216  040432                  TICKUS: .WORD   16666.          ;16666 MICROSECONDS PER CLOCK TICK
 61
 62                                 ;KW11-P CLOCK TABLE, CSR REG, PKB REG, PKC REG & VEC ADR
 63
 64 012220  000000                  PCLKTB: .WORD   0               ;P-CLK TBL ADR
 65
 66 012222  172540                  PKCS:   .WORD   172540          ;CONTROL & STATUS
 67 012224  172542                  PKB:    .WORD   172542          ;COUNT SET BFR
 68 012226  172544                  PKC:    .WORD   172544          ;COUNTER
 69 012230  000104  000106          PKV:    .WORD   104,106         ;VECTOR
 70
 71                                 ;KW11-L CLOCK TABLE, CSR REG & VEC ADR
 72
 73 012234  000000                  LCLKTB: .WORD   0               ;L CLK TBL ADR
 74
 75 012236  177546                  LKS:    .WORD   177546          ;CONTROL & STATUS
 76 012240  000100  000102          LKV:    .WORD   100,102         ;VECTOR
 77
 78 012244  000000                  HERTZ:  .WORD   0               ;60 HZ. OR 50 HZ. LINE FREQUENCY
 79
 80 012246                          ST.PCLK:
 81 012246  105737  002233                  TSTB    STOFLG          ;ALLOW SOFTWARE TIMEOUTS ?
 82 012252  001021                          BNE     1$              ;NO  BRANCH
 83                                                                 ;SETUP VECTOR FOR P CLOCK
 84 012254  012746  000300                  MOV     @PRIO6, (SP)
    012260  012746  012414                  MOV     @KWSRV,-(SP)
    012264  013746  012230                  MOV     PKV,-(SP)
    012270  012746  000003                  MOV     #3, (SP)
    012274  104437                          TRAP    C$SVEC
    012276  062706  000010                  ADD     #10,SP
 85 012302  012777  000001  177714          MOV     #1,@PKB         ;COUNT ONE TICK
 86 012310  012777  000115  177704          MOV     #115,@PKCS      ;"INT.EN.",COUNT DOWN", "MODE 1 (REPEAT)",
 87                                                                 ;"LINE FREQ', AND "RUN"
 88 012316  000207                  1$:     RTS     PC              ;RETURN
 89
 90 012320                          ST.LCLK:
 91 012320  105737  002233                  TSTB    STOFLG          ;ALLOW SOFTWARE TIMEOUTS ?
 92 012324  001016                          BNE     1$              ;NO- BRANCH
 93                                                                 ;SETUP VECTOR FOR L-CLOCK
 94 012326  012746  000300                  MOV     @PRIO6,-(SP)
    012332  012746  012414                  MOV     @KWSRV,-(SP)
    012336  013746  012240                  MOV     LKV,-(SP)
    012342  012746  000003                  MOV     #3,-(SP)
    012346  104437                          TRAP    C$SVEC
    012350  062706  000010                  ADD     #10,SP
 95 012354  012777  000100  177654          MOV     #100,@LKS       ;START THE KW11 L
 96 012362  000207                  1$:     RTS     PC              ;RETURN
 97
 98                                 ;THIS ROUTINE IS USED TO STOP THE SYSTEM CLOCK
 99                                 ;CALL
100                                 ;       JSR     PC,STOPCK       ;CALL ROUTINE
```

```
101
102 012364  005737  002260          STOPCK: TST     CLKSTA          ;IS THERE A CLOCK AVAILABLE ?
103 012370  001410                          BEQ     2$              ;BR IF NO
104 012372  100404                          BMI     1$              ;BR IF L CLOCK
105 012374  042777  000101  177620          BIC     #101,@PKCS      ;STOP THE P CLOCK
106 012402  000403                          BR      2$
107 012404  042777  000100  177624  1$:     BIC     #100,@LKS       ;STOP THE L CLOCK
108 012412  000207                  2$:     RTS     PC
109
110                                 ;KW11 CLOCK INTERRUPT SERVICE ROUTINE
111
113 012414  013746  012214          KWSRV:  MOV     TICKMS,(SP)     ;TIME PER TICK IN MILLISECONDS
114 012420  004737  024104                  JSR     PC,RPTMR        ;COUNT THE ELASPED TIME
115 012424                          L10006:
    012424  000002                          RTI
116
120                                 ;THIS SUBROUTINE IS USED TO RELOAD THE CLOCK FOR A 4 SECOND TIMEOUT DURING
121                                 ;A RECALIBRATE COMMAND
122
123 012426  042777  000101  177566  FORSEC: BIC     #101,@PKCS      ;STOP CLOCK
124 012434  017746  177570                  MOV     @PKV,-(SP)      ;SAVE THE OLD CLOCK VECTOR ADDRESS
125                                                                 ;SETUP VECTOR FOR P CLOCK
126 012440  012746  000300                  MOV     #PRI06,(SP)
    012444  012746  012504                  MOV     #1$,(SP)
    012450  013746  012230                  MOV     PKV,-(SP)
    012454  012746  000003                  MOV     #3,-(SP)
    012460  104437                          TRAP    C$SVEC
    012462  062706  000010                  ADD     #10,SP
127 012466  012777  000360  177530          MOV     #240.,@PKB      ;4 SEC  DELAY AT LINE FREQ
128 012474  012777  000105  177520          MOV     #105,@PKCS      ;RUN AT LINE FREQ, DOWN MODE, IE=1
129 012502  000001                          WAIT                    ;WAIT FOR CLK INTER
131 012504  042777  000101  177510  1$:     BIC     #101,@PKCS      ;STOP CLOCK
132 012512  012716  012520                  MOV     #2$,(SP)        ;ADJUST FOR RETURN
133 012516                          L10007:
    012516  000002                          RTI
134 012520                          2$:                             ;RESTORE OLD VECTOR ADDRESS FOR P CLOCK
135 012520  012746  000300                  MOV     #PRI06,(SP)
    012524  012646                          MOV     (SP)+,-(SP)
    012526  013746  012230                  MOV     PKV,-(SP)
    012532  012746  000003                  MOV     #3,-(SP)
    012536  104437                          TRAP    C$SVEC
    012540  062706  000010                  ADD     #10,SP
136 012544  005077  177454                  CLR     @PKB            ;CLEAR CLK BFR COUNT
137 012550  000207                          RTS     PC
141
145                                 ;ROUTINE TO PROVIDE A 2 MS STALL AFTER A SEEK OPERATION IN THE SEEK TIMING
146                                 ;TESTS.  THIS STALL IS REQUIRED TO COMPENSATE FOR THE 'ACCESS READY' DELAY
147                                 ;IN THE RP07.  THIS STALL TIME IS NOT INCLUDED IN THE CALCULATED SEEK TIMES.
148                                 ;CALL
149                                 ;       JSR     PC,TWOMS
150                                 ;       RETURN
151
152 012552  042777  000101  177442  TWOMS:  BIC     #101,@PKCS      ;STOP THE P-CLOCK
153 012560  017746  177444                  MOV     @PKV,(SP)       ;SAVE THE OLD CLOCK VECTOR ADDRESS
154                                                                 ;SETUP VECTOR FOR P-CLOCK
155 012564  012746  000300                  MOV     #PRI06,-(SP)
    012570  012746  012656                  MOV     #2$,-(SP)
```

```
        012574  013746  012230                  MOV     PKV, (SP)
        012600  012746  000003                  MOV     #3,-(SP)
        012604  104437                          TRAP    C$SVEC
        012606  062706  000010                  ADD     #10,SP
    156 012612  012777  000310  177404          MOV     #200.,@PKB      ;LOAD THE CLOCK BUFFER
    157 012620  105737  002230                  TSTB    TIMSTL          ;RANDOM STALL?
    158 012624  001410                          BEQ     1$              ;NO
    159 012626  004737  011712                  JSR     PC,RAND         ;YES, FETCH A RANDOM NUMBER
    160 012632  013746  011774                  MOV     $RP1, (SP)      ;GET RANDOM NUMBER
    161 012636  042716  173000                  BIC     #^C4777,(SP)    ;LIMIT IT TO 25 MSEC
    162 012642  062677  177356                  ADD     (SP)+,@PKB      ;ADD IT TO THE BASIC 2 MSEC STALL
    163 012646  012777  000101  177346  1$:     MOV     #101,@PKCS      ;START THE CLOCK
    164 012654  000001                          WAIT                    ;WAIT FOR 2 MS
    166 012656  042777  000101  177336  2$:     BIC     #101,@PKCS      ;STOP THE P-CLOCK
    167 012664  012716  012672                  MOV     #3$,(SP)        ;ADJUST FOR RETURN
    168 012670                          L10010:
        012670  000002                          RTI
    169 012672                          3$:                             ;RESTORE OLD VECTOR ADDRESS FOR P-CLOCK
    170 012672  012746  000300                  MOV     #PRI06,-(SP)
        012676  012646                          MOV     (SP)+, (SP)
        012700  013746  012230                  MOV     PKV,-(SP)
        012704  012746  000003                  MOV     #3, (SP)
        012710  104437                          TRAP    C$SVEC
        012712  062706  000010                  ADD     #10,SP
    171 012716  005077  177302                  CLR     @PKB            ;SET COUNT = 0
    172 012722  000207                          RTS     PC              ;RETURN
    176
    177                                 ;THIS ROUTINE LOADS A READ HEADER AND DATA COMMAND OR A SEEK COMMAND
    178                                 ;INTO DPB.B+2 AND DPB.C+2, DEPENDING ON THE STATE OF REDHDR FLAG
    179                                 ;THAT CAN BE ALTERED BY THE OPERATOR.
    180                                 ;CALL
    181                                 ;       JSR     PC,LDCMD
    182                                 ;       RETURN
    183
    184 012724                          LDCMD:
    185 012724  105737  002226                  TSTB    REDHDR          ;DO EXPLICIT SEEKS FOR VERIFYING ?
    186 012730  001407                          BEQ     1$              ;NO  BRANCH
    187 012732  012737  000173  002572          MOV     #RDHD,DPB.B+2   ;NO -SET UP FOR READ HEADER AND
    188 012740  012737  000173  002612          MOV     #RDHD,DPB.C+2   ;DATA COMMAND
    189 012746  000406                          BR      2$
    190 012750  012737  000105  002572  1$:     MOV     #SEEK,DPB.B+2 ;SETUP FOR SEEK COMMAND
    191 012756  012737  000105  002612          MOV     #SEEK,DPB.C+2
    192 012764  000207                  2$:     RTS     PC
```

```
                                        ;ERROR ANALYSIS ROUTINE
                                        ;R0     NOT USED
                                        ;R1     DPB ADDRESS
                                        ;R2     BASE ADDRESS OF SAVED REG'S TABLE
                                        ;R3     TEMP STORAGE
                                        ;R4
                                        ;R5     LINK AND RET
                                        ;
                                        ;       CALLING SEQ:
                                        ;       JSR     R5,ERRANY
                                        ;       DPB
                                        ;       RET

012766                                  ERRANY:
012766  010146                                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
012770  010246                                  MOV     R2, (SP)        ;;PUSH R2 ON STACK
012772  010346                                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
012774  010446                                  MOV     R4,-(SP)        ;;PUSH R4 ON STACK
012776  005037  002264                         CLR     SVSTAT          ;PROGRAM FLAGS: EACH BIT INDICATES ERROR TYPE
013002  012501                                  MOV     (R5)+,R1        ;DPB ADDRESS
013004  016102  000014                         MOV     14(R1),R2       ;ADDRESS OF SAVED REGISTER TABLE
013010  016237  000036  002276                 MOV     36(R2),CYL.RD   ;GET CURRENT CYLINDER
013016  116237  000006  002302                 MOVB    6(R2),SEC.RD    ;GET CURRENT SECTOR
013024  116237  000007  002300                 MOVB    7(R2),TRK.RD    ;GET CURRENT TRACK
013032  126127  000002  000150                 CMPB    2(R1),#150      ;IF DATA TFR CMD
013040  002402                                  BLT     1$
013042  004737  014322                         JSR     PC,ADJUST       ;THEN GET THE DECREMENTED SECTOR ADDRESS
013046  032712  020000                 1$:     BIT     #MCPE,(R2)      ;MCPE ERROR ?
013052  001406                                  BEQ     2$              ;BRANCH IF NOT
013054  104456                                  TRAP    C$ERHRD
013056  000001                                  .WORD   1
013060  005420                                  .WORD   EM1
013062  007672                                  .WORD   DH44
013064  000137  014156                         JMP     32$             ;EXIT

013070  032762  020400  000010         2$:     BIT     #MDPE!UPE,10(R2) ;DATA PARITY PROBLEM ?
013076  001414                                  BEQ     4$               ;BRANCH IF NONE
013100  032762  100000  000042                 BIT     #BSE,42(R2)     ;SEE IF BAD SECTOR DETECTED,
013106  001402                                  BEQ     3$              ;BRANCH IF NOT, ELSE
013110  000137  014310                         JMP     42$             ;EXIT
013114                                  3$:
013114  104456                                  TRAP    C$ERHRD
013116  000002                                  .WORD   2
013120  005465                                  .WORD   EM2
013122  007672                                  .WORD   DH44
013124  000137  014166                         JMP     33$             ;EXIT

013130  032762  017000  000010         4$:     BIT     #NED!NEM!MSPGE!MXF,10(R2) ;ILLEGAL CONDITIONS ?
013136  001412                                  BEQ     5$                        ;BRANCH IF NONE
013140  032762  040000  000012                 BIT     #ERR,12(R2)     ;ANY DRIVE ERROR ?
013146  001006                                  BNE     5$              ;REPORT THE DRIVE ERROR
013150  104456                                  TRAP    C$ERHRD
013152  000003                                  .WORD   3
013154  005527                                  .WORD   EM3
013156  007672                                  .WORD   DH44
013160  000137  014166                         JMP     33$             ;EXIT
```

```
013164  032762  040000  000010  5$:     BIT     #WCE,10(R2)     ;ANY DATA PATTERN ERROR ?
013172  001406                          BEQ     6$              ;BRANCH IF NONE
013174  104456                          TRAP    C$ERHRD
013176  000004                          .WORD   4
013200  005605                          .WORD   EM4
013202  007672                          .WORD   DH44
013204  000137  014166                  JMP     33$             ;EXIT

013210  032762  100000  000010  6$:     BIT     #DLT,10(R2)     ;ANY DATA LATE ERROR ?
013216  001406                          BEQ     7$              ;BRANCH IF NONE
013220  104456                          TRAP    C$ERHRD
013222  000005                          .WORD   5
013224  005627                          .WORD   EM5
013226  007672                          .WORD   DH44
013230  000137  014166                  JMP     33$             ;EXIT

013234  032762  040000  000012  7$:     BIT     #ERR,12(R2)     ;ANY DRIVE ERROR ?
013242  001002                          BNE     8$              ;BRANCH IF ANY
013244  000137  014310                  JMP     42$             ;EXIT

013250  032762  100000  000040  8$:     BIT     #PGE,40(R2)     ;DRIVE PROGRAMMING ERROR ?
013256  001406                          BEQ     9$              ;BRANCH IF NONE
013260  104456                          TRAP    C$ERHRD
013262  000006                          .WORD   6
013264  005647                          .WORD   EM6
013266  007672                          .WORD   DH44
013270  000137  014176                  JMP     34$             ;EXIT

013274  032762  002000  000042  9$:     BIT     #LBC,42(R2)     ;LOST BIT CLOCK ?
013302  001406                          BEQ     10$             ;BRANCH IF NONE
013304  104456                          TRAP    C$ERHRD
013306  000007                          .WORD   7
013310  005705                          .WORD   EM7
013312  007672                          .WORD   DH44
013314  000137  014206                  JMP     35$             ;EXIT

013320  032762  000040  000014  10$:    BIT     #WCF,14(R2)     ;WRITE CLOCK FAILS ?
013326  001406                          BEQ     11$             ;BRANCH IF NONE
013330  104456                          TRAP    C$ERHRD
013332  000013                          .WORD   11
013334  005733                          .WORD   EM11
013336  007672                          .WORD   DH44
013340  000137  014206                  JMP     35$             ;EXIT

013344  032762  004000  000014  11$:    BIT     #WLE,14(R2)     ;WRITE LOCK ERROR ?
013352  001406                          BEQ     12$             ;BRANCH IF NONE
013354  104456                          TRAP    C$ERHRD
013356  000014                          .WORD   12
013360  005755                          .WORD   EM12
013362  007672                          .WORD   DH44
013364  000137  014206                  JMP     35$             ;EXIT

013370  032762  010000  000014  12$:    BIT     #DTE,14(R2)     ;DATA ERROR ON DRIVE ?
013376  001042                          BNE     17$             ;REPORT THE DRIVE TIMING ERROR
013400  032762  100000  000014          BIT     #DCK,14(R2)     ;ANY DATA ERROR ?
013406  001444                          BEQ     18$             ;BRANCH IF NONE
```

```
 83 013410  032762  000100  000014          BIT     #ECH,14(R2)     ;ECH SET, THEN RPEC1=10040
 84 013416  001412                          BEQ     14$             ;EXIT IF NOT SET
 85 013420  022762  010040  000044  13$:     CMP     #10040,44(R2)   ;POSITION REG=10040
 86 013426  001012                          BNE     15$             ;REPORT ECC LOGIC FAILURE
 87 013430  104456                          TRAP    C$ERHRD
    013432  000057                          .WORD   47
    013434  007305                          .WORD   EM47
    013436  007672                          .WORD   DH44
 88 013440  000137  014206                  JMP     35$             ;EXIT
 89
 90 013444  022762  010040  000044  14$:     CMP     #10040,44(R2)   ;LEGICAL POSITION REG CONTENTS ?
 91 013452  101006                          BHI     16$             ;BRANCH IF SO
 92 013454                          15$:
    013454  104456                          TRAP    C$ERHRD
    013456  000053                          .WORD   43
    013460  007134                          .WORD   EM43
    013462  007672                          .WORD   DH44
 93 013464  000137  014206                  JMP     35$             ;EXIT
 94
 95 013470                          16$:
    013470  104456                          TRAP    C$ERHRD
    013472  000015                          .WORD   13
    013474  005776                          .WORD   EM13
    013476  007672                          .WORD   DH44
 96 013500  000137  014206                  JMP     35$             ;EXIT
 97
 98 013504                          17$:
    013504  104456                          TRAP    C$ERHRD
    013506  000055                          .WORD   45
    013510  007224                          .WORD   EM45
    013512  007672                          .WORD   DH44
 99 013514  000137  014206                  JMP     35$             ;EXIT
100
101 013520  032762  000010  000042  18$:     BIT     #DPE,42(R2)     ;DATA BUS PARITY ?
102 013526  001406                          BEQ     19$             ;BRANCH IF NONE
103 013530  104456                          TRAP    C$ERHRD
    013532  000016                          .WORD   14
    013534  006017                          .WORD   EM14
    013536  007672                          .WORD   DH44
104 013540  000137  014206                  JMP     35$             ;EXIT
105
106 013544  032762  000007  000014  19$:     BIT     #ILF!ILR!RMR,14(R2)     ;INTERFACE PROBLEM ?
107 013552  001406                          BEQ     20$             ;BRANCH IF NONE
108 013554  104456                          TRAP    C$ERHRD
    013556  000017                          .WORD   15
    013560  006054                          .WORD   EM15
    013562  007672                          .WORD   DH44
109 013564  000137  014216                  JMP     36$             ;EXIT
110
111 013570  032762  003000  000014  20$:     BIT     #IAE!AOE,14(R2) ;POSITION ERROR
112 013576  001406                          BEQ     21$             ;BRANCH IF NONE
113 013600  104456                          TRAP    C$ERHRD
    013602  000020                          .WORD   16
    013604  006121                          .WORD   EM16
    013606  007672                          .WORD   DH44
114 013610  000137  014226                  JMP     37$             ;EXIT
115
```

```
116 013614  032762  020000  000014  21$:    BIT     @OPI,14(R2)       ;OPERATION INCOMPLETE ?
117 013622  001406                          BEQ     22$               ;BRANCH IF SO
118 013624  104456                          TRAP    C$ERHRD
    013626  000051                          .WORD   41
    013630  007054                          .WORD   EM41
    013632  007672                          .WORD   DH44
119 013634  000137  014226                  JMP     37$               ;EXIT
120
121 013640  032762  041000  000042  22$:    BIT     @SKI!LCE,42(R2)   ;SERVO OR ACTUATOR SEEK ERROR ?
122 013646  001406                          BEQ     23$               ;BRANCH IF NONE
123 013650  104456                          TRAP    C$ERHRD
    013652  000021                          .WORD   17
    013654  006154                          .WORD   EM17
    013656  007672                          .WORD   DH44
124 013660  000137  014226                  JMP     37$
125
126 013664  032762  000002  000012  23$:    BIT     @EWN,12(R2)       ;PROBLEM ?
127 013672  001406                          BEQ     24$               ;BRANCH IF SO
128 013674  104456                          TRAP    C$ERHRD
    013676  000025                          .WORD   21
    013700  006250                          .WORD   EM21
    013702  007672                          .WORD   DH44
129 013704  000137  014236                  JMP     38$               ;EXIT
130
131 013710  016203  000014          24$:    MOV     14(R2),R3                   ;CHECK IF HEAD MISSING
132 013714  042703  177057                  BIC     @#C<FER!ECH!HCRC!HCE>,R3    ;CHOP THE REST BITS
133 013720  022703  000720                  CMP     @FER!ECH!HCRC!HCE,R3        ;MISSING HEAD ?
134 013724  001006                          BNE     25$                         ;BRANCH IF NOT
135 013726  104456                          TRAP    C$ERHRD
    013730  000026                          .WORD   22
    013732  006274                          .WORD   EM22
    013734  007672                          .WORD   DH44
136 013736  000137  014246                  JMP     39$               ;EXIT
137
138 013742  032762  000020  000014  25$:    BIT     @FER,14(R2)       ;FORMAT ERROR ?
139 013750  001406                          BEQ     26$               ;BRANCH IF NOT
140 013752  104456                          TRAP    C$ERHRD
    013754  000027                          .WORD   23
    013756  006324                          .WORD   EM23
    013760  007672                          .WORD   DH44
141 013762  000137  014246                  JMP     39$               ;EXIT
142
143 013766  032762  000600  000014  26$:    BIT     @HCRC!HCE,14(R2)  ;HEADER INFORMATION ERROR ?
144 013774  001420                          BEQ     28$                ;BRANCH IF NONE
145 013776  032762  000400  000014          BIT     @HCRC,14(R2)      ;HEADER CRC ERROR ?
146 014004  001006                          BNE     27$               ;BRACH IF SO
147 014006  104456                          TRAP    C$ERHRD
    014010  000030                          .WORD   24
    014012  006360                          .WORD   EM24
    014014  007672                          .WORD   DH44
148 014016  000137  014246                  JMP     39$               ;EXIT
149
150 014022                          27$:
    014022  104456                          TRAP    C$ERHRD
    014024  000056                          .WORD   46
    014026  007255                          .WORD   EM46
    014030  007672                          .WORD   DH44
```

```
151 014032  000137  014246                 JMP     39$             ;EXIT
152
153 014036  032762  017400  000040  28$:   BIT     #WRYUNS!WOR!RWU1!RWU2!RWU3,40(R2) ;WRITE AND READ UNSAFE ?
154 014044  001406                         BEQ     29$                               ;BRANCH IF NONE
155 014046  104456                         TRAP    C$ERHRD
    014050  000040                         .WORD   32
    014052  006703                         .WORD   EM32
    014054  007672                         .WORD   DH44
156 014056  000137  014256                 JMP     40$             ;EXIT
157
158 014062  032762  000040  000042  29$:   BIT     #DCU,42(R2)     ;DC LOW ?
159 014070  001406                         BEQ     30$             ;BRANCH IF NONE
160 014072  104456                         TRAP    C$ERHRD
    014074  000041                         .WORD   33
    014076  006726                         .WORD   EM33
    014100  007672                         .WORD   DH44
161 014102  000137  014256                 JMP     40$             ;EXIT
162
163 014106  032762  000100  000042  30$:   BIT     #IXU,42(R2)     ;INDEX UNSAFE ?
164 014114  001406                         BEQ     31$             ;BRANCH IF NONE
165 014116  104456                         TRAP    C$ERHRD
    014120  000042                         .WORD   34
    014122  006746                         .WORD   EM34
    014124  007672                         .WORD   DH44
166 014126  000137  014256                 JMP     40$             ;EXIT
167
168 014132  032762  000400  000042  31$:   BIT     #PHF,42(R2)     ;PROCESSOR HANDSHAKE FAILURE??
169 014140  001452                         BEQ     41$             ;BRANCH IF NOT
170 014142  104456                         TRAP    C$ERHRD
    014144  000043                         .WORD   35
    014146  006763                         .WORD   EM35
    014150  007672                         .WORD   DH44
171 014152  000137  014256                 JMP     40$
172
173 014156  052737  000001  002264  32$:   BIS     #BIT0,SVSTAT    ;MCPE=1,RHXX A-SYNC CONTROL BUS PARITY
174 014164  000451                         BR      42$
175
176 014166  052737  000002  002264  33$:   BIS     #BIT1,SVSTAT    ;RHXX DATA BUS PARITY,ILLEGAL CONDITION
177 014174  000445                         BR      42$             ;DATA LATE, WRITE CHECK.
178
179 014176  052737  000004  002264  34$:   BIS     #BIT2,SVSTAT    ;PROGRAM ERROR: PROHIBITED COMMANDS
180 014204  000441                         BR      42$             ;WERE EXECUTED (WRITE/READ TRACK DES.
181                                                                 ;FORMAT TRACK).
182
183 014206  052737  000010  002264  35$:   BIS     #BIT3,SVSTAT    ;DRIVE CLOCK, TIMING, DATA ERROR
184 014214  000435                         BR      42$             ;RETRY SHOULD BE ALLOWED.
185
186 014216  052737  000020  002264  36$:   BIS     #BIT4,SVSTAT    ;ILLEGAL CONDITION ,DECODER, INTERFACE
187 014224  000431                         BR      42$             ;PROBLEM
188
189 014226  052737  000040  002264  37$:   BIS     #BIT5,SVSTAT    ;POSITIONING ERROR
190 014234  000425                         BR      42$
191
192 014236  052737  000100  002264  38$:   BIS     #BIT6,SVSTAT    ;MECHANICAL FAILURE : AIR, TEMP ETC.
193 014244  000421                         BR      42$
194
195 014246  052737  000200  002264  39$:   BIS     #BIT7,SVSTAT    ;HEADER INFORMATION ( HEADER FAILURE,
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```
    196 014254  000415                          BR      42$             ;OR UNFORMAT TRACK )
    197
    198 014256  052737  000400  002264  40$:    BIS     #BIT8,SVSTAT    ;UNSAFE (READ/WRITE, INDEX, TACH)
    199 014264  000411                          BR      42$
    200
    201 014266  032762  100000  000042  41$:    BIT     #BSE,42(R2)     ;IF BAD SECTOR DETECTED,
    202 014274  001005                          BNE     42$             ;BRANCH WITHOUT REPORTING ERROR, ELSE
    203 014276  104456                          TRAP    C$ERHRD
        014300  000054                          .WORD   44
        014302  007156                          .WORD   EM44
        014304  007672                          .WORD   DH44
    204 014306  000763                          BR      40$             ;EXIT
    205 014310                          42$:
        014310  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
        014312  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
        014314  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
        014316  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
    206 014320  000205                          RTS     R5
```

```
                                        ;SUBROUTINE TO ADJUST THE SECTOR ADDRESS BECAUSE IT IS AUTOMATICALLY
                                        ;INCREMENTED AT THE END OF A TRANSFER
                                        ;CALL
                                        ;       JSR     PC,ADJUST       ;CALL ROUTINE

014322  005737  002302          ADJUST: TST     SEC.RD          ;SECTOR 0?
014326  001014                          BNE     1$              ;BR IF NOT
014330  013737  002274  002302          MOV     NS1,SEC.RD      ;MAKE IT LAST PHYSICAL SECTOR AND DECR TRACK
014336  005737  002300                  TST     TRK.RD          ;LAST TRACK?
014342  001011                          BNE     2$              ;BR IF NOT
014344  013737  002272  002300          MOV     NT1,TRK.RD      ;MAKE IT LAST PHYSICAL TRACK AND DECR CYL
014352  005337  002276                  DEC     CYL.RD          ;DECR CYL
014356  000405                          BR      3$              ;EXIT
014360  005337  002302          1$:     DEC     SEC.RD          ;
014364  000402                          BR      3$              ;EXIT
014366  005337  002300          2$:     DEC     TRK.RD          ;ADJUST TRACK
014372  000207                  3$:     RTS     PC

                                        ;THIS ROUTINE WILL CALL THE RP07 DRIVER AND THEN WAIT ON THE FUNCTION
                                        ;TO COMPLETE. IF AN ERROR OCCURS IT IS REPORTED.
                                        ;CALL
                                        ;       FILL "DPB" WITH COMMAND INFORMATION
                                        ;       JSR     R4,CALL.A
                                        ;       RETURN

014374  004437  021122          CALL.A: JSR     R4,RP07         ;CALL RP07 DRIVER
014400  002550                          DPB.A
014402  000774                          BR      CALL.A
014404  005737  002566          1$:     TST     DPB.A+16        ;DONE?
014410  001775                          BEQ     1$              ;NO--LOOP
014412  100036                          BPL     3$              ;BRANCH IF NO ERROR
014414  013737  002562  002304          MOV     DPB.A+12,CYL.DS ;CYLINDER
014422  113737  002561  002310          MOVB    DPB.A+11,TRK.DS ;TRACK
014430  113737  002560  002306          MOVB    DPB.A+10,SEC.DS ;SECTOR
014436  004537  015214                  JSR     R5,ERRABO       ;CHECK THE ABORT CONDITION
014442  002550                          DPB.A                   ;PARAMETER BLOCK ADDRESS
014444  004537  012766                  JSR     R5,ERRANY       ;DETECT ERROR
014450  002550                          DPB.A
014452  022737  000200  002264          CMP     #BIT7,SVSTAT    ;HEADER ERROR?
014460  001013                          BNE     3$              ;IF NOT MATCH, NO
014462  013746  002552                  MOV     DPB.A+2,-(SP)
014466  112737  000107  002552          MOVB    #RECAL,DPB.A+2  ;SET UP FOR A RECAL COMMAND
014474  004437  021122                  JSR     R4,RP07         ;ISSUE THE COMMAND
014500  002550                          DPB.A                   ;THIS BUFFER
014502  000240                          NOP                     ;FILLER FOR THE DRIVER
014504  012637  002552                  MOV     (SP)+,DPB.A+2
014510  000204                  3$:     RTS     R4              ;RETURN

                                        ;THIS ROUTINE IS THE SAME AS "CALL.A" EXCEPT FOR THE DPB USED AND IF
                                        ;THE COMMAND IS A READ HEADER AND DATA THE HEADER (CYLINDER, TRACK,
                                        ;AND SECTOR) READ IS CHECKED FOR VALIDITY.
                                        ;CALL
                                        ;       FILL DPB
                                        ;       JSR     R4,CALL.B
                                        ;       RETURN

014512  004437  021122          CALL.B: JSR     R4,RP07         ;CALL  DRIVER
```

```
     56 014516  002570                          DPB.B
     57 014520  000774                          BR      CALL.B
     58 014522  005737  002606          1$:     TST     DPB.B+16        ;DONE?
     59 014526  001775                          BEQ     1$              ;NO--BRANCH
     60 014530  100037                          BPL     3$              ;BRANCH IF NO ERROR
     61 014532  013737  002602  002304          MOV     DPB.B+12,CYL.DS ;CYLINDER
        014540  113737  002601  002310          MOVB    DPB.B+11,TRK.DS ;TRACK
        014546  113737  002600  002306          MOVB    DPB.B+10,SEC.DS ;SECTOR
     62 014554  004537  015214                  JSR     R5,ERRABO       ;CHECK THE ABORT CONDITION
     63 014560  002570                          DPB.B
     64 014562  004537  012766                  JSR     R5,ERRANY
     65 014566  002570                          DPB.B
     66 014570  022737  000200  002264          CMP     #BIT7,SVSTAT    ;HEADER ERRORS?
     67 014576  001013                          BNE     2$              ;TAKE BRANCH IF NOT MATCH
     68 014600  013746  002572                  MOV     DPB.B+2,-(SP)
     69 014604  112737  000107  002572          MOVB    #RECAL,DPB.B+2  ;SET UP A RECAL COMMAND
     70 014612  004437  021122                  JSR     R4,RP07         ;ISSUE THE COMMAND
     71 014616  002570                          DPB.B                   ;THIS BUFFER
     72 014620  000240                          NOP                     ;FILLER FOR THE DRIVER
     73 014622  012637  002572                  MOV     (SP)+,DPB.B+2           ;RESTORE THE COMMAND
     74 014626  000421                  2$:     BR      5$              ;EXIT
     75 014630  123727  002572  000173  3$:     CMPB    DPB.B+2,#RDHD   ;DOING IMPLIED SEEKS?
     76 014636  001007                          BNE     4$              ;NO--BRANCH
     77 014640  005737  002606                  TST     DPB.B+16        ;ERROR DETECTED ?
     78 014644  100404                          BMI     4$              ;BRANCH IF SO
     79 014646  004437  015470                  JSR     R4,VERIFY       ;GO CHECK THE DATA
     80 014652  002600                          DPB.B+10
     81 014654  000406                          BR      5$              ;ERROR DURING VERIFY
     82 014656                          4$:
     83 014656  105737  002231                  TSTB    STALLF          ;STALL ?
     84 014662  001403                          BEQ     5$              ;NO--BRANCH
     85 014664  004437  015410                  JSR     R4,STALL        ;YES--CALL STALL ROUTINE
     86 014670  002356                          .WORD   STALL1          ;STALL TIME POINTER
     87 014672  000204                  5$:     RTS     R4              ;RETURN
     88
     89                                 ;THIS ROUTINE IS THE SAME AS "CALL.B" EXCEPT FOR THE DPB USED.
     90                                 ;CALL
     91                                 ;       FILL DPB
     92                                 ;       JSR     R4,CALL.C
     93                                 ;       RETURN
     94
     95 014674  004437  021122          CALL.C: JSR     R4,RP07         ;CALL  DRIVER
     96 014700  002610                          DPB.C
     97 014702  000774                          BR      CALL.C
     98 014704  005737  002626          1$:     TST     DPB.C+16        ;DONE?
     99 014710  001775                          BEQ     1$              ;NO--LOOP
    100 014712  100037                          BPL     3$              ;YES--BRANCH IF NO ERROR
    101 014714  013737  002622  002304          MOV     DPB.C+12,CYL.DS ;CYLINDER
        014722  113737  002621  002310          MOVB    DPB.C+11,TRK.DS ;TRACK
        014730  113737  002620  002306          MOVB    DPB.C+10,SEC.DS ;SECTOR
    102 014736  004537  015214                  JSR     R5,ERRABO
    103 014742  002610                          DPB.C                   ;CHECK THE ABORT CONDITION
    104 014744  004537  012766                  JSR     R5,ERRANY
    105 014750  002610                          DPB.C
    106 014752  022737  000200  002264          CMP     #BIT7,SVSTAT    ;HEADER ERRORS?
    107 014760  001013                          BNE     2$              ;IF NO MATCH, NO!
    108 014762  013746  002612                  MOV     DPB.C+2,-(SP)
```

```
    109 014766  112737  000107  002612          MOVB    #RECAL,DPB.C+2  ;SET UP A RECAL COMMAND
    110 014774  004437  021122                  JSR     R4,RP07         ;ISSUE THE COMMAND
    111 015000  002610                          DPB.C                   ;FROM THIS BUFFER
    112 015002  000240                          NOP                     ;FILLER FOR THE DRIVER
    113 015004  012637  002612                  MOV     (SP)+,DPB.C+2
    114 015010  000421                  2$:     BR      5$              ;EXIT
    115
    116 015012  123727  002612  000173  3$:     CMPB    DPB.C+2,#RDHD   ;DOING IMPLIED SEEK?
    117 015020  001007                          BNE     4$              ;NO--EXIT
    118 015022  005737  002626                  TST     DPB.C+16        ;ANY ERROR ?
    119 015026  100404                          BMI     4$              ;EXIT
    120 015030  004437  015470                  JSR     R4,VERIFY       ;YES--CHECK THE DATA
    121 015034  002620                          DPB.C+10
    122 015036  000406                          BR      5$              ;ERROR DURING VERIFY
    123 015040  105737  002231          4$:     TSTB    STALLF          ;STALL ?
    124 015044  001403                          BEQ     5$              ;NO--BRANCH
    125 015046  004437  015410                  JSR     R4,STALL        ;YES--CALL STALL ROUTINE
    126 015052  002356                          .WORD   STALL1          ;STALL TIME POINTER
    127 015054  000204                  5$:     RTS     R4
```

```
                                        ;THIS ROUTINE IS THE SAME AS 'CALL.A' EXCEPT FOR THE DPB USED AND
                                        ;ON AN ERROR LOCATION 'ERR.CT' IS EXAMINED. IF ERR.CT IS EQUAL TO
                                        ;$ERFLG EXIT IS TO THE NEXT TEST.
                                        ;CALL
                                        ;       FILL DPB
                                        ;       JSR     R4,DRVCAL
                                        ;       RETURN

 015056  005037  002350        DRVCAL: CLR     WCEF G          ;CLEAR WRITE CHECK ERROR FLAG
 015062  004437  021122                JSR     R4,RP07         ;CALL  DRIVER
 015066  002630                        DTADPB
 015070  000772                        BR      DRVCAL
 015072  005737  002646        3$:     TST     DTADPB+16       ;DONE
 015076  001775                        BEQ     3$              ;NO- LOOP
 015100  100401                        BMI     1$              ;BR IF ERRORS
 015102  000417                        BR      4$              ;NO ERRORS
 015104                        1$:
 015104  013737  002642  002304        MOV     DTADPB+12,CYL.DS        ;CYLINDER
 015112  113737  002641  002310        MOVB    DTADPB+11,TRK.DS        ;TRACK
 015120  113737  002640  002306        MOVB    DTADPB+10,SEC.DS        ;SECTOR
 015126  004537  015214                JSR     R5,ERRABO       ;CHECK THE ABORT CONDITION
 015132  002630                        DTADPB                  ;DATA BLOCK ADDRESS
 015134  004537  012766                JSR     R5,ERRANY
 015140  002630                        DTADPB
 015142                        4$:
 015142  105737  002231                TSTB    STALLF          ;STALL ?
 015146  001403                        BEQ     5$              ;NO  BRANCH
 015150  004437  015410                JSR     R4,STALL        ;YES -CALL STALL ROUTINE
 015154  002360                        .WORD   STALL2          ;STALL TIME POINTER
 015156  000204                5$:     RTS     R4

                                        ;SUBR TO EXECUTE A COMMAND STORED IN DTADPB.
                                        ;SIMILAR TO SUBR CALL.A EXCEPT THAT HARD AND SOFT ERRORS ARE NOT CHECKED
                                        ;I.E. NO CALL TO ERRANY.

 015160  004437  021122        EXECMD: JSR     R4,RP07         ;EXEC CMD
 015164  002630                        DTADPB                  ;DPB PTR
 015166  000774                        BR      EXECMD          ;WAIT FOR Q NOT FULL
 015170  005737  002646        2$:     TST     DTADPB+16       ;DONE?
 015174  001775                        BEQ     2$              ;WAIT FOR DONE
 015176  100003                        BPL     3$              ;SKIP ON ERROR FREE DONE
 015200  004537  015214                JSR     R5,ERRABO       ;ERROR: CHECK ABORT CONDITION
                                                                ;EXIT TEST IF 'DPB'+16 SET WITH ERRORS:
                                                                ;NED+PRT+STO+MCP+PAR+OFL+UNS.
 015204  002630                        DTADPB                  ;'DPB' PTR
 015206  013702  002644        3$:     MOV     DTADPB+14,R2    ;FETCH AD OF SAVED REG TBL
 015212  000207                        RTS     PC
```

```
 1
 2                                      ;THIS ROUTINE IS USED TO DETERMINE THE ABORT CONDITIONS OF
 3                                      ;THE I/O ROUTINES
 4                                      ;CALLING SEQ
 5                                      ;       JSR     R5,ERRABO
 6                                      ;       DPB                             DATA BLOCK PAR ADDRESS
 7                                      ;       NORMAL RET
 8
 9 015214  010146                       ERRABO: MOV     R1,-(SP)        ;SAVE R1
10 015216  010246                               MOV     R2,-(SP)        ;SAVE R2
11 015220  012501                               MOV     (R5)+,R1        ;LOAD THE DPB ADDRESS
12 015222  016102  000014                       MOV     14(R1),R2       ;ADDRESS OF SAVED REGISTER TABLE
13 015226  016237  000036  002276               MOV     36(R2),CYL.RD   ;GET CURRENT CYLINDER
14 015234  116237  000006  002302               MOVB    6(R2),SEC.RD    ;GET CURRENT SECTOR
15 015242  116237  000007  002300               MOVB    7(R2),TRK.RD    ;GET CURRENT TRACK
16 015250  016102  000016                       MOV     16(R1),R2       ;R2 TEMP STORAGE
17 015254  032702  000002                       BIT     #BIT1,R2        ;DRIVE BECOME NON EXIST ?
18 015260  001405                               BEQ     1$              ;BRANCH IF NOT
19 015262  104455                               TRAP    C$ERDF
   015264  000031                               .WORD   25
   015266  006417                               .WORD   EM25
   015270  010702                               .WORD   DH25
20 015272  000440                               BR      5$              ;EXIT
21 015274  032702  000004               1$:     BIT     #BIT2,R2        ;PORT REQUEST TIMEOUT ?
22 015300  001405                               BEQ     2$              ;BRANCH IF NOT
23 015302  104455                               TRAP    C$ERDF
   015304  000032                               .WORD   26
   015306  006455                               .WORD   EM26
   015310  007672                               .WORD   DH44
24 015312  000430                               BR      5$
25 015314  032702  001000               2$:     BIT     #BIT9,R2        ;TIME OUT ON THIS DRIVE
26 015320  001405                               BEQ     3$              ;BANCH IF NOT
27 015322  104455                               TRAP    C$ERDF
   015324  000033                               .WORD   27
   015326  006525                               .WORD   EM27
   015330  007672                               .WORD   DH44
28 015332  000420                               BR      5$              ;EXIT
29 015334  032702  006000               3$:     BIT     #BIT10!BIT11,R2 ;MASSBUS PARITY ERROR ?
30 015340  001405                               BEQ     4$              ;BRANCH IF NOT
31 015342  104455                               TRAP    C$ERDF
   015344  000036                               .WORD   30
   015346  006564                               .WORD   EM30
   015350  010702                               .WORD   DH25
32 015352  000410                               BR      5$
33 015354  032702  050000               4$:     BIT     #BIT12!BIT14,R2 ;DRIVE UNSAFE OR OFFLINE
34 015360  001407                               BEQ     6$              ;BRANCH IF NOT (OTHER ERROR CATLOG)
35 015362  104455                               TRAP    C$ERDF
   015364  000037                               .WORD   31
   015366  006641                               .WORD   EM31
   015370  010702                               .WORD   DH25
36 015372  000400                               BR      5$
37 015374  013705  002262               5$:     MOV     BYPASS,R5       ;THE ABORT ADDRESS
38 015400  012602                       6$:     MOV     (SP)+,R2        ;EXIT IF NO ABORT CONDITION
39 015402  012601                               MOV     (SP)+,R1
40 015404  000205                               RTS     R5              ;EXIT
41
42
```

```
                                ;ABORT RETURN ADDRESS FROM 'ERRABO' SUBR, VIA  BYPASS',  ON DEV FATAL ERROR

015406                          ABOPAS:
015406  104444                          TRAP    C$DCLN


                                ;THIS ROUTINE WILL PROVIDE A STALL IN MILLISECONDS FOR A SPECIFIC
                                ;AMOUNT OF TIME IF STALRD = 0 OR A RANDOM AMOUNT OF TIME IF STALRD = 1.
                                ;STALL1 CONTAINS SPECIFIED TIME FOR TESTS 1 6, AND STALL2
                                ;CONTAINS THE TIME FOR TESTS 13-18.
                                ;CALL
                                ;       JSR     R4,STALL
                                ;       TIME POINTER            ;WHERE TO FIND THE STALL TIME

015410  013446                  STALL:  MOV     @(R4)+,-(SP)    ;PICKUP STALL TIME
015412  105737  002232                  TSTB    STALRD          ;USE A RANDOM TIME ?
015416  001406                          BEQ     1$              ;NO -BRANCH
015420  004737  011712                  JSR     PC,RAND         ;YES--FORM RANDOM NUMBER
015424  013716  011774                  MOV     $RP1,(SP)       ;AND USE IT FOR THE STALL TIME
015430  042716  177700                  BIC     #^C77,(SP)      ;BUT NEVER > 64 MILLISECONDS
015434  005046                  1$:     CLR      (SP)           ;CLEAR TEMP. LOCATION
015436  162766  000001  000002  2$:     SUB     #1,2(SP)        ;MORE STALL REQUIRED?
015444  103407                          BLO     4$              ;NO--BRANCH
015446  012716  000144                  MOV     #100.,(SP)      ;STALL FOR ABOUT 1 MILLISECOND
015452  005704                  3$:     TST     R4              ;NOP TO KILL TIME
015454  005366  000000                  DEC     0(SP)           ;COUNT
015460  001374                          BNE     3$              ;LOOP IF MORE COUNTS NEEDED
015462  000765                          BR      2$
015464  022626                  4$:     CMP     (SP)+,(SP)+     ;CLEAN OFF THE STACK
015466  000204                          RTS     R4              ;EXIT
```

```
                                        ;ROUTINE TO SOFTWARE COMPARE HEADER ON IMPLIED SEEKS
                                        ;CALL
                                        ;       JSR     R4,VERIFY
                                        ;       ADR POINTER             ;ADDRESS OF DPB+10 (SECTOR NUMBER)
                                        ;       ERR RETURN
                                        ;       RETURN

015470  010146                  VERIFY: MOV     R1, (SP)                ;SAVE R1
015472  012401                          MOV     (R4)+,R1                ;GET ADDRESS OF DPB+10
015474  042737  150000  042762          BIC     #150000,DBUFF           ;STRIP FORMAT AND BAD SECTOR BITS FROM CYLINDER NUMBER
015502  023761  042762  000002          CMP     DBUFF,2(R1)             ;CYLINDER NUMBER OK?
015510  001003                          BNE     1$                      ;NO--BRANCH
015512  023711  042764                  CMP     DBUFF+2,(R1)            ;YES--HOW ABOUT TRACK/SECTOR?
015516  001431                          BEQ     3$                      ;BRANCH IF GOOD
015520  013737  042762  002276  1$:     MOV     DBUFF,CYL.RD            ;SAVE THE EXPECTED AND THE
015526  113737  042765  002300          MOVB    DBUFF+3,TRK.RD          ;RECIEVED CYLINDER, TRACK,
015534  113737  042764  002302          MOVB    DBUFF+2,SEC.RD          ;AND SECTOR
015542  112137  002306                  MOVB    (R1)+,SEC.DS
015546  112137  002310                  MOVB    (R1)+,TRK.DS
015552  011137  002304                  MOV     (R1),CYL.DS
015556  005744                          TST     -(R4)                   ;MAKE IT TEST PC+4
015560  104456                          TRAP    C$ERHRD
015562  000052                          .WORD   42
015564  007107                          .WORD   EM42
015566  010366                          .WORD   DH45
015570  012737  000107  002552  2$:     MOV     #RECAL,DPB.A+2          ;LOAD RECALIBRATE ORDER CODE
015576  004437  014374                  JSR     R4,CALL.A               ;GO EXECUTE THE COMMAND
015602  062704  000002          3$:     ADD     #2,R4                   ;INCREMENT RETURN ADDRESS
015606  012601                  4$:     MOV     (SP)+,R1                ;RESTORE R1
015610  000204                          RTS     R4                      ;EXIT
```

```
                                        ;THIS ROUTINE WILL PERFORM A "MASSBUS" INIT. FOLLOWED BY
                                        ;A "RECALIBRATE" ON THE DRIVE UNDER TEST.
                                        ;NOTE: THIS ROUTINE DESTROYS R1 AND R4
                                        ;CALL
                                        ;       JSR     R4,SRCH00       ;DO A MASSBUS INIT. AND RECAL
                                        ;       RETURN1                 ;RETURN HERE IF NO ERROR
                                        ;       RETURN2                 ;RETURN HERE ON ERROR

015612  005001                  SRCH00: CLR     R1              ;INCASE OF ERROR (TYPTIM)
015614  012777  000040  165056          MOV     #CLR,@RPCS2     ;MASSBUS INIT.
015622  005037  002640                  CLR     DTADPB+10       ;TRACK=0; SECTOR=0
015626  005037  002642                  CLR     DTADPB+12       ;CYLINDER =0
015632  012737  000107  002632          MOV     #RECAL,DTADPB+2 ;COMMAND = RECALIBRATE
015640  004437  021122                  JSR     R4,RP07         ;CALL THE DRIVER
015644  002630                          DTADPB                  ;DPB POINTER
015646  000433                          BR      4$              ;BRANCH IF QUEUE FULL,NO SPACE
015650  005737  002646          1$:     TST     DTADPB+16       ;WAIT ON DONE
015654  001775                          BEQ     1$
015656  100021                          BPL     3$              ;TAKE NORMAL EXIT IF NO ERROR
015660  013737  002642  002304          MOV     DTADPB+12,CYL.DS        ;CYLINDER
015666  113737  002641  002310          MOVB    DTADPB+11,TRK.DS        ;TRACK
015674  113737  002640  002306          MOVB    DTADPB+10,SEC.DS        ;SECTOR
015702  004537  015214                  JSR     R5,ERRABO       ;CHECK ANY ABORT CONDITION
015706  002630                          DTADPB
015710  004537  012766                  JSR     R5,ERRANY
015714  002630                          DTADPB
015716  005724                  2$:     TST     (R4)+           ;ADJUST FOR ERROR EXIT
015720  000406                          BR      4$              ;GO TO THE EXIT
015722  012777  000000  164746  3$:     MOV     #0,@RPDA        ;TRACK AND SECTOR =0
015730  012777  000000  164766          MOV     #0,@RPDC        ;CYLINDER = 0
015736  000204                  4$:     RTS     R4              ;RETURN

                                        ;THIS IS AN RTI WHICH IS USED BY THE TIMING TESTS

015740                          DORTI:                          ;RETURN FROM INTERRUPT
015740                          L10011:
015740  000002                          RTI

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

015742  004737  010750          STRTMR: JSR     PC,SAVREG       ;SAVE R0-R5
015746  012700  002312                  MOV     #TIM.UP,R0      ;START AT TIM.UP (MINIMUM)
015752  012701  002346                  MOV     #TIM.PT,R1      ;STOP AT TIM.PT
015756  005020                  1$:     CLR     (R0)+           ;CLEAR
015760  020001                          CMP     R0,R1           ;DONE?
015762  103775                          BLO     1$              ;NO--BRANCH
015764  012710  042762                  MOV     #DBUFF,(R0)     ;SETUP POINTER
015770  012737  077777  002312          MOV     #^CBIT15,TIM.UP ;SET MINIMUM TIME TO MAXIMUM
015776  012737  077777  002330          MOV     #^CBIT15,TIM.DN ;POSITIVE NUMBER
016004  004737  011002                  JSR     PC,RESREG       ;RESTORE R0-R5
016010  000207                          RTS     PC              ;RETURN

                                        ;THIS ROUTINE IS USED FOR MEASURE THE AVERAGE SEEK TIME
```

```
                                        ;IN THE TEST 10
                                        ;THE TIME IS MEASURED AS:
                                        ;
                                        ;               (T1X629+T2X628+T3X627+T4X626.......)X2
                                        ;         T   = ------------------------------------
                                        ;                         629X629
                                        
                                        ; WHERE THE T1 IS THE SEEK TIME FROM CYL0 TO CYL1
                                        ;       THE T2 IS THE SEEK TIME FROM CYL0 TO CYL2 ,ETC.
                                        ;THE COUNT2: ROUTINE WILL CALCULATE THE FOLLOWING SUMMATION:
                                        ;
                                        ;               (T1X629+T2X628+T3X627+.......) X 2
                                        ;         T   = ----------------------------------
                                        ;                       629

016012  012702  002312          COUNT2: MOV     #TIM.UP,R2      ;COUNT UP TABLE
016016  005705                          TST     R5              ;COUNT UP CALCULATING ?
016020  001402                          BEQ     1$              ;BRANCH IF SO
016022  012702  002330                  MOV     #TIM.DN,R2      ;LOAD THE COUNT DOWN TABLE
016026  010146                  1$:     MOV     R1,-(SP)        ;COEFFICIENT 629,628,627,..... ETC.
016030  017746  174172                  MOV     @PKC,-(SP)      ;MEASURED TIME INTERVAL
016034  004737  011420                  JSR     PC,$MULT        ;TIME INTERVAL X COEFFICIENT
016040  016666  000002  177776          MOV     2(SP),-2(SP)    ;SWAP THE LSB , MSB OF THE PRODUCTION
016046  011666  000002                  MOV     (SP),2(SP)      ;
016052  016616  177776                  MOV     -2(SP),(SP)     ; FOR THE CALLING SEQ OF $DIV ROUTINE
016056  013746  002206                  MOV     LC,-(SP)        ;DIVIDED BY 629 (TOTOL # OF SEEKS)
016062  006216                          ASR     (SP)            ; DIVIDEC BY 629/2
016064  005216                          INC     (SP)            ;ROUND UP THE FRACTION
016066  004737  011176                  JSR     PC,$DIV         ;TIME X COEFFICIENT/TOTAL # OF SEEKS
016072  006126                          ROL     (SP)+           ;REMAINDER OVER 0.5 ?
016074  100001                          BPL     2$              ;BRANCH IF NOT
016076  005216                          INC     (SP)            ;ROUND UP
016100  062662  000010          2$:     ADD     (SP)+,10(R2)    ;LSB OF THE TOTAL SUM
016104  005562  000012                  ADC     12(R2)          ;HSB OF THE TOTAL SUM
016110  005262  000014                  INC     14(R2)          ;TOTAL SEEK COUNT
016114  017777  174106  164224          MOV     @PKC,@TIM.PT    ;SAVE THE TIME INTERVAL
016122  062737  000002  002346          ADD     #2,TIM.PT               ;ADJUST THE POINTER
016130  027712  174072                  CMP     @PKC,(R2)               ;MINIMUM TIME
016134  002002                          BGE     3$              ;BRANCH IF NOT
016136  017712  174064                  MOV     @PKC,(R2)       ;LOAD THE NEW MINIMUM
016142  027763  174060  000004  3$:     CMP     @PKC,4(R3)      ;LOWER THEN THE LIMIT ?
016150  002002                          BGE     4$              ;BRANCH IF NOT
016152  005262  000002                  INC     2(R2)           ;UPDATE THE COUNTER IS SO
016156  027762  174044  000004  4$:     CMP     @PKC,4(R2)      ;GREATER THAN THE MAXIMUM VALUE ?
016164  003403                          BLE     5$              ;BRANCH IF NOT
016166  017762  174034  000004          MOV     @PKC,4(R2)      ;LOAD THE NEW MAXIMUM VALUE
016174  027763  174026  000006  5$:     CMP     @PKC,6(R3)      ;OVER THE LIMIT
016202  003402                          BLE     6$              ;BRANCH IF NOT
016204  005262  000006                  INC     6(R2)           ;UPDATE THE COUNT, IF SO
016210  000207                  6$:     RTS     PC              ;EXIT

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

```
                                        ;                               ;FLAG= 1=COUNT DOWN
                                        ;       JSR     PC,COUNT
                                        ;       RETURN
                                        ;
016212  012702  002312         COUNT:  MOV     #TIM.UP,R2              ;PICKUP THE "UP" POINTER
016216  005705                          TST     R5                      ;USE IT?
016220  001402                          BEQ     1$                      ;YES--BRANCH
016222  012702  002330                  MOV     #TIM.DN,R2              ;NO -PICKUP "DOWN" POINTER
016226  027722  173774         1$:     CMP     @PKC,(R2)+              ;LESS THAN PREVIOUS LOW?
016232  002003                          BGE     2$                      ;NO--BRANCH
016234  017762  173766  177776        MOV     @PKC, 2(R2)             ;YES--SAVE IT
016242  027763  173760  000004  2$:     CMP     @PKC,4(R3)              ;LESS THAN THE LOW LIMIT?
016250  002001                          BGE     3$                      ;NO--BRANCH
016252  005212                          INC     (R2)                    ;YES--COUNT IT
016254  005722                  3$:     TST     (R2)+                   ;ADVANCE THE POINTER
016256  027722  173744                  CMP     @PKC,(R2)+              ;GREATER THAN PREVIOUS HIGH?
016262  003403                          BLE     4$                      ;NO--BRANCH
016264  017762  173736  177776        MOV     @PKC, 2(R2)             ;YES--SAVE IT
016272  027763  173730  000006  4$:     CMP     @PKC,6(R3)              ;GREATER THAN THE HIGH LIMIT?
016300  003401                          BLE     5$                      ;NO--BRANCH
016302  005212                          INC     (R2)                    ;YES--COUNT IT
016304  005722                  5$:     TST     (R2)+                   ;ADVANCE THE POINTER
016306  067722  173714                  ADD     @PKC,(R2)+              ;ADD THIS COUNT TO THE TOTAL
016312  005522                          ADC     (R2)+
016314  005212                          INC     (R2)                    ;COUNT THIS READING
016316  023727  002114  000022          CMP     L$TEST,#18.             ;DO NOT SAVE COUNTS IN MEMO IN 8 TO ALLOW
                                                                        ;A WRITE-CHECK OPERATION AFTER THE TIMED WRITE
                                                                        ;OTHERWISE WRITE DATA WILL BE DESTOYED AND A
                                                                        ;WRITE CHECK ERROR WCE WILL RESULT IN RPCS2!
016324  001412                          BEQ     6$
016326  022737  047706  002346          CMP     #DBUFF+<4*629.>,TIM.PT ;SAVE THIS COUNT?
                                                                                ;LAST CYLINDER X 4
016334  101406                          BLOS    6$                      ;NO--BRANCH
016336  017777  173664  164002        MOV     @PKC,@TIM.PT            ;YES -WELL SAVE IT THEN
016344  062737  000002  002346        ADD     #2,TIM.PT               ;ADVANCE THE POINTER
016352  000207                  6$:     RTS     PC                      ;RETURN


                                        ;THIS ROUTINE PRINTS THE SPEC OF ALL TIMING TESTS
                                        ;CALL
                                        ;       JSR     R4,SPTYP
                                        ;       TABLE ADDRESS
                                        ;
                                        ;TABLE: .WORD   MESSAGE
                                        ;       .WORD   MIN VALUE
                                        ;       .WORD   MAX VALUE


016354  012402                  SPTYP:  MOV     (R4)+,R2                ;THE TABLE ADDRESS
016356  005737  002242                  TST     TYTIME                  ;ALLOW TIME TO BE TYPED ?
016362  001447                          BEQ     3$                      ;BR IF NO
                                                                        ;PRINT MESSAGE
016364  012246                          MOV     (R2)+,-(SP)
016366  012746  000001                  MOV     #1,-(SP)
016372  010600                          MOV     SP,R0
016374  104417                          TRAP    C$PNTF
016376  062706  000004                  ADD     #4,SP
```

```
166 016402  005722                      TST     (R2)+           ;LOAD MIN VALUE
167 016404  001412                      BEQ     1$              ;SKIP IF MIN VALUE IS 0
168 016406  016246  177776              MOV      2(R2), (SP)
    016412  012746  017270              MOV     #MSGMIN,-(SP)
    016416  012746  000002              MOV     #2,-(SP)
    016422  010600                      MOV     SP,R0
    016424  104417                      TRAP    C$PNTF
    016426  062706  000006              ADD     #6,SP
169 016432  005722              1$:     TST     (R2)+           ;THE MAXIMUM VALUE
170 016434  001412                      BEQ     2$              ;BRANCH IF NO LIMIT
171 016436  016246  177776              MOV     -2(R2),-(SP)
    016442  012746  017313              MOV     #MSGMAX,-(SP)
    016446  012746  000002              MOV     #2,-(SP)
    016452  010600                      MOV     SP,R0
    016454  104417                      TRAP    C$PNTF
    016456  062706  000006              ADD     #6,SP
172 016462              2$:                             ;CR LF
173 016462  012746  003064              MOV     #CRLF, (SP)
    016466  012746  000001              MOV     #1,-(SP)
    016472  010600                      MOV     SP,R0
    016474  104417                      TRAP    C$PNTF
    016476  062706  000004              ADD     #4,SP
174 016502  000204              3$:     RTS     R4
```

```
 1
 2                                ;;THIS ROUTINE IS USED TO TYPE THE MINIMUM,
 3                                ;MAXIMUM, AND AVERAGE TIMES FOR THE TIMING TESTS
 4                                ;IT WILL ALSO CHECK THE TIMES TO ENSURE
 5                                ;THEY ARE WITHIN TOLERANCE AND IF NOT FLAG THE BAD TIMES.
 6                                ;NOTE: THIS ROUTINE DESTROYS R2 R5
 7                                ;CALL
 8                                ;       JSR     R4,TYPTIM       ;GO REPORT THE TIMES
 9                                ;       TABLE                   ;POINT TO THE PROPER TABLE
10                                ;       RETURN
11                                ;
12                                ;TABLE: MSGADR1                 ;ADDRESS OF ASCIZ MESSAGE NUMBER 1
13                                ;       MSGADR2                 ;ADDRESS OF ASCIZ MESSAGE NUMBER 2
14                                ;       MIN. ALLOWED            ;MINIMUM TIME ALLOWED
15                                ;       MAX. ALLOWED            ;MAXIMUM TIME ALLOWED
16
17 016504  012402                 TYPTIM: MOV     (R4)+,R2        ;PICKUP THE TABLE POINTER
18 016506  010446                         MOV     R4,-(SP)        ;;PUSH R4 ON STACK
19 016510  012237  017264                 MOV     (R2)+,12$       ;ADDRESS OF 1ST MESSAGE
20 016514  012205                         MOV     (R2)+,R5        ;ADDRESS OF 2ND MESSAGE
21 016516  012203                         MOV     (R2)+,R3        ;PICKUP THE LO LIMIT
22 016520  011202                         MOV     (R2),R2         ;AND HI LIMIT VALUES.
23 016522  012704  002312                 MOV     #TIM.UP,R4      ;GET ADDRESS OF UP TIMES STORAGE
24 016526  004737  017634                 JSR     PC,CHKAVG       ;SEE IF AVERAGE BELOW/ABOVE SEEK TIMES SHOULD
25                                                                 ;BE TYPED
26 016532  012737  000001  002242         MOV     #1,TYTIME       ;ALLOW TIMES AND LIMITS TO BE TYPED
27 016540  105737  002227                 TSTB    TIMTYP          ;ALWAYS TYPE THE TIMES ?
28 016544  001020                         BNE     3$              ;BR IF YES
29 016546  005764  000002                 TST     2(R4)           ;ANY SEEKS BELOW THE LOW LIMIT
30 016552  001403                         BEQ     1$              ;BR IF NO
31 016554  005737  017714                 TST     $$FLG           ;TYPE # OF SEEKS BELOW LIMIT?
32 016560  001012                         BNE     3$              ;BR IF YES
33 016562  005764  000006         1$:     TST     6(R4)           ;ANY SEEKS ABOVE THE HIGH LIMIT
34 016566  001403                         BEQ     2$              ;BR IF NO
35 016570  005737  017714                 TST     $$FLG           ;TYPE # OF SEEKS ABOVE LIMIT?
36 016574  001004                         BNE     3$              ;BR IF YES
37 016576  005037  002242         2$:     CLR     TYTIME          ;NO TIMES OR LIMITS TO BE TYPED
38 016602  000137  017260                 JMP     11$             ;NO--EXIT
39
40 016606                          3$:
   016606  013746  017264                 MOV     12$,-(SP)
   016612  012746  000001                 MOV     #1,-(SP)
   016616  010600                         MOV     SP,R0
   016620  104417                         TRAP    C$PNTF
   016622  062706  000004                 ADD     #4,SP
41 016626  005764  000014                 TST     14(R4)          ;DID ANY SEEKS OCCUR ?
42 016632  001012                         BNE     4$              ;BR IF YES
43 016634  012746  017615                 MOV     #MSGNON,-(SP)
   016640  012746  000001                 MOV     #1,-(SP)
   016644  010600                         MOV     SP,R0
   016646  104417                         TRAP    C$PNTF
   016650  062706  000004                 ADD     #4,SP
44 016654  000137  017260                 JMP     11$
45 016660                          4$:
   016660  012446                         MOV     (R4)+,-(SP)
   016662  012746  017270                 MOV     #MSGMIN,-(SP)
   016666  012746  000002                 MOV     #2,-(SP)
```

GLOBAL SUBROUTINES SECTION

```
        016672  010600                          MOV     SP,R0
        016674  104417                          TRAP    C$PNTF
        016676  062706  000006                  ADD     #6,SP
    46  016702  005724                          TST     (R4)+           ;ANY SEEKS BELOW THE LOW LIMIT
    47  016704  001416                          BEQ     5$              ;NO--BRANCH
    48  016706  005737  017714                  TST     $$FLG           ;TYPE # OF SEEKS BELOW LIMIT?
    49  016712  001413                          BEQ     5$              ;NO, SKIP IT
    50  016714  010346                          MOV     R3,-(SP)
        016716  016446  177776                  MOV     -2(R4),-(SP)
        016722  012746  017362                  MOV     #MSGBEL,-(SP)
        016726  012746  000003                  MOV     #3,-(SP)
        016732  010600                          MOV     SP,R0
        016734  104417                          TRAP    C$PNTF
        016736  062706  000010                  ADD     #10,SP
    51  016742                          5$:
        016742  012446                          MOV     (R4)+,(SP)
        016744  012746  017313                  MOV     #MSGMAX,-(SP)
        016750  012746  000002                  MOV     #2,-(SP)
        016754  010600                          MOV     SP,R0
        016756  104417                          TRAP    C$PNTF
        016760  062706  000006                  ADD     #6,SP
    52  016764  005724                          TST     (R4)+           ;ANY SEEKS ABOVE THE HIGH LIMIT
    53  016766  001416                          BEQ     6$              ;NO--BRANCH
    54  016770  005737  017714                  TST     $$FLG           ;TYPE # OF SEEKS ABOVE LIMIT?
    55  016774  001413                          BEQ     6$              ;NO, SKIP IT
    56  016776  010246                          MOV     R2,-(SP)
        017000  016446  177776                  MOV     -2(R4),-(SP)
        017004  012746  017434                  MOV     #MSGABV,-(SP)
        017010  012746  000003                  MOV     #3,-(SP)
        017014  010600                          MOV     SP,R0
        017016  104417                          TRAP    C$PNTF
        017020  062706  000010                  ADD     #10,SP
    57  017024                          6$:
        017024  012746  017336                  MOV     #MSGAVG,-(SP)
        017030  012746  000001                  MOV     #1,-(SP)
        017034  010600                          MOV     SP,R0
        017036  104417                          TRAP    C$PNTF
        017040  062706  000004                  ADD     #4,SP
    58  017044  012446                          MOV     (R4)+,-(SP)     ;FORM THE AVERAGE
    59  017046  012446                          MOV     (R4)+,-(SP)
    60  017050  012446                          MOV     (R4)+,-(SP)
    61  017052  004737  011176                  JSR     PC,$DIV
    62  017056  006126                          ROL     (SP)+           ;IS THE REMAINDER OVER HALF?
    63  017060  100001                          BPL     7$              ;NO--BRANCH
    64  017062  005216                          INC     (SP)            ;YES--ROUND UP
    65  017064  012637  017266          7$:     MOV     (SP)+,AVERAG    ;POP AVERAGE VALUE FOR PRINT
    66  017070  013746  017266                  MOV     AVERAG,-(SP)
        017074  012746  017347                  MOV     #AVGVAL,-(SP)
        017100  012746  000002                  MOV     #2,-(SP)
        017104  010600                          MOV     SP,R0
        017106  104417                          TRAP    C$PNTF
        017110  062706  000006                  ADD     #6,SP
    67  017114  022737  000007  002114          CMP     #7,L$TEST       ;TEST 7 ?
    68  017122  001423                          BEQ     8$              ;BRANCH IF SO
    69  017124  022737  000016  002114          CMP     #14.,L$TEST     ;TEST 14 ?
    70  017132  001432                          BEQ     9$              ;BRANCH IF SO
    71  017134  022737  000022  002114          CMP     #18.,L$TEST     ;TEST 18 ?
```

```
 72 017142  001426                        BEQ     9$              ;BRANCH IF SO
 73 017144  016446  177776                MOV      2(R4), (SP)
    017150  012746  017506                MOV     #MSGNUM,-(SP)
    017154  012746  000002                MOV     #2, (SP)
    017160  010600                        MOV     SP,R0
    017162  104417                        TRAP    C$PNTF
    017164  062706  000006                ADD     #6,SP
 74 017170  000425                        BR      10$             ;SKIP
 75 017172                          8$:
    017172  016446  177776                MOV     -2(R4),-(SP)
    017176  012746  017533                MOV     #MSGSEA,-(SP)
    017202  012746  000002                MOV     #2,-(SP)
    017206  010600                        MOV     SP,R0
    017210  104417                        TRAP    C$PNTF
    017212  062706  000006                ADD     #6,SP
 76 017216  000412                        BR      10$             ;SKIP
 77 017220                          9$:
    017220  016446  177776                MOV     -2(R4),-(SP)
    017224  012746  017563                MOV     #MSGOPE,-(SP)
    017230  012746  000002                MOV     #2,-(SP)
    017234  010600                        MOV     SP,R0
    017236  104417                        TRAP    C$PNTF
    017240  062706  000006                ADD     #6,SP
 78 017244  010537  017264          10$:  MOV     R5,12$          ;NEXT MESSAGE POINTER
 79 017250  001403                        BEQ     11$             ;IF NONE EXIT
 80 017252  005005                        CLR     R5              ;NO MORE THAN 2
 81 017254  000137  016606                JMP     3$
 82 017260                          11$:
    017260  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
 83 017262  000204                        RTS     R4              ;EXIT
 84
 85 017264  000000                 12$:   .WORD   0               ;ADRRESS OF MSG 1
 86 017266  000000                 AVERAG: .WORD  0               ;AVERAGE VALUE
 87
 91 017270     045     116     045  MSGMIN: .ASCIZ  /%N%AMIN=%D5%AO. US/
 92 017313     045     116     045  MSGMAX: .ASCIZ  /%N%AMAX=%D5%AO. US/
 93 017336     045     116     045  MSGAVG: .ASCIZ  /%N%AAVG=/
 94 017347     045     104     065  AVGVAL: .ASCIZ  /%D5%AO. US/
 95 017362     045     101     040  MSGBEL: .ASCIZ  /%A %D4%A. BELOW THE MINIMUM OF %D5%AO. US/
 96 017434     045     101     040  MSGABV: .ASCIZ  /%A %D4%A. ABOVE THE MAXIMUM OF %D5%AO. US/
 97 017506     045     104     065  MSGNUM: .ASCIZ  /%D5%A. SEEKS TIMED%N/
 98 017533     045     104     065  MSGSEA: .ASCIZ  /%D5%A. SEARCHES TIMED%N/
 99 017563     045     104     065  MSGOPE:: .ASCIZ /%D5%A. OPERATIONS TIMED%N/
100 017615     045     101     040  MSGNON: .ASCIZ  /%A NOT TIMED%N/
101
102                                 .EVEN
106
107                                 ;SUBR TO CHECK IF COMPLETE SPECS ON SEEKS SHOULD BE TYPED
108                                 ;IF THE AVERAGE SEEK TIME IS ABOVE SPEC, THEN TYPE ABOVE AND BELOW VALUES
109                                 ;ELSE, DO NOT TYPE THEM
110                                 ;$$FLG IS SET TO INDICATE TYPE THEM
111
112 017634  005037  017714          CHKAVG: CLR     $$FLG           ;INIT FLAG
113 017640  122737  000011  002114          CMPB    #9.,L$TEST      ;TEST 9, AVERAGE SEEK TIMING ?
114 017646  001017                        BNE     2$              ;EXIT IF NOT
115 017650  016446  000010                MOV     10(R4),-(SP)    ;PUSH LOW DIVIDEND OF TOTAL TIME OF ALL SEEKS
116 017654  016446  000012                MOV     12(R4),-(SP)    ;PUSH HIGH DIVIDEND
```

MF,


```
117 017660  016446  000014              MOV     14(R4), (SP)    ;PUSH DIVISOR = NUMBER OF SEEKS TIMED
118 017664  004737  011176              JSR     PC,$DIV         ;CALCULATE AVERAGE
119 017670  006116                      ROL     (SP)            ;REM/2
120 017672  022664  000014              CMP     (SP)+,14(R4)    ;IS REM OVER HALF?
121 017676  002401                      BLT     1$              ;NO, SKIP NEXT
122 017700  005216                      INC     (SP)            ;YES, ROUND UP AVG TIME
123 017702  022602              1$:     CMP     (SP)+,R2        ;OUT OF SPEC?
124 017704  003402                      BLE     3$              ;EXIT IF NOT
125 017706  005237  017714      2$:     INC     $$FLG           ;SET FLAG TO REPORT ALL DATA
126 017712  000207              3$:     RTS     PC
127
128 017714  000000              $$FLG:  .WORD   0               ;TYPE ALL SPECS FLAG
```

```
                                        ;THIS ROUTINE GENERATES RANDOM CYLINDER, TRACK, AND SECTOR
                                        ;ADDRESSES AND SAVES THEN IN THE DPB (DTADPB+10, 11 & DTADPB+12).
                                        ;NOTE: THIS ROUTINE DESTROYS R1 R3
                                        ;CALL
                                        ;       JSR     R4,RANADR
                                        ;       RETURN

017716  004737  011712        RANADR: JSR     PC,RAND         ;GENERATE A RANDOM NUMBER
017722  113701  011774                MOVB    $RP1,R1         ;FORM SECTOR IN R1
017726  042701  177700                BIC     #177700,R1      ;REDUCE SIZE TO <= 63

                                        ;BINARY SEARCH FOR FS<=R1<=LS

017732  020137  002222        1$:     CMP     R1,LS           ;WHILE R1>LS DO R1=FS+(R1-FS)/2
017736  003407                        BLE     2$
017740  163701  002220                SUB     FS,R1
017744  000241                        CLC
017746  006001                        ROR     R1
017750  063701  002220                ADD     FS,R1
017754  000766                        BR      1$

017756  020137  002220        2$:     CMP     R1,FS           ;WHILE R1<FS DO R1=LS-(LS-R1)/2
017762  002011                        BGE     3$
017764  013702  002222                MOV     LS,R2
017770  010203                        MOV     R2,R3
017772  160102                        SUB     R1,R2
017774  000241                        CLC
017776  006002                        ROR     R2
020000  160203                        SUB     R2,R3
020002  010301                        MOV     R3,R1
020004  000764                        BR      2$

020006  110137  002640        3$:     MOVB    R1,DTADPB+10    ;SET RANDOM SECTOR IN DPB
020012  113701  011775                MOVB    $RP1+1,R1       ;FORM TRACK IN R1
020016  042701  177740                BIC     #177740,R1      ;REDUCE SIZE TO <= 31

                                        ;BINARY SEARCH FOR FT<=R1<=LT

020022  020137  002214        4$:     CMP     R1,LT           ;WHILE R1>LT DO R1=FT+(R1 FT)/2
020026  003407                        BLE     5$
020030  163701  002212                SUB     FT,R1
020034  000241                        CLC
020036  006001                        ROR     R1
020040  063701  002212                ADD     FT,R1
020044  000766                        BR      4$
020046  020137  002212        5$:     CMP     R1,FT           ;WHILE R1<FT DO R1=LT (LT R1)/2
020052  002011                        BGE     6$
020054  013702  002214                MOV     LT,R2
020060  010203                        MOV     R2,R3
020062  160102                        SUB     R1,R2
020064  000241                        CLC
020066  006002                        ROR     R2
020070  160203                        SUB     R2,R3
020072  010301                        MOV     R3,R1
020074  000764                        BR      5$

020076  110137  002641        6$:     MOVB    R1,DTADPB+11    ;SET RANDOM TRACK IN DPB
```

```
     58 020102  004737  011712                 JSR     PC,RAND         ;GENERATE RANDOM NUMBERS
     59 020106  013701  011774                 MOV     $RP1,R1         ;PICK ONE FOR CYLINDER
     60 020112  042701  176000                 BIC     #176000,R1      ;REDUCE SIZE TO <=1777
     61
     62                                        ;BINARY SEARCH FOR FC<=R1<=LC
     63
     64 020116  020137  002206         7$:     CMP     R1,LC           ;WHILE R1>LC DO R1=FC+(R1-FC)/2
     65 020122  003407                         BLE     8$
     66 020124  163701  002204                 SUB     FC,R1
     67 020130  000241                         CLC
     68 020132  006001                         ROR     R1
     69 020134  063701  002204                 ADD     FC,R1
     70 020140  000766                         BR      7$
     71
     72 020142  020137  002204         8$:     CMP     R1,FC           ;WHILE R1<FC DO R1=LC-(LC-R1)/2
     73 020146  002011                         BGE     9$
     74 020150  013702  002206                 MOV     LC,R2
     75 020154  010203                         MOV     R2,R3
     76 020156  160102                         SUB     R1,R2
     77 020160  000241                         CLC
     78 020162  006002                         ROR     R2
     79 020164  160203                         SUB     R2,R3
     80 020166  010301                         MOV     R3,R1
     81 020170  000764                         BR      8$
     82
     83 020172  010137  002642         9$:     MOV     R1,DTADPB+12    ;SAVE CYLINDER ADDRESS
     84 020176  000204                         RTS     R4              ;RETURN
```

```
                                .SBTTL  RP07 DRIVER

                                ;STORAGE FOR RPDS, RPER1, RPER2, AND RPER3

020200  000000  000000  000000  RPSTU0: .WORD   0,0,0,0          ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 0
020210  000000  000000  000000  RPSTU1: .WORD   0,0,0,0          ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 1
020220  000000  000000  000000  RPSTU2: .WORD   0,0,0,0          ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 2
020230  000000  000000  000000  RPSTU3: .WORD   0,0,0,0          ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 3
020240  000000  000000  000000  RPSTU4: .WORD   0,0,0,0          ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 4
020250  000000  000000  000000  RPSTU5: .WORD   0,0,0,0          ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 5
020260  000000  000000  000000  RPSTU6: .WORD   0,0,0,0          ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 6
020270  000000  000000  000000  RPSTU7: .WORD   0,0,0,0          ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 7

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

020300      000                 DRVACT: .BYTE   0                ;DRIVE 0
020301      000                         .BYTE   0                ;DRIVE 1
020302      000                         .BYTE   0                ;DRIVE 2
020303      000                         .BYTE   0                ;DRIVE 3
020304      000                         .BYTE   0                ;DRIVE 4
020305      000                         .BYTE   0                ;DRIVE 5
020306      000                         .BYTE   0                ;DRIVE 6
020307      000                         .BYTE   0                ;DRIVE 7

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

020310      000                 DRVSTA: .BYTE   0                ;DRIVE 0
020311      000                         .BYTE   0                ;DRIVE 1
020312      000                         .BYTE   0                ;DRIVE 2
020313      000                         .BYTE   0                ;DRIVE 3
020314      000                         .BYTE   0                ;DRIVE 4
020315      000                         .BYTE   0                ;DRIVE 5
020316      000                         .BYTE   0                ;DRIVE 6
020317      000                         .BYTE   0                ;DRIVE 7

                                ;TABLE OF DRIVE TYPES (DRVTYP=8 BYTES)
                                        ;DRVTYP=0 IF DRIVE IS NONEXISTENT (DRVSTA=0, ALSO)
                                        ;DRVTYP=5 IF DRIVE IS RP07  MOVING HEAD OPTION
                                        ;DRVTYP=4 IF DRIVE IS RP07 FIX HEAD OPTION
                                        ;DRVTYP=-1 IF NOT RP07

020320      000                 DRVTYP: .BYTE   0                ;DRIVE 0
020321      000                         .BYTE   0                ;DRIVE 1
020322      000                         .BYTE   0                ;DRIVE 2
020323      000                         .BYTE   0                ;DRIVE 3
020324      000                         .BYTE   0                ;DRIVE 4
020325      000                         .BYTE   0                ;DRIVE 5
020326      000                         .BYTE   0                ;DRIVE 6
020327      000                         .BYTE   0                ;DRIVE 7

                                ;TABLE OF DUAL PORT INITIALIZATION INDICATORS
```

```
                                        ;DPINT=0 IF INITIALIZATION IS NOT ACTIVE ON THE DRIVE
                                        ;DPINT<0 IF INITIALIZATION IS IN PROGRESS

020330  000             DPINT:  .BYTE   0               ;DRIVE 0
020331  000                     .BYTE   0               ;DRIVE 1
020332  000                     .BYTE   0               ;DRIVE 2
020333  000                     .BYTE   0               ;DRIVE 3
020334  000                     .BYTE   0               ;DRIVE 4
020335  000                     .BYTE   0               ;DRIVE 5
020336  000                     .BYTE   0               ;DRIVE 6
020337  000                     .BYTE   0               ;DRIVE 7

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

020340  000             DPRQS:  .BYTE   0               ;DRIVE 0
020341  000                     .BYTE   0               ;DRIVE 1
020342  000                     .BYTE   0               ;DRIVE 2
020343  000                     .BYTE   0               ;DRIVE 3
020344  000                     .BYTE   0               ;DRIVE 4
020345  000                     .BYTE   0               ;DRIVE 5
020346  000                     .BYTE   0               ;DRIVE 6
020347  000                     .BYTE   0               ;DRIVE 7

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

020350  000000          TRNSWT: .WORD   0

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

020352  000000          SRCHWT: .WORD   0

                        ;RP07 DRIVER ACTIVE FLAG (ACTDRV=1 BYTE)
                                        ;ACTDRV=0 IF DRIVER IS INACTIVE
                                        ;ACTDRV>0 IF DRIVER IS ACTIVE

020354  000             ACTDRV: .BYTE   0

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

020355  000             ACTSTR: .BYTE   0


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

020356  177777          TIMER:  .WORD   -1      ;DRIVE 0
020360  177777                  .WORD   -1      ;DRIVE 1
```

```
020362  177777                          .WORD    1       ;DRIVE 2
020364  177777                          .WORD    1       ;DRIVE 3
020366  177777                          .WORD    1       ;DRIVE 4
020370  177777                          .WORD    1       ;DRIVE 5
020372  177777                          .WORD    1       ;DRIVE 6
020374  177777                          .WORD   -1       ;DRIVE 7

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

020376  177777                  DTUW:   .WORD   -1
```

```
 1
 2                                      ;RHXX/RP07 DRIVER INITIALIZATION CODE
 3                                              ;THIS ROUTINE WILL DETERMINE WHICH RP07 DRIVES ARE
 4                                              ;AVAILABLE FOR TESTING AND SET THE DRVSTA INDICATOR
 5                                              ;TO THE PROPER STATE FOR EACH DRIVE.
 6                                              ;NOTE: THIS ROUTINE CALLS DRVINT
 7                                      ;
 8                                      ;CALL
 9                                      ;
10                                      ;       JSR     PC,RPINIT
11                                      ;       RETURN
12                                      ;
13                                      ;NOTE: THE 'P' OR 'L' CLOCK MUST BE STARTED
14                                      ;
15 020400  004737  010750               RPINIT: JSR     PC,SAVREG       ;SAVE R0 - R5
16 020404  004737  012000                       JSR     PC,ST.CLK       ;TURN ON THE CLOCK
17                                                                      ;SAVE THE PRESENT PROCESSOR STATUS
18 020410  104440                               TRAP    C$GPRI
   020412  010046                               MOV     R0,-(SP)
19                                                                      ;CHANGE THE PRIORITY TO 5
20 020414  012700  000240                       MOV     #PRI05,R0
   020420  104441                               TRAP    C$SPRI
21 020422  004737  025350                       JSR     PC,CLRQUE       ;CLEAR ALL REQUEST QUEUES
22 020426  012701  020200                       MOV     #RPSTU0,R1      ;FIRST ADDRESS TO BE CLEARED
23 020432  012702  020356                       MOV     #TIMER,R2       ;LAST ADDRESS TO BE CLEARED
24 020436  005021                       1$:     CLR     (R1)+           ;CLEAR
25 020440  020102                               CMP     R1,R2           ;ARE WE DONE?
26 020442  103775                               BLO     1$              ;BRANCH IF NO
27 020444  012702  020376                       MOV     #DTUW,R2        ;LAST ADDRESS
28 020450  012721  177777               2$:     MOV     # 1,(R1)+       ;INITIALIZE
29 020454  020102                               CMP     R1,R2           ;DONE?
30 020456  101774                               BLOS    2$              ;LOOP IF NO
31 020460  005037  020310                       CLR     DRVSTA          ;SET ALL DRIVES TO OFFLINE
32 020464  005037  020312                       CLR     DRVSTA+2
33 020470  005037  020314                       CLR     DRVSTA+4
34 020474  005037  020316                       CLR     DRVSTA+6
35                                                                      ;SETUP RHXX/RP07 VECTOR
36 020500  013746  002656                       MOV     RPVEC+2,-(SP)
   020504  012746  023046                       MOV     #ISRV,-(SP)
   020510  013746  002654                       MOV     RPVEC,-(SP)
   020514  012746  000003                       MOV     #3,-(SP)
   020520  104437                               TRAP    C$SVEC
   020522  062706  000010                       ADD     #10,SP
37 020526  012777  000040  162144               MOV     #CLR,@RPCS2     ;MASSBUS INIT
38 020534  013701  002664                       MOV     DRVNO,R1        ;GET SELECTED DRIVE
39 020540  004437  020566               3$:     JSR     R4,DRVINT       ;INIT THE DRIVE
40 020544  000401                               BR      4$              ;'DVA' NOT SET OR PARITY ERROR
41 020546  000402                               BR      5$              ;NORMAL RETURN
42
43 020550  105061  020310               4$:     CLRB    DRVSTA(R1)      ;SET DRIVE STATUS TO OFFLINE
44 020554                               5$:                             ;RESTORE THE PROCESSOR STATUS
45 020554  012600                               MOV     (SP)+,R0
   020556  104441                               TRAP    C$SPRI
46 020560  004737  011002                       JSR     PC,RESREG       ;RESTORE R0   R5
47 020564  000207                               RTS     PC              ;BYE-BYE
48
49                                      ;DRIVE INITILIZATION ROUTINE
```

```
                                                ;THIS ROUTINE DETERMINES IF A DRIVE EXIST AND IF IT IS
                                                ;AN RP07. IF IT IS, A "READ IN PRESET" IS ISSUED AND FMT16
                                                ;IS SET TO A '1". THEN MOL, DPR, DRY, AND VV ARE CHECKED TO
                                                ;INSURE THEY ARE ALL ON A '1". AND DEPENDING ON THEIR STATE,
                                                ;DRVSTA IS SET TO THE PROPER CONDITION.
                                        ;CALL
                                        ;       MOV     @DRVNUM,R1      ;DRIVE NUMBER TO R1
                                        ;       JSR     R4,DRVINT       ;CALLED BY A JSR
                                        ;       RETURN1                 ;ERROR OCCURRED (PARITY)
                                        ;       RETURN2                 ;NORPAL RETURN
                                        ;
020566  010546                  DRVINT: MOV     R5,-(SP)        ;SAVE R5
020570  112761  177777  020330          MOVB    @-1,DPINT(R1)   ;SET THE INITIAL FLAG
020576  006301                          ASL     R1
020600  012761  003720  020356          MOV     @2000.,TIMER(R1)        ;SET A 2 SECOND TIMER
020606  006201                          ASR     R1              ;DRIVE ADDRESS
020610  105061  020310          10$:    CLRB    DRVSTA(R1)      ;START DRIVE STATUS AS OFFLINE
020614  105061  020320                  CLRB    DRVTYP(R1)      ;CLEAR THE DRIVE TYPE INDICATOR
020620  010177  162054                  MOV     R1,@RPCS2       ;SELECT A DRIVE
020624  112777  000111  162036          MOVB    @111,@RPCS1     ;DO A DRIVE CLEAR COMMAND (& SEIZE DRIVE)
020632  032777  010000  162040          BIT     @BIT12,@RPCS2 ;NONEXISTENT DRIVE?
020640  001403                          BEQ     1$              ;NO-- BRANCH
020642  004737  025004                  JSR     PC,SET.IE       ;GO SET "IE" WITHOUT A "TRE"
020646  000513                          BR      6$              ;LEAVE THIS ROUTINE

020650  105061  020310          1$:     CLRB    DRVSTA(R1)      ;SET DRIVE STATUS TO OFFLINE
020654  032777  004000  162006          BIT     @BIT11,@RPCS1  ;SEE IF DRIVE AVAILABLE
020662  001004                          BNE     22$             ;BRANCH IF DVA SET
020664  105761  020330                  TSTB    DPINT(R1)       ;SOFTWARE TIME OUT
020670  001347                          BNE     10$             ;BRANCH IF NOT
020672  000501                          BR      6$              ;OTHERWISE EXIT

020674  004437  024426          22$:    JSR     R4,RD.RP        ;READ THE DRIVE TYPE REG.
020700  000026                          26
020702  021100                          8$                      ;ERROR RETURN ADDRESS
020704  012605                          MOV     (SP)+,R5        ;PUT DRIVE TYPE IN R5
020706  112761  000005  020320          MOVB    @5,DRVTYP(R1)   ;SET RP07 INDICATOR
020714  022705  020040                  CMP     @20040,R5       ;SINGLE PORT RP07
020720  001420                          BEQ     2$              ;BR IF YES
020722  022705  024040                  CMP     @24040,R5       ;DUAL PORT RP07
020726  001415                          BEQ     2$              ;BR IF YES
020730  112761  000004  020320          MOVB    @4,DRVTYP(R1)   ;SET RP07+ INDICATOR
020736  022705  020042                  CMP     @20042,R5       ;SINGLE PPRT RP07+
020742  001407                          BEQ     2$              ;BRANCH IF SO
020744  022705  024042                  CMP     @24042,R5       ;DUAL PORT RP07+
020750  001404                          BEQ     2$              ;BRANCH IF SO
020752  112761  177777  020320          MOVB    @-1,DRVTYP(R1)  ;SET INDICATOR TO 'OTHER'
020760  000446                          BR      6$              ;EXIT

020762  012746  000121          2$:     MOV     @121,-(SP)      ;DO A "READ-IN PRESET"
020766  004437  024520                  JSR     R4,WRT.RP
020772  000000                          0
020774  021100                          8$
020776  012746  010000                  MOV     @BIT12,-(SP)    ;SET FMT16=1
021002  004437  024520                  JSR     R4,WRT.RP
021006  000032                          32
```

```
 107 021010  021100                          8$
 108 021012  004437  024426                   JSR     R4,RD.RP        ;READ RPDS
 109 021016  000012                           12
 110 021020  021100                           8$
 111 021022  012605                           MOV     (SP)+,R5        ;AND SAVE IT IN R5
 112 021024  100015                           BPL     4$              ;BRANCH IF ATA=0
 113 021026  116177  002744  161652           MOVB    ATABIT(R1),@RPAS ;CLEAR ATTENTION BIT
 114 021034  004437  024426                   JSR     R4,RD.RP        ;FIND OUT WHY ATA=1
 115 021040  000014                           14
 116 021042  021100                           8$
 117 021044  006126                           ROL     (SP)+           ;IS IT UNSAFE?
 118 021046  100004                           BPL     4$              ;BR IF NOT
 119 021050  112761  177777  020310           MOVB    #-1,DRVSTA(R1)  ;SET UNSAFE INDICATOR
 120 021056  000407                           BR      6$              ;EXIT
 121 021060  005105                  4$:      COM     R5              ;CHECK MOL, DPR, DRY, AND VV
 122 021062  042705  167077                   BIC     #^C<BIT12!BIT08!BIT07!BIT06>,R5
 123 021066  001003                           BNE     6$              ;BRANCH IF MOL, DPR, DRY, OR VV IS CLEAR
 124 021070  112761  000001  020310           MOVB    #1,DRVSTA(R1)   ;SET DRIVE STATUS TO ONLINE
 125 021076  005724                  6$:      TST     (R4)+           ;STEP OVER THE ERROR RETURN
 126 021100                          7$:
 127 021100  006301                  8$:      ASL     R1              ;WORD INDEX
 128 021102  012761  177777  020356           MOV     #-1,TIMER(R1)   ;STOP THE CLOCK
 129 021110  006201                           ASR     R1              ;DRIVE ADDRESS
 130 021112  105061  020330                   CLRB    DPINT(R1)
 131 021116  012605                           MOV     (SP)+,R5        ;RESTORE R5
 132 021120  000204                           RTS     R4              ;EXIT
 133
 134                                 ;REQUEST PRE PROCESSOR HANDLES SUBSYSTEM REQUEST
 135                                 ;
 136                                 ;CALL
 137                                 ;
 138                                 ;       JSR     R4,RP07         ;CALL THE RP07 DRIVER
 139                                 ;       PNTADR                  ;ADDRESS OF POINTER OF DRIVES PARAMETER BLOCK
 140                                 ;       RETURN1                 ;RETURN HERE IF QUEUE IS FULL
 141                                 ;       RETURN2                 ;RETURN HERE IF REQUEST IS IN QUEUE OR THERE
 142                                 ;                               ;IS AN ERROR CONDITION
 143
 144 021122                          RP07:                           ;SAVE THE CALLING STATUS
 145 021122  104440                           TRAP    C$GPRI
     021124  010046                           MOV     R0,-(SP)
 146                                                                 ;DON'T ALLOW ANY RP07 INTERRUPTS
 147 021126  013700  002656                   MOV     RPVEC+2,R0
     021132  104441                           TRAP    C$SPRI
 148 021134  112737  000001  020354           MOVB    #1,ACTDRV       ;SET "ACTIVE DRIVER" FLAG
 149 021142  004737  010750                   JSR     PC,SAVREG       ;SAVE R0 - R5
 150 021146  011402                           MOV     (R4),R2         ;PICKUP THE DRIVE PARAMETER BLOCK POINTER
 151 021150  005062  000016                   CLR     16(R2)          ;CLEAR THE STATUS/ERROR INDICATOR
 152 021154  111201                           MOVB    (R2),R1         ;PICKUP THE DRIVE NUMBER
 153 021156  105761  020310                   TSTB    DRVSTA(R1)      ;CHECK DRIVES STATUS
 154 021162  003006                           BGT     1$              ;BRANCH IF ONLINE
 155 021164  004437  020566                   JSR     R4,DRVINT       ;GO INIT. THE DRIVE
 156 021170  000421                           BR      4$              ;ERROR RETURN
 157                                                                 ;NO ERROR
 158 021172  105761  020310                   TSTB    DRVSTA(R1)      ;IS DRIVE STATUS ONLINE?
 159 021176  003436                           BLE     6$              ;BR IF NOT
 160 021200  105761  020340          1$:      TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
 161 021204  001016                           BNE     5$              ;BR IF YES
```

```
                                        MOV     R1,@RPCS2       ;SELECT THE DRIVE
                                        JSR     R4,DRVQUE       ;PUT THIS REQUEST IN QUEUE
                                        BR      9$              ;QUEUE IS FULL

                                2$:     TSTB    DRVACT(R1)      ;IS THIS DRIVE ACTIVE?
                                        BNE     8$              ;BR IF YES
                                        JSR     PC,OPT          ;CALL THE OPTIMIZER
                                        BR      8$
                                3$:
                                4$:     JSR     PC,CI7          ;GO HANDLE THE PARITY ERROR
                                        BR      8$

                                5$:     JSR     R4,DRVQUE       ;PUT REQUEST IN QUEUE
                                        BR      9$              ;QUEUE IS FULL

                                        MOV     #0,@RPCC        ;WRITE THE CURRENT CYL REG
                                        BIT     #BIT06,@RPCS1   ;IE BIT SET ?
                                        BNE     8$              ;YES
                                        JSR     PC,SET.IE       ;SET THE INTERRUPT
                                        BR      8$              ;RETURN

                                6$:     TSTB    DRVSTA(R1)      ;SEE IF DRIVE OFFLINE OR UNSAFE
                                        BLT     7$              ;BR IF UNSAFE
                                        MOV     #BIT15!BIT14,16(R2)  ;SET OFFLINE ERROR INDICATOR
                                        TSTB    DRVTYP(R1)      ;SEE IF OFFLINE OR NONEXISTENT
                                        BNE     8$              ;BR IF OFFLINE
                                        MOV     #BIT15!BIT01,16(R2)  ;REPORT DRIVE NONEXISTENT
                                        BR      8$              ;GO TO EXIT

                                7$:     MOV     #BIT15!BIT12,16(R2)  ;DRIVE IS UNSAFE
                                8$:     JSR     PC,RESREG       ;RESTORE R0 - R5
                                        TST     (R4)+           ;SETUP FOR NORMAL RETURN
                                        BR      10$             ;FINISH UP, THEN EXIT
                                9$:     JSR     PC,RESREG       ;RESTORE R0 - R5
                                10$:    TST     (R4)+           ;CORRECT THE RETURN ADDRESS
                                        CLRB    ACTDRV          ;CLEAR "ACTIVE DRIVER" FLAG
                                                                ;RESTORE PRIORITY
                                        MOV     (SP)+,R0
                                        TRAP    C$SPRI
                                        RTS     R4              ;RETURN TO CALLER

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

                                OPT:    JSR     PC,SAVREG       ;SAVE R0 - R5
                                        TRAP    C$GPRI
                                        MOV     R0,-(SP)
                                        BICB    ATABIT(R1),SRCHWT       ;CLEAR LA SEACH FLAG
                                        CLRB    DPRQS(R1)       ;RESET THE PORT REQ FLAG ****
                                        JSR     PC,GETREQ       ;GET "DPB" POINTER OF REQUEST
                                        TST     R2              ;IS THERE A REQUEST IN QUEUE?
                                        BEQ     7$              ;NO--BRANCH TO EXIT
                                        MOV     R1,@RPCS2       ;LOAD THE DRIVE ADDRESS *******
                                        MOV     #111,@RPCS1     ;CLEAR THE DRIVE
```

```
217 021430  032777  000400  161244          BIT     #BIT8,@RPDS     ;DPR SET ?
218 021436  001443                          BEQ     5$              ;TO PROT REQUEST ,IF NOT
219 021440  105761  020310          10$:    TSTB    DRVSTA(R1)      ;IS DRIVE ONLINE?
220 021444  003014                          BGT     1$              ;YES--BRANCH
221 021446  004737  025550                  JSR     PC,POPQUE       ;NO--REMOVE REQUEST FROM QUEUE
222 021452  012762  140000  000016          MOV     #BIT15!BIT14,16(R2)     ;SET OFFLINE STATUS/ERROR INDICATOR
223 021460  105761  020310                  TSTB    DRVSTA(R1)      ;IS DRIVE UNSAFE ?
224 021464  100054                          BPL     8$              ;BR TO EXIT IF NOT
225 021466  012762  110000  000016          MOV     #BIT15!BIT12,16(R2)     ;SET UNSAFE STATUS/ERROR INDICATOR
226 021474  000450                          BR      8$              ;BRANCH TO EXIT
227
228 021476  122762  000150  000002  1$:     CMPB    #150,2(R2)      ;IS THE REQUEST FOR I/O?
229 021504  002407                          BLT     2$              ;YES--BRANCH
230 021506  122762  000135  000002          CMPB    #135,2(R2)      ;IS THE DIAGNOSTIC COMMAND ?
231 021514  001403                          BEQ     2$              ;BRANCH IF SO
232 021516  004737  022126                  JSR     PC,CI4          ;CALL THE COMMAND INITIATOR
233 021522  000435                          BR      8$              ;BRANCH TO EXIT
234
235 021524  005737  020376          2$:     TST     DTUW            ;DATA TRANSFER UNDERWAY?
236 021530  002003                          BGE     4$              ;YES--GO START A SEARCH
237 021532  004737  021630          3$:     JSR     PC,CI1          ;START A DATA TRANSFER
238 021536  000427                          BR      8$
239
240 021540  004737  022014          4$:     JSR     PC,CI3          ;START A SEARCH
241 021544  000424                          BR      8$              ;GO TO THE EXIT
242
243 021546  112761  177777  020340  5$:     MOVB    #-1,DPRQS(R1)   ;SET PORT REQUEST INDICATOR
244 021554  010103                          MOV     R1,R3           ;SET UP TO ADDRESS WORDS
245 021556  006303                          ASL     R3              ;CONVERT TO WORD INDEX
246 021560  012763  047040  020356          MOV     #20000.,TIMER(R3)       ;SET A 20. SECOND TIMER
247 021566  012777  000000  161132          MOV     #0,@RPCC        ;SET PORT REQUEST
248 021574  000402                          BR      7$              ;EXIT
249 021576  004737  022536          6$:     JSR     PC,CI7          ;PROCESS THE PARITY ERROR
250 021602  032777  000100  161060  7$:     BIT     #BIT06,@RPCS1   ;SEE IF 'IE' ALREADY SET
251 021610  001002                          BNE     8$              ;BR IF SET
252 021612  004737  025004                  JSR     PC,SET.IE       ;SET "IE" WITHOUT A "TRE"
253 021616                          8$:                             ;RESTORE PROC. STATUS
254 021616  012600                          MOV     (SP)+,R0
    021620  104441                          TRAP    C$SPRT
255 021622  004737  011002                  JSR     PC,RESREG       ;RESTORE R0 - R5
256 021626  000207                          RTS     PC
```

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

021630  004737  025550          CI1:    JSR     PC,POPQUE       ;REMOVE REQUEST FROM "DRIVES WAIT" QUEUE
021634  010237  020350                  MOV     R2,TRNSWT       ;PUT REQ. IN TRANSFER WAIT QUEUE
021640  010203                          MOV     R2,R3           ;DPB ADDRESS TO R3
021642  013704  002670                  MOV     RPCS1,R4        ;RPCS1 ADDRESS
021646  010177  161026                  MOV     R1,@RPCS2       ;SELECT DRIVE
021652  122762  000135  000002          CMPB    #DIAG,2(R2)     ;DIAGNOSTIC COMMAND ?
021660  001011                          BNE     1$              ;BRANCH IF NOT
021662  016246  000004                  MOV     4(R2),-(SP)     ;GET THE RT NUMBER, PARAMETERS
021666  052716  100000                  BIS     #DMD,(SP)       ;SET THE GIAGNOSTIC MODE BIT
021672  004437  024520                  JSR     R4,WRT.RP       ;WRITE THE RPMR1 REG
021676  000024                          24
021700  022536                          CI7                     ;RETURN HERE ON ERROR
021702  000432                          BR      2$              ;LOAD THE COMMAND AND EXIT

021704  062703  000004          1$:     ADD     #4,R3           ;DESIRED WORD COUNT
021710  062704  000002                  ADD     #2,R4           ;RPWC ADDRESS
021714  012324                          MOV     (R3)+,(R4)+     ;LOAD WORD COUNT
021716  012324                          MOV     (R3)+,(R4)+     ;LOAD BUFFER ADDRESS
021720  012346                          MOV     (R3)+,-(SP)     ;LOAD SECTOR AND TRACK
021722  004437  024520                  JSR     R4,WRT.RP       ;CALL THE LOAD(WRITE) ROUTINE
021726  000006                          6                       ;INDEX OF REGISTER TO LOAD
021730  022536                          CI7                     ;RETURN HERE ON ERROR
021732  012346                          MOV     (R3)+,-(SP)     ;LOAD CYLINDER ADDRESS
021734  004437  024520                  JSR     R4,WRT.RP
021740  000034                          34
021742  022536                          CI7                     ;RETURN HERE ON ERROR
021744  032712  100000                  BIT     #BIT15,(R2)     ;MAINTENANCE MODE FLAG BIT SET ?
021750  001407                          BEQ     2$              ;BRANCH IF NOT
021752  005046                          CLR     -(SP)           ;SET DMD BIT IN RPMR
021754  052716  100000                  BIS     #BIT15,(SP)     ;SET DMD BIT ONLY THE REST BITS MUST BE 0
021760  004437  024520                  JSR     R4,WRT.RP       ;WRITE TO RPMR
021764  000024                          24
021766  022536                          CI7                     ;RETURN HERE ON ERROR
021770  016246  000002          2$:     MOV     2(R2),-(SP)     ;LOAD "COMMAND+GO", "A17&A16", AND "PSEL"
021774  004437  024520                  JSR     R4,WRT.RP
022000  000000                          0
022002  022536                          CI7                     ;RETURN HERE ON ERROR
022004  010137  020376                  MOV     R1,DTUW         ;SET "DATA TRANSFER UNDERWAY"
022010  000137  022452                  JMP     CI5

022014  013704  002670          CI3:    MOV     RPCS1,R4        ;RPCS1 ADDRESS
022020  010177  160654                  MOV     R1,@RPCS2       ;SELECT DRIVE
022024  016246  000012                  MOV     12(R2),-(SP)    ;DESIRED CYLINDER ADDRESS
022030  004437  024520                  JSR     R4,WRT.RP
022034  000034                          34
022036  022536                          CI7                     ;RETURN HERE ON ERROR
```

```
 58 022040  016246  000010              MOV     10(R2), (SP)    ;THE SECTOR AND TRACK ADDRESS
 59 022044  004437  024520              JSR     R4,WRT.RP       ;LOAD DESIRED TRACK & SECTOR
 60 022050  000006                      6
 61 022052  022536                      CI7                     ;RETURN HERE ON ERROR
 62 022054  032762  100000  000000      BIT     #BIT15,0(R2)    ;MAINTENANCE MODE ?
 63 022062  001407                      BEQ     1$              ;BRANCH IF NOT
 64 022064  005046                      CLR     -(SP)
 65 022066  052716  100000              BIS     #BIT15,(SP)     ;SET DMD BIT ONLY,THE REST BITS MUST BE 0
 66 022072  004437  024520              JSR     R4,WRT.RP
 67 022076  000024                      24
 68 022100  022536                      CI7                     ;RETURN HERE ON ERROR
 69 022102                      1$:
 70 022102  012746  000131              MOV     #SEARCH,-(SP)   ;START A SEARCH
 71 022106  004437  024520              JSR     R4,WRT.RP
 72 022112  000000                      0
 73 022114  022536                      CI7                     ;RETURN HERE ON ERROR
 74 022116  156137  002744  020352      BISB    ATABIT(R1),SRCHWT       ;SET "SEARCH WAIT" KEY
 75 022124  000552                      BR      CI5
 76
 77 022126  013704  002670      CI4:    MOV     RPCS1,R4        ;RPCS1 ADDRESS
 78 022132  010177  160542              MOV     R1,@RPCS2       ;SELECT DRIVE
 79 022136  116203  000002              MOVB    2(R2),R3        ;PICKUP THE REQUESTED COMMAND
 80 022142  122703  000131              CMPB    #SEARCH,R3      ;IS IT A SEARCH COMMAND?
 81 022146  001007                      BNE     1$              ;BRANCH IF NO
 82 022150  016246  000010              MOV     10(R2),-(SP)    ;LOAD DESIRED TRACK & SECTOR
 83 022154  004437  024520              JSR     R4,WRT.RP
 84 022160  000006                      6
 85 022162  022536                      CI7                     ;RETURN HERE ON ERROR
 86 022164  000403                      BR      2$              ;GO LOAD CYLINDER
 87
 88 022166  122703  000105      1$:     CMPB    #SEEK,R3        ;IS IT A SEEK COMMAND
 89 022172  001007                      BNE     3$              ;BRANCH IF NO
 90 022174  016246  000012      2$:     MOV     12(R2),-(SP)    ;LOAD DESIRED CYLINDER
 91 022200  004437  024520              JSR     R4,WRT.RP
 92 022204  000034                      34
 93 022206  022536                      CI7                     ;RETURN HERE ON ERROR
 94 022210  000531                      BR      CI6
 95
 96 022212  122703  000115      3$:     CMPB    #OFFSET,R3      ;IS IT AN "OFFSET" REGISTER CHANGE COMMAND ?
 97 022216  001013                      BNE     4$              ;BR IF NO
 98 022220  004437  024426              JSR     R4,RD.RP        ;MERGE THE OFFSET VALUE INTO RPOF
 99 022224  000032                      32                      ;BUT DON'T CHANGE THE UPPER
100 022226  022536                      CI7                     ;RETURN HERE ON ERROR
101 022230  116216  000001              MOVB    1(R2),(SP)      ;BYTE WHEN LOADING THE
102 022234  004437  024520              JSR     R4,WRT.RP       ;REGISTER (RPOF)
103 022240  000032                      32
104 022242  022536                      CI7                     ;RETURN HERE ON ERROR
105 022244  000513                      BR      CI6             ;GO START THE COMMAND
106
107 022246  122703  000107      4$:     CMPB    #RECAL,R3       ;IS IT A "RECALIBRATE" COMMAND?
108 022252  001510                      BEQ     CI6             ;BRANCH IF YES
109 022254  122703  000117              CMPB    #RTC,R3         ;IS IT A RETURN TO CENTER?
110 022260  001505                      BEQ     CI6             ;BRANCH IF YES
111 022262  122703  000147      5$:     CMPB    #SETFORM,R3     ;IS IT A "SET FORMAT" COMMAND?
112 022266  001014                      BNE     6$              ;BRANCH IF NO
113 022270  004437  024426              JSR     R4,RD.RP        ;READ THE OFFSET REGISTER
114 022274  000032                      32
```

M7


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115 022276  022536                        CI7                     ;RETURN HERE ON ERROR
116 022300  116266  000001  000001        MOVB    1(R2),1(SP)     ;COMBINE "FMT16",'ECI", AND "HCI"
117 022306  004437  024520                JSR     R4,WRT.RP       ;LOAD "FMT16", "ECI", AND/OR "HCI".
118 022312  000032                        32
119 022314  022536                        CI7                     ;RETURN HERE ON ERROR
120 022316  000445                        BR      12$
121
122 022320  122703  000141          6$:   CMPB    #GETRFG,R3      ;IS IT A "GET REGISTER" COMMAND?
123 022324  001023                        BNE     10$             ;BRANCH IF NO
124 022326  016203  000006          7$:   MOV     6(R2),R3        ;POINTS TO 1ST ADDRESS OF WHERE
125                                                               ;TO PUT THE REGISTER(S)
126 022332  116237  000010  022350        MOVB    10(R2),9$       ;INIT. THE INDEX FOR THE FIRST REG.
127 022340  116205  000011                MOVB    11(R2),R5       ;INDEX OF LAST REG. TO MOVE
128 022344  004437  024426          8$:   JSR     R4,RD.RP        ;READ RHXX/RP07 REGISTER
129 022350  000000          9$:   0                               ;INDEX OF REG. TO READ
130 022352  022536                        CI7                     ;RETURN HERE ON ERROR
131 022354  012623                        MOV     (SP)+,(R3)+     ;GET THE CONTENTS OF RHXX//RP07 REG.
132 022356  023705  022350                CMP     9$,R5           ;LAST REG. BEEN READ?
133 022362  001423                        BEQ     12$             ;GET OUT IF YES
134 022364  062737  000002  022350        ADD     #2.9$           ;INCREASE THE INDEX BY 2
135 022372  000764                        BR      8$              ;LOOP--MORE TO READ
136
137 022374  122703  000145         10$:   CMPB    #MAINT,R3       ;IS IT A "SELECT MAINTENANCE" COMMAND?
138 022400  001007                        BNE     11$             ;BRANCH IF NOT
139 022402  012746  100000                MOV     #DMD,-(SP)      ;SET DIAGNOSTIC MODE COMMAND
140 022406  004437  024520                JSR     R4,WRT.RP       ;WRITE THE MAINTENANCE REGISTER
141 022412  000024                        24
142 022414  022536                        CI7                     ;RETURN HERE ON ERROR
143 022416  000405                        BR      12$             ;EXIT
144
145 022420  010346         11$:   MOV     R3,-(SP)        ;LOAD THE COMMAND
146 022422  004437  024520                JSR     R4,WRT.RP
147 022426  000000                        0                       ;INDEX OF REG. TO WRITE
148 022430  022536                        CI7                     ;RETURN HERE ON ERROR
149 022432  004737  025550         12$:   JSR     PC,POPQUE       ;REMOVE REQ. FROM QUEUE
150 022436  052762  000200  000016        BIS     #BIT07,16(R2)   ;SET THE "DONE" BIT
151 022444  004737  024644                JSR     PC,SVRHXX       ;YES--GO SAVE THE REGISTERS
152 022450  000207         13$:   RTS     PC                      ;RETURN TO USER
153
154 022452  006301         CI5:   ASL     R1
155 022454  012761  001750  020356        MOV     #1000.,TIMER(R1)        ;SET A ONE SECOND TIMER
156 022462  006201                        ASR     R1
157 022464  112761  000001  020300        MOVB    #1,DRVACT(R1)   ;SET THE DRIVE ACTIVE
158 022472  000207                        RTS     PC              ;RETURN TO THE USER
159
160 022474  032762  100000  000000  CI6:  BIT     #BIT15,0(R2)    ;MAINTENANCE MODE ?
161 022502  001407                        BEQ     1$              ;BRANCH IF NOT
162 022504  005046                        CLR     -(SP)           ;
163 022506  052716  100000                BIS     #BIT15,(SP)     ;SET DMD BIT ONLY
164 022512  004437  024520                JSR     R4,WRT.RP       ;THE REST BITS MUST BE 0
165 022516  000024                        24
166 022520  022536                        CI7                     ;RETURN HERE ON ERROR
167 022522  010346          1$:   MOV     R3,-(SP)        ;LOAD THE COMMAND
168 022524  004437  024520                JSR     R4,WRT.RP
169 022530  000000                        0                       ;INDEX OF REG. TO WRITE
170 022532  022536                        CI7                     ;RETURN HERE ON ERROR
171 022534  000746                        BR      CI5
```

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                                CI7:
022536                  1$:     TST     R2              ;ANYTHING IN QUEUE ?
022536  005702                  BNE     2$              ;BRANCH IF QUEUE IS THERE
022540  001001                  RTS     PC              ;OTHERWISE EXIT
022542  000207          2$:     MOV     #BIT15!BIT11,16(R2)     ;SET "PARITY" ERROR INDICATOR
022544  012762  104000  000016
                        CI7B:   MOV     #111,-(SP)      ;DO A "DRIVE CLEAR"
022552  012746  000111          JSR     R4,WRT.RP
022556  004437  024520          0
022562  000000                  CI8                     ;RETURN HERE ON ERROR
022564  022624          2$:     JSR     PC,EMPTYQ       ;EMPTY THE QUEUE
022566  004737  025432          CLRB    DPRQS(R1)       ;CLEAR THE PORT REQUEST FLAG
022572  105061  020340          CLRB    DRVACT(R1)      ;DRIVE IS IDLE
022576  105061  020300          CMP     R2,TRNSWT       ;IF THIS DRIVE HAD AN I/O REQUEST
022602  020237  020350          BNE     1$              ;IN PROGRESS CLEAR ALL OF THE FLAGS
022606  001005                  CLR     TRNSWT
022610  005037  020350          MOV     #-1,DTUW
022614  012737  177777  020376  1$:     RTS     PC
022622  000207
                        CI8:    JSR     PC,SAVREG       ;SAVE R0 - R5
022624  004737  010750          CLR     R1
022630  005001                  CLR     R3
022632  005003          1$:     TSTB    DRVACT(R1)      ;DRIVE ACTIVE?
022634  105761  020300          BNE     22$             ;BRANCH IF IN ACTIVE
022640  001003                  TSTB    DPRQS(R1)       ;PORT REQUEST
022642  105761  020340          BEQ     5$              ;BRANCH IF NOT
022646  001443          22$:    MOV     TRNSWT,R2       ;GET THE "TRANSFER WAIT" QUEUE
022650  013702  020350          CMP     R1,DTUW         ;DID THIS DRIVE HAVE AN I/O IN PROGRESS?
022654  020137  020376          BEQ     2$              ;BRANCH IF YES
022660  001402                  JSR     PC,GETREQ       ;GET THE DPB POINTER
022662  004737  025526  2$:     TST     R2              ;QUEUE ENTRY FOR DRIVE ?
022666  005702                  BEQ     4$              ;BR IF NOT
022670  001413                  BIT     #BIT12,@RPCS2   ;'NED' SET ?
022672  032777  010000  160000  BEQ     3$              ;BR IF NOT
022700  001404                  MOV     #BIT15!BIT01,16(R2)  ;SET 'DRIVE NON-EXISTENT' INDICATOR
022702  012762  100002  000016  BR      4$              ;CONTINUE
022710  000403

022712  012762  102000  000016  3$:     MOV     #BIT15!BIT10,16(R2) ;SET "NON-CLEARABLE PARITY" ERROR INDICATOR
022720  012763  177777  020356  4$:     MOV     #-1,TIMER(R3)   ;STOP THE TIMER
022726  105061  020300          CLRB    DRVACT(R1)      ;SET "DRIVE ACTIVE" TO IDLE
022732  105061  020340          CLRB    DPRQS(R1)       ;CLEAR PORT REQUEST FLAG
022736  020137  020376          CMP     R1,DTUW         ;IS THIS DRIVE SETUP FOR A TRANSFER
022742  001005                  BNE     5$              ;BR IF NOT
022744  012737  177777  020376  MOV     #-1,DTUW        ;RESET THE INDICATOR
022752  005037  020350          CLR     TRNSWT          ;CLEAR THE TRANSFER QUEUE
022756  005201          5$:     INC     R1              ;MOVE TO THE NEXT DRIVE
022760  062703  000002          ADD     #2,R3
022764  042701  177770          BIC     #^C7,R1
022770  001321                  BNE     1$              ;BRANCH IF MORE DRIVES
022772  012737  177777  020376  MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
023000  005037  020350          CLR     TRNSWT          ;CLEAR THE 'TRANSFER WAIT' QUEUE
023004  004737  025350          JSR     PC,CLRQUE       ;CLEAR ALL OF THE REQUEST QUEUES
023010  012777  000040  157662  MOV     #CLR,@RPCS2     ;DO A MASSBUS INIT.
023016  000406                  BR      7$              ;CONTINUE

023020  004737  025432  6$:     JSR     PC,EMPTYQ       ;CLEAR THE DRIVE'S QUEUE
023024  105061  020310          CLRB    DRVSTA(R1)      ;SET DRIVE TO OFFLINE
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    229 023030  105061  020320                  CLRB    DRVTYP(R1)      ;CLEAR THE DRIVE TYPE INDICATOR
    230 023034  004737  025004          78:     JSR     PC,SET.IE       ;SET "IE' WITHOUT  TRE'
    231 023040  004737  011002                  JSR     PC,RESREG       ;RESTORE R0   R5
    232 023044  000207                          RTS     PC              ;RETURN
```

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 1
 2                                      ;INTERRUPT SERVICE ROUTINE
 3
 5 023046  112737  000001  020354  ISRV:   MOVB    #1,ACTDRV       ;SET "ACTIVE DRIVER" FLAG
 6 023054  005237  002246          ISRCNT: INC     ISRCNT          ;COUNT INTERRUPTS
 7 023060  004737  010750          SAVREG: JSR     PC,SAVREG       ;SAVE R0   R5
 8 023064  013701  020376          DTUW:   MOV     DTUW,R1         ;GET "DATA TRANSFER UNDERWAY" INDICATOR
 9 023070  002403                  1$:     BLT     1$              ;BRANCH IF NO DATA TRANSFER UNDERWAY
10 023072  004737  023116          TD:     JSR     PC,TD           ;CALL TRANSFER DONE
11 023076  000402                  2$:     BR      2$              ;EXIT
12 023100  004737  023304          SC:     JSR     PC,SC           ;CALL SPECIAL CONDITIONS
13 023104  004737  011002          RESREG: JSR     PC,RESREG       ;RESTORE R0   R5
14 023110  105037  020354          ACTDRV: CLRB    ACTDRV          ;CLEAR "ACTIVE DRIVER" FLAG
15 023114                          L10012:
   023114  000002                          RTI
16
17                                      ;TRANSFER DONE ROUTINE
18
19 023116  105061  020300          TD:     CLRB    DRVACT(R1)      ;SET DRIVE ACTIVE INDICATOR TO IDLE
20 023122  012737  177777  020376          MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
21 023130  006301                          ASL     R1
22 023132  012761  177777  020356          MOV     #-1,TIMER(R1)   ;CANCEL TIMEOUT
23 023140  006201                          ASR     R1
24 023142  013702  020350          TRNSWT: MOV     TRNSWT,R2       ;GET "DPB" ADDRESS FROM THE
25 023146  005037  020350                  CLR     TRNSWT          ;TRANSFER WAIT QUEUE  CLEAR QUEUE
26 023152  052762  000200  000016          BIS     #BIT07,16(R2)   ;SET DONE
27 023160  010177  157514                  MOV     R1,@RPCS2       ;SELECT THE DRIVE
28 023164  004437  024426                  JSR     R4,RD.RP        ;TRANSFER ERROR(TRE=1)?
29 023170  000000                          0
30 023172  022536                          CI7                     ;RETURN HERE ON ERROR
31 023174  006126                          ROL     (SP)+
32 023176  100424                          BMI     3$              ;BR IF YES
33 023200  004737  024644                  JSR     PC,SVRHXX       ;YES--SAVE THE REGISTERS
34 023204  122762  000135  000002          CMPB    #135,2(R2)      ;IE FROM DIAGNOSTIC COMMAND ?
35 023212  001003                          BNE     1$              ;BRANCH IF NOT
36 023214  116177  002744  157464          MOVB    ATABIT(R1),@RPAS        ;RESET THE ATA BIT
37 023222  004737  025526          1$:     JSR     PC,GETREQ       ;GET DPB POINTER
38 023226  005702                          TST     R2              ;ENTRY FOR DRIVE ?
39 023230  001403                          BEQ     2$              ;BR IF NOT
40 023232  004737  021364                  JSR     PC,OPT          ;CALL OPTIMIZER
41 023236  000422                          BR      SC              ;CHECK OTHER DRIVES
42
43 023240  012777  000113  157422  2$:     MOV     #113,@RPCS1     ;RELEASE THE DRIVE
44 023246  000416                          BR      SC              ;CHECK FOR OTHER DRIVES
45 023250  052762  100100  000016  3$:     BIS     #BIT15!BIT06,16(R2) ;SET DATA ERROR FLAG
46 023256  004737  025432                  JSR     PC,EMPTYQ       ;EMPTY THE "DRIVE'S WAIT" QUEUE
47 023262  004737  024644                  JSR     PC,SVRHXX       ;SAVE THE RHXX/RP07 REGISTERS
48 023266  012777  040111  157374          MOV     #40111,@RPCS1   ;ISSUE A "DRIVE CLEAR"
49 023274  012777  000113  157366          MOV     #113,@RPCS1     ;ISSUE A RELEASE TO THE DRIVE
50 023302  000400                          BR      SC              ;CHECK FOR OTHER DRIVES
51
52                                      ;SPECIAL CONDITION ROUTINE
53
54 023304  117703  157376          SC:     MOVB    @RPAS,R3        ;READ "RPAS"
55 023310  001014                          BNE     2$              ;BRANCH IF ANY 'ATA' BITS SET
56 023312  004437  024426                  JSR     R4,RD.RP        ;READ CONTROL AND STATUS REGISTER
57 023316  000000                          0
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 58 023320  022624                        CIB                     ;RETURN H R  ON ERROR
 59 023322  106126                        ROLB    (SP)+           ;IS "IE"=1?
 60 023324  100405                        BMI     1$              ;YES, NO DRIVES TO CHECK
 61 023326  000240                        NOP
 62 023330  000240                        NOP
 63 023332  000240                        NOP
 64 023334  004737  025004                JSR     PC,SET.IE       ;SET INTERRUPT ENABLE
 65 023340  000207              1$:       RTS     PC              ;RETURN
 66 023342  005046              2$:       CLR      (SP)           ;PROCESS ALL DRIVES THAT HAVE
 67 023344  110316                        MOVB    R3,(SP)         ;AN "ATA"=1
 68 023346  012703  000001                MOV     #1,R3
 69 023352  005001                        CLR     R1
 70 023354  030316              SC3:      BIT     R3,(SP)         ;ATA=1?
 71 023356  001005                        BNE     SC5             ;YES -BRANCH
 72 023360  005201              SC4:      INC     R1              ;MOVE TO THE NEXT DRIVE
 73 023362  106303                        ASLB    R3
 74 023364  001373                        BNE     SC3             ;BRANCH IF MORE TO CHECK?
 75 023366  005726                        TST     (SP)+           ;CLEAN OFF THE STACK
 76 023370  000207                        RTS     PC              ;RETURN TO USER
 77 023372                      SC5:
 78 023372  105761  020340      1$:       TSTB    DPRQS(R1)       ;PORT REQUEST OUTSTANDING ?
 79 023376  001402                        BEQ     2$              ;BR IF NOT
 80 023400  000137  023766                JMP     SC13            ;START THE OUTSTANDING COMMAND
 81 023404  105761  020310      2$:       TSTB    DRVSTA(R1)      ;CHECK THE DRIVE STATUS
 82 023410  003011                        BGT     5$              ;BRANCH IF ONLINE
 83 023412  004737  025526                JSR     PC,GETREQ       ;GET DPB POINTER
 84 023416  004737  024644                JSR     PC,SVRHXX       ;SAVE THE RHXX/RP07 REGISTERS
 85 023422  004737  023702                JSR     PC,SC12         ;SAVE RPDS, RPER1, RPER3, AND RPER2
 86                                                              ;ALSO DO A DRIVE INIT (DRVINT)
 87 023426  105761  020310                TSTB    DRVSTA(R1)      ;DID DRIVE COME ONLINE?
 88 023432  003405                        BLE     6$              ;NO---BRANCH
 89 023434  105761  020300      5$:       TSTB    DRVACT(R1)      ;DRIVE ACTIVE WITH COMMAND OR ERROR RECOVERY ?
 90 023440  001035                        BNE     SC6             ;BR IF EITHER
 91 023442  004737  023702                JSR     PC,SC12         ;SAVE RPDS, RPER1, RPER3, AND RPER2
 92                                                              ;ALSO DO A DRVINT
 93 023446  105761  020310      6$:       TSTB    DRVSTA(R1)      ;CHECK ON DRIVE'S STATUS
 94 023452  100421                        BMI     7$              ;BR IF UNSAFE
 95 023454  006301                        ASL     R1
 96 023456  006301                        ASL     R1
 97 023460  006301                        ASL     R1
 98 023462  016105  020204                MOV     RPSTU0+4(R1),R5
 99 023466  006201                        ASR     R1
100 023470  006201                        ASR     R1
101 023472  006201                        ASR     R1
102 023474  032705  020000                BIT     #BIT13,R5       ;ADDRESS PLUG CHANGED
103 023500  001012                        BNE     8$              ;BRANCH IF SO
104 023502  012746  000111                MOV     #111,-(SP)      ;DRIVE CLEAR
105 023506  004437  024520                JSR     R4,WRT.RP       ;WRITE THE COMMAND INTO RPCS1
106 023512  000000                        0                       ;REGISTER INDEX
107 023514  023562                        SC8                     ;PARITY EXIT ADDRESS
108 023516  011605              7$:       MOV     (SP),R5         ;PICKUP (RPAS) BEFORE THE ERROR CALL
109 023520  000240                        NOP
110 023522  000240                        NOP
111 023524  000715                        BR      SC4             ;GO CHECK FOR MORE ATA'S
112
113 023526  000240              8$:       NOP
114 023530  000240                        NOP
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115 023532  000712                          BR      SC4             ;CHECK FOR MORE DRIVES
116
117 023534  006301                  SC6:    ASL     R1              ;SETUP TO ADDRESS WORDS
118 023536  012761  177777  020356          MOV     #1,TIMER(R1)    ;STOP THE TIMER
119 023544  006201                          ASR     R1              ;RESTORE THE DRIVE ADDRESS
120 023546  004737  025526                  JSR     PC,GETREQ       ;GET THE DPB POINTER FROM THE QUEUE
121 023552  010177  157122                  MOV     R1,@RPCS2       ;SELECT DRIVE
122 023556  000137  023612                  JMP     SC11            ;PROCESS THE SEARCH
123 023562  105761  020300          SC8:    TSTB    DRVACT(R1)      ;IS DRIVE IDLE?
124 023566  001405                          BEQ     1$              ;YES--BRANCH
125 023570  004737  025526                  JSR     PC,GETREQ       ;GET DPB POINTER
126 023574  004737  022536                  JSR     PC,CI7          ;PROCESS THE PARITY ERROR
127 023600  000402                          BR      2$              ;CONTINUE
128
129 023602  004737  022552          1$:     JSR     PC,CI7B         ;PROCESS THE UNCORRECTABLE PARITY ERROR
130 023606  000137  023360          2$:     JMP     SC4             ;CHECK MORE DRIVES
131
132 023612                          SC11:
133 023612  105061  020300          1$:     CLRB    DRVACT(R1)      ;SET DRIVE IDLE
134 023616  136137  002744  020352          BITB    ATABIT(R1),SRCHWT  ;DOING A SEARCH OPERATION FOR
135                                                                 ;AN I/O COMMAND?
136 023624  001007                          BNE     2$              ;BRANCH IF YES
137 023626  004737  025550                  JSR     PC,POPQUE       ;REMOVE REQUEST FROM QUEUE
138 023632  052762  000200  000016          BIS     #BIT07,16(R2)   ;SET "DONE" BIT
139 023640  004737  024644                  JSR     PC,SVRHXX       ;YES--SAVE ALL OF THE RHXX/RP07 REG'S
140 023644  116177  002744  157034  2$:     MOVB    ATABIT(R1),@RPAS  ;CLEAR ATTENTION BIT
141 023652  146137  002744  020352          BICB    ATABIT(R1),SRCHWT       ;CLEAR IMPLIED SEEK SET
142 023660  006301                          ASL     R1              ;WORD INDEX
143 023662  012761  177777  020356          MOV     #-1,TIMER(R1)   ;STOP CLOCK
144 023670  006201                          ASR     R1              ;RESTORE R1
145 023672  004737  021364                  JSR     PC,OPT          ;START A REQUEST
146 023676  000137  023360                  JMP     SC4             ;CHECK FOR MORE DRIVES
147
148 023702  010177  156772          SC12:   MOV     R1,@RPCS2       ;SELECT DRIVE
149 023706  006301                          ASL     R1
150 023710  006301                          ASL     R1
151 023712  006301                          ASL     R1
152 023714  017761  156762  020200          MOV     @RPDS,RPSTUO(R1)
153 023722  017761  156756  020202          MOV     @RPER1,RPSTUO+2(R1)
154 023730  017761  156774  020204          MOV     @RPER2,RPSTUO+4(R1)
155 023736  017761  156770  020206          MOV     @RPER3,RPSTUO+6(R1)
156 023744  006201                          ASR     R1
157 023746  006201                          ASR     R1
158 023750  006201                          ASR     R1
159 023752  004437  020566                  JSR     R4,DRVINT       ;INIT. THE STATE OF THE DRIVE
160 023756  000401                          BR      1$              ;TAKE ERROR EXIT
161 023760  000207                          RTS     PC              ;RETURN
162
163 023762  005726                  1$:     TST     (SP)+           ;CLEAR THE STACK
164 023764  000676                          BR      SC8             ;PROCESS THE PARITY ERROR
165
166 023766                          SC13:;  ASL     R1              ;SETUP TO ADDRESS WORDS
167                                 ;       MOV     #-1,TIMER(R1)   ;STOP THE TIMER
168                                 ;       ASR     R1              ;
169 023766  010177  156706                  MOV     R1,@RPCS2       ;SELECT THE DRIVE
170 023772  116177  002744  156706          MOVB    ATABIT(R1),@RPAS  ;CLEAR THE ATTENTION BIT
171 024000  105761  020330          1$:     TSTB    DPINT(R1)       ;INITIALIZING THE DRIVE ?
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```
                                        BEQ     2$              ;BR IF NOT
                                        CLRB    DPINT(R1)       ;CLEAR THE INIT INDICATOR
                                        JSR     R4,DRVINT       ;GO INIT THE DRIVE
                                        NOP                     ;DUMMY PARITY ERROR RETURN
                                        TSTB    DRVSTA(R1)      ;DRIVE ONLINE ?
                                        BGT     2$              ;BR IF YES  - START ORDER
                                        TST     R2              ;QUEUE ENTRY FOR THE DRIVE
                                        BEQ     3$              ;BR IF NOT
                                        JSR     PC,GETREQ       ;GET DPB ADDRESS
                                        BIS     #BIT15!BIT14,16(R2)  ;INFORP USER THAT DRIVE OFFLINE
                                        JSR     PC,SVRHXX       ;SAVE THE REGISTERS
                                        JSR     PC,POPQUE       ;REMOVE THE QUEUE
                                        BR      3$

                                2$:     BIT     #BIT8,@RPDS     ;DVA SET ?
                                        BNE     4$              ;SET THEN CALL OPT
                                ;       ASL     R1
                                ;       MOV     #60000.,TIMER(R1);SET A 60. SECOND TIMER
                                ;       ASR     R1
                                        JSR     PC,SET.IE
                                        BR      3$

                                4$:     JSR     PC,OPT          ;START THE PENDING REQUEST
                                3$:     JMP     SC4             ;PROCESS OTHER DRIVES

                                ;/RP07 TIMER ROUTINE
                                ;CALL
                                ;       MOV     #TIME,-(SP)     ;ELASPED TIME IN MILLISECONDS ON THE STACK
                                ;       JSR     PC,RPTMR        ;CALL RP07 TIME ROUTINE

                                RPTMR:  TST     ACTDRV          ;CHECK "ACTDRV & ACTSTR"
                                        BNE     4$              ;IF NON ZERO EXIT
                                        MOVB    #1,ACTSTR       ;SET "ACTSTR"
                                        JSR     PC,SAVREG       ;SAVE R0 - R5
                                        CLR     R1              ;START WITH DRIVE 0
                                        CLR     R3
                                1$:     TST     TIMER(R3)       ;IS THE TIMER RUNNING?
                                        BLT     2$              ;BRANCH IF NO
                                        SUB     2(SP),TIMER(R3) ;COUNT THE INTERVAL
                                        BGT     2$              ;BR IF NO SOFTWARE TIMEOUT
                                        JSR     PC,STO          ;CALL SOFTWARE TIMEOUT ROUTINE
                                2$:     INC     R1              ;MOVE TO NEXT DRIVE
                                        TST     (R3)+
                                        CMP     #8.,R1          ;OUT OF DRIVES?
                                        BGT     1$              ;BRANCH IF NO
                                3$:     JSR     PC,RESREG       ;RESTORE R0 - R5
                                        CLRB    ACTSTR          ;ZERO ACTIVE SOFTWARE TIMEOUT ROUTINE FLAG
                                4$:     MOV     (SP)+,(SP)      ;ADJUST THE STACK
                                        RTS     PC              ;RETURN

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

```
                                ;       JSR     PC,STO          ;CALL
                                ;       RETURN
                                
024200  010146                  STO:    MOV     R1, (SP)        ;SAVE R1 R4
024202  010246                          MOV     R2,-(SP)        ;
024204  010346                          MOV     R3,-(SP)        ;
024206  010446                          MOV     R4, (SP)        ;
024210  013702  020350                  MOV     TRNSWT,R2       ;PICKUP THE TRANSFER QUEUE
024214  020137  020376                  CMP     R1,DTUW         ;TRANSFER UNDER WAY ON THIS DRIVE
024220  001421                          BEQ     1$              ;BRANCH IF SO
024222  105761  020330                  TSTB    DPINT(R1)       ;DRIVE INITIALIZE ?
024226  001033                          BNE     2$              ;BRANCH IF SO
024230  105761  020340                  TSTB    DPRQS(R1)       ;PROT REQUEST ?
024234  001047                          BNE     3$              ;BRANCH IF SO
024236  012763  177777  020356          MOV     #-1,TIMER(R3)   ;STOP THE TIMER
024244  004737  025526                  JSR     PC,GETREQ       ;GET THE QUEUE
024250  005702                          TST     R2              ;EXIT IF NONE
024252  001460                          BEQ     5$              ;
024254  052762  101000  000016          BIS     #BIT15!BIT9,16(R2)      ;TIME OUT OR LOST INTERRUPT
                                                                ;ON HOUSE KEEPING COMMANDS
024262  000454                          BR      5$              ;EXIT
024264  052762  101000  000016  1$:     BIS     #BIT15!BIT9,16(R2)      ;TIME OUT ON DATA TRANSFER
024272  004737  024644                  JSR     PC,SVRHXX       ;READ ALL REGISTERS
024276  105061  020300                  CLRB    DRVACT(R1)      ;DRRIVE SET TO IDLE
024302  005037  020350                  CLR     TRNSWT          ;CLEAR DATA TRANSFER QUEUE
024306  012737  177777  020376          MOV     #-1,DTUW        ;CLEAR THE TRANSFER DRIVE #
024314  000437                          BR      5$              ;EXIT
024316  105061  020330          2$:     CLRB    DPINT(R1)       ;CLEAR THE INITIALIZE INDICATOR
024322  105061  020310                  CLRB    DRVSTA(R1)      ;SET UNIT TO OFFLINE
024326  012763  177777  020356          MOV     #-1,TIMER(R3)   ;STOP THE TIMER
024334  004737  025526                  JSR     PC,GETREQ       ;GET THE DPB ADDRESS
024340  005702                          TST     R2              ;ANYTHING IN QUEUE
024342  001424                          BEQ     5$              ;BRANCH IF NOT
024344  052762  140000  000016          BIS     #BIT15!BIT14,16(R2) ;INFORM THE USER DRIVE NOT AVAILABLE
024352  000420                          BR      5$              ;FINISH
024354  012763  177777  020356  3$:     MOV     #-1,TIMER(R3)   ;STOP THE TIMER
024362  105061  020340                  CLRB    DPRQS(R1)       ;CLEAR THE PORT REQUEST INDICATOR
024366  004737  025526                  JSR     PC,GETREQ       ;GET DPB ADDRESS
024372  005702                          TST     R2              ;ANYTHING IN QUEUE ?
024374  001407                          BEQ     5$              ;BRANCH IF NONE
024376  012762  100004  000016          MOV     #BIT15!BIT2,16(R2) ;INFORM USER OF PROT REQUEST TIMEOUT
024404  004737  024644          4$:     JSR     PC,SVRHXX       ;READ ALL REGISTERS
024410  004737  025432                  JSR     PC,EMPTYQ       ;CANCEL ALL QUEUE REQ
024414  012604                  5$:     MOV     (SP)+,R4        ;RESTORE R4-R1
024416  012603                          MOV     (SP)+,R3
024420  012602                          MOV     (SP)+,R2
024422  012601                          MOV     (SP)+,R1
024424  000207                          RTS     PC              ;EXIT

                                ;ROUTINE TO READ A RHXX/RP07 REGISTER
                                ;
                                ;CALL
                                ;       JSR     R4,RD.RP        ;GO READ A REGISTER
                                ;       INDEX                   ;REG. INDEX FROM BASE
                                ;       ERRADR                  ;ERROR ADDRESS--PROCESS ERROR STARTING
                                ;                               ;AT THIS ADDRESS
                                ;       RETURN                  ;CONTENTS OF REG. IS ON THE STACK
```

```
                                        ;
024426                                  RD.RP:
024426  011646                                  MOV     (SP),-(SP)      ;SAVE R4
024430  013746  002670                          MOV     RPCS1,-(SP)     ;ADDRESS OF THE
024434  062416                                  ADD     (R4)+,(SP)      ;REG
024436  017666  000000  000004                  MOV     @(SP),4(SP)     ;READ THE CONTENTS OF THE REG
024444  013716  002670                          MOV     RPCS1,(SP)      ;CHECK IF NON-EXIST DRIVE
024450  062716  000010                          ADD     #10,(SP)        ;
024454  032776  010000  000000                  BIT     #BIT12,@(SP)    ;NED BIT SET ?
024462  001004                                  BNE     1$              ;ERROR EXIT
024464  032777  020000  156176                  BIT     #BIT13,@RPCS1   ;MCPE SET ?
024472  001406                                  BEQ     2$              ;EXIT
024474  016666  000002  000004  1$:             MOV     2(SP),4(SP)     ;MOVE THE R4 TO TOP OF STACK
024502  022626                                  CMP     (SP)+,(SP)+     ;CLEAR OFF THE STACK
024504  011404                                  MOV     (R4),R4 ;ERROR EXIT ADDRESS
024506  000403                                  BR      3$              ;EXIT
024510  062704  000002          2$:             ADD     #2,R4           ;NORMAL EXIT
024514  005726                                  TST     (SP)+           ;CLEAR OFF STACK
024516  000204                  3$:             RTS     R4              ;EXIT
                                        ;
                                        ;ROUTINE TO WRITE A REGISTER
                                        ;
                                        ;CALL
                                        ;       MOV     DATA, (SP)      ;DATA TO BE LOADED ON THE STACK
                                        ;       JSR     R4,WRT.RP       ;CALL THE ROUTINE TO LOAD(WRITE) THE REG.
                                        ;       INDEX                   ;INDEX OF THE REGISTER TO BE LOADED
                                        ;       ERRADR                  ;ADDRESS TO RETURN TO ON AN ERROR
                                        ;       RETURN                  ;ERROR FREE RETURN
                                        ;
024520                                  WRT.RP:
024520  012446                                  MOV     (R4)+,-(SP)     ;FORMING THE REG ADDRESS
024522  001014                                  BNE     1$              ;BRANCH IF NOT RPCS1
024524  122766  000150  000004                  CMPB    #150,4(SP)      ;DATA XTRNS COMMAND ?
024532  002410                                  BLT     1$              ;BRANCH IF NOT
024534  017746  156130                          MOV     @RPCS1,-(SP)    ;READ RPCS1
024540  000316                                  SWAB    (SP)            ;MERG THE A17,A18,PSEL BITS
024542  042716  177770                          BIC     #^C7,(SP)       ;CHOP OFF THE REST BITS FROM RPCS1
024546  111666  000007                          MOVB    (SP),7(SP)      ;ATTACH A17,A18,PSEL TO COMMAND
024552  005726                                  TST     (SP)+           ;RESTORE STACK LEVEL
024554  063716  002670          1$:             ADD     RPCS1,(SP)      ;THE DEST REG ADDRESS
024560  016676  000004  000000                  MOV     4(SP),@(SP)     ;WRITE THE REGISTER
024566  013716  002670                          MOV     RPCS1,(SP)      ;CHECK NED,PAR BITS
024572  062716  000010                          ADD     #10,(SP)        ;
024576  032776  010000  000000                  BIT     #BIT12,@(SP)    ;NONE EXIST DRIVE ?
024604  001013                                  BNE     2$              ;BRANCH IF IT IS
024606  013716  002670                          MOV     RPCS1,(SP)      ;ADDRESS RPER1
024612  062716  000014                          ADD     #14,(SP)        ;
024616  032776  000010  000000                  BIT     #BIT3,@(SP)     ;PAR SET ?
024624  001003                                  BNE     2$              ;BRANCH IF SO
024626  062704  000002                          ADD     #2,R4           ;NORMAL RETURN
024632  000401                                  BR      3$              ;EXIT
024634  011404                  2$:             MOV     (R4),R4         ;ERROR EXIT
024636  005726                  3$:             TST     (SP)+           ;CLEAR OFF THE STACK
024640  012616                                  MOV     (SP)+,(SP)      ;MOVE R4 TO TOP OF STACK
024642  000204                                  RTS     R4              ;EXIT
                                        ;ROUTINE TO SAVE THE RHXX/RP07 REGISTERS AS PER DPB+14
```

```
                                        ;
                                        ;CALL
                                        ;       MOV     #DPBNUM,R2      ;DPB POINTER TO R2
                                        ;       JSR     PC,SVRHXX       ;SAVE THE DRIVES REG'S (RHXX= RH11 JR RH70)
                                        SVRHXX:
024644  004737  010750                          JSR     PC,SAVREG       ;;SAVE R0 R5
024650  005702                                  TST     R2              ;QUEUE ENTRY FOR THE DRIVE ?
024652  001451                                  BEQ     7$              ;BR IF NONE
024654  111277  156020                          MOVB    (R2),@RPCS2     ;SELECT DRIVE
024660  016203  000014                          MOV     14(R2),R3       ;GET THE ERROR TABLE POINTER
024664  001444                                  BEQ     7$              ;EXIT IF NO ADDRESS
024666  005037  024722                          CLR     3$              ;COUNTER & POINTER
024672  023727  024722  000022        1$:       CMP     3$,#22          ;REACHED THE BUFFER REGISTER ?
024700  001006                                  BNE     2$              ;BR IF NOT
024702  032777  000200  155770                  BIT     #BIT07,@RPCS2   ;'OR' SET ?
024710  001002                                  BNE     2$              ;BR IF SET
024712  005023                                  CLR     (R3)+           ;STORE RPDB AS ZEROES
024714  000405                                  BR      4$              ;CONTINUE

024716  004437  024426                2$:       JSR     R4,RD.RP        ;READ THE SELECTED REGISTER
024722  000000                      3$:       .WORD   0               ;REGISTER INDEX
024724  024750                              5$                      ;ERROR RETURN ADDRESS
024726  012623                              MOV     (SP)+,(R3)+     ;STORE THE REGISTER CONTENTS
024730  023727  024722  000046        4$:       CMP     3$,#46          ;REACHED THE END ?
024736  001406                                  BEQ     6$              ;BR IF YES
024740  062737  000002  024722                  ADD     #2,3$           ;INCREMENT THE REGISTER INDEX
024746  000751                                  BR      1$              ;CONTINUE READING THE REGISTERS

024750  004737  022536                5$:       JSR     PC,CI7          ;PROCESS THE UNCORRECTABLE PARITY ERROR
024754  005737  002662                6$:       TST     RHTYPE          ;IS IT RH70 ?
024760  001406                                  BEQ     7$              ;IF EQ, NO
024762  013704  002652                          MOV     RPADR,R4        ;GET RPCS1 BASE ADDRESS
024766  063704  002660                          ADD     RHEXT,R4        ;POINT TO RPBAE
024772  012423                                  MOV     (R4)+,(R3)+     ;STORE THE CONTENTS
024774  011413                                  MOV     (R4),(R3)       ;GET RPCS3
024776                              7$:
024776  004737  011002                          JSR     PC,RESREG       ;;RESTORE R0-R5
025002  000207                                  RTS     PC              ;RETURN

                                        ;ROUTINE TO SET THE INTERRUPT WITHOUT GETTING A "TRE"
                                        ;CALL
                                        ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
                                        ;       JSR     PC,SET.IE       ;SET "IE"
                                        ;       RETURN

025004  010446                          SET.IE: MOV     R4,-(SP)        ;SAVE R4
025006  013704  002670                          MOV     RPCS1,R4        ;PICKUP ADR OF RPCS1
025012  010177  155662                          MOV     R1,@RPCS2       ;SELECT DRIVE
025016  011446                                  MOV     (R4),-(SP)      ;READ RPCS1
025020  052716  040000                          BIS     #BIT14,(SP)     ;SET THE "TRE" BIT OF THE WORD READ
025024  000316                                  SWAB    (SP)            ;ADJUST FOR DATO
025026  112714  000100                          MOVB    #BIT06,(R4)     ;SET "IE"
025032  032777  010000  155640                  BIT     #BIT12,@RPCS2 ;IS "NED"=1?
025040  001002                                  BNE     1$              ;YES--CLEAR "TRE"
025042  005726                                  TST     (SP)+           ;CLEAN OFF THE STACK
025044  000402                                  BR      2$
```

```
398 025046  112664  000001          1$:     MOVB    (SP)+,1(R4)     ;CLEAR "TRE '
399 025052  012604                  2$:     MOV     (SP)+,R4        ;RESTORE R4
400 025054  000207                          RTS     PC              ;RETURN TO CALLER
```

```
 1
 2                                  ;QUEUE COUNT
 3 025056      000                  QCNT:    .BYTE   0              ;DRIVE 0
 4 025057      000                           .BYTE   0              ;DRIVE 1
 5 025060      000                           .BYTE   0              ;DRIVE 2
 6 025061      000                           .BYTE   0              ;DRIVE 3
 7 025062      000                           .BYTE   0              ;DRIVE 4
 8 025063      000                           .BYTE   0              ;DRIVE 5
 9 025064      000                           .BYTE   0              ;DRIVE 6
10 025065      000                           .BYTE   0              ;DRIVE 7
11
12                                  ;QUEUE INPUT POINTERS
13
14 025066  025150                  QINPT:   .WORD   QDRV0          ;DRIVE 0
15 025070  025170                           .WORD   QDRV1          ;DRIVE 1
16 025072  025210                           .WORD   QDRV2          ;DRIVE 2
17 025074  025230                           .WORD   QDRV3          ;DRIVE 3
18 025076  025250                           .WORD   QDRV4          ;DRIVE 4
19 025100  025270                           .WORD   QDRV5          ;DRIVE 5
20 025102  025310                           .WORD   QDRV6          ;DRIVE 6
21 025104  025330                           .WORD   QDRV7          ;DRIVE 7
22
23                                  ;QUEUE OUTPUT POINTERS
24
25 025106  025150                  QOUTPT:  .WORD   QDRV0          ;DRIVE 0
26 025110  025170                           .WORD   QDRV1          ;DRIVE 1
27 025112  025210                           .WORD   QDRV2          ;DRIVE 2
28 025114  025230                           .WORD   QDRV3          ;DRIVE 3
29 025116  025250                           .WORD   QDRV4          ;DRIVE 4
30 025120  025270                           .WORD   QDRV5          ;DRIVE 5
31 025122  025310                           .WORD   QDRV6          ;DRIVE 6
32 025124  025330                           .WORD   QDRV7          ;DRIVE 7
33
34 025126  025150                  QSTART:  .WORD   QDRV0          ;DRIVE 0 START ADDRESS
35 025130  025170                  QSTOP:   .WORD   QDRV1          ;DRIVE 0 STOP ADDRESS & DRIVE 1 START ADDRESS
36 025132  025210                           .WORD   QDRV2          ;STOP DRIVE 1--START DRIVE 2
37 025134  025230                           .WORD   QDRV3          ;STOP DRIVE 2--START DRIVE 3
38 025136  025250                           .WORD   QDRV4          ;STOP DRIVE 3--START DRIVE 4
39 025140  025270                           .WORD   QDRV5          ;STOP DRIVE 4--START DRIVE 5
40 025142  025310                           .WORD   QDRV6          ;STOP DRIVE 5--START DRIVE 6
41 025144  025330                           .WORD   QDRV7          ;STOP DRIVE 6--START DRIVE 7
42 025146  025350                           .WORD   QTERP          ;STOP DRIVE 7
43
44                                  ;DRIVE REQUEST QUEUES
45
46 025150                           QDRV0:   .BLKW   10
47 025170                           QDRV1:   .BLKW   10
48 025210                           QDRV2:   .BLKW   10
49 025230                           QDRV3:   .BLKW   10
50 025250                           QDRV4:   .BLKW   10
51 025270                           QDRV5:   .BLKW   10
52 025310                           QDRV6:   .BLKW   10
53 025330                           QDRV7:   .BLKW   10
54         025350                   QTERP=.
```

```
 1
 2                                  ;ROUTINE TO CLEAR ALL OF THE REQUEST QUEUES
 3                                  ;
 4                                  ;CALL
 5                                  ;       JSR     PC,CLRQUE
 6
 7 025350  004737  010750           CLRQUE: JSR     PC,SAVREG       ;SAVE R0 - R5
 8 025354  012702  025056                   MOV     #QCNT,R2        ;ZERO THE QUEUE COUNTS
 9 025360  005022                           CLR     (R2)+           ;DRIVES 0 & 1
10 025362  005022                           CLR     (R2)+           ;DRIVES 2 & 3
11 025364  005022                           CLR     (R2)+           ;DRIVES 4 & 5
12 025366  005022                           CLR     (R2)+           ;DRIVES 6 & 7
13 025370  012703  000010                   MOV     #8.,R3          ;MOVE THE STARTING
14 025374  012701  025126                   MOV     #QSTART,R1      ;ADDRESS OF THE QUEUE INTO
15 025400  012122                  1$:      MOV     (R1)+,(R2)+     ;THE QUEUE INPUT POINTER
16 025402  005303                           DEC     R3
17 025404  001375                           BNE     1$
18 025406  012703  000010                   MOV     #8.,R3          ;MOVE THE STARTING ADDRESS
19 025412  012701  025126                   MOV     #QSTART,R1      ;OF THE QUEUE INTO THE
20 025416  012122                  2$:      MOV     (R1)+,(R2)+     ;QUEUE OUTPUT POINTER
21 025420  005303                           DEC     R3
22 025422  001375                           BNE     2$
23 025424  004737  011002                   JSR     PC,RESREG       ;RESTORE R0 - R5
24 025430  000207                           RTS     PC
25
26                                  ;EMPTY THE QUEUE SPECIFIED BY R1
27                                  ;
28                                  ;CALL
29                                  ;       MOV     DRVNUM,R1       ;DRIVE NUMBER TO R1
30                                  ;       JSR     PC,EMPTYQ
31
32 025432  105061  025056           EMPTYQ: CLRB    QCNT(R1)        ;CLEAR NUMBER OF ITEMS IN QUEUE
33 025436  006301                           ASL     R1
34 025440  016161  025066  025106           MOV     QINPT(R1),QOUTPT(R1) ;SET OUTPUT QUEUE POINTER=INPUT POINTER
35 025446  006201                           ASR     R1
36 025450  000207                           RTS     PC
37
                                    ;ROUTINE TO PUT A REQUEST IN QUEUE
3                                   ;
40                                  ;CALL
41                                  ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
42                                  ;       MOV     #DPB,R2         ;ADDRESS OF PARAMETER BLOCK
43                                  ;       JSR     R4,DRVQUE       ;GO PUT REQUEST IN QUEUE
44                                  ;       RETURN1                 ;RETURN HERE IF QUEUE IS FULL
45                                  ;       RETURN2                 ;RETURN HERE IF REQUEST IS IN QUEUE
46
47 025452  122761  000010  025056   DRVQUE: CMPB    #10,QCNT(R1)    ;IS QUEUE FULL?
48 025460  001421                           BEQ     2$              ;BR IF YES-TAKE RETURN1
49 025462  105261  025056                   INCB    QCNT(R1)        ;INCREMENT QUEUE COUNT
50 025466  006301                           ASL     R1
51 025470  010271  025066                   MOV     R2,@QINPT(R1)   ;PUT THIS REQUEST IN QUEUE
52 025474  062761  000002  025066           ADD     #2,QINPT(R1)    ;UPDATE THE QUEUE POINTER
53 025502  026161  025066  025130           CMP     QINPT(R1),QSTOP(R1) ;TIME TO RESET THE POINTER
54 025510  001003                           BNE     1$              ;BRANCH IF NO
55 025512  016161  025126  025066           MOV     QSTART(R1),QINPT(R1) ;YES--RESET POINTER
56 025520  006201                  1$:      ASR     R1
57 025522  005724                           TST     (R4)+           ;TAKE RETURN 2
```

```
      58 025524  000204                  2$:     RTS     R4              ;RETURN TO USER
      59
      60                                 ;ROUTINE TO GET THE "DPB" ADDRESS OF NEXT REQUEST IN QUEUE
      61                                 ;
      62                                 ;CALL
      63                                 ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
      64                                 ;       JSR     PC,GETREQ       ;GO GET THE REQUEST
      65                                 ;       RETURN                  ;R2="DPB" ADDRESS OF THE REQUEST
      66                                 ;                               ;R2=0 IF NO REQUEST IN QUEUE
      67
      68 025526  005002                  GETREQ: CLR     R2
      69 025530  105761  025056                  TSTB    QCNT(R1)        ;IS THERE ANY REQUEST IN QUEUE?
      70 025534  001404                          BEQ     2$              ;NO---BRANCH
      71 025536  006301                  1$:     ASL     R1
      72 025540  017102  025106                  MOV     @QOUTPT(R1),R2  ;PICKUP "DPB" POINTER FOR THIS DRIVE
      73 025544  006201                          ASR     R1
      74 025546  000207                  2$:     RTS     PC              ;RETURN TO USER
      75
      76                                 ;ROUTINE TO "POP" THE REQUEST FROM QUEUE
      77                                 ;
      78                                 ;CALL
      79                                 ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
      80                                 ;       JSR     PC,POPQUE       ;CALL TO REMOVE REQUEST
      81                                 ;       RETURN                  ;R2=ADDRESS OF DPB REMOVED
      82
      83 025550  105361  025056          POPQUE: DECB    QCNT(R1)        ;DECREMENT QUEUE COUNT
      84 025554  006301                          ASL     R1
      85 025556  017102  025106                  MOV     @QOUTPT(R1),R2  ;GET THE "DPB" POINTER
      86 025562  005071  025106                  CLR     @QOUTPT(R1)     ;REMOVE DPB ADDRESS FROM THE QUEUE
      87 025566  062761  000002  025106          ADD     #2,QOUTPT(R1)   ;UPDATE THE QUEUE POINTER
      88 025574  026161  025106  025130          CMP     QOUTPT(R1),QSTOP(R1) ;TIME TO RESET THE POINTER?
      89 025602  001003                          BNE     1$              ;NO--BRANCH TO EXIT
      90 025604  016161  025126  025106          MOV     QSTART(R1),QOUTPT(R1) ;YES -RESET THE POINTER
      91 025612  006201                  1$:     ASR     R1
      92 025614  000207                          RTS     PC              ;RETURN TO USER
      93
     102
     109
```

```
                                .SBTTL  REPORT CODING SECTION

                                ;++
                                ; THE REPORT CODING SECTION CONTAINS THE
                                ; "PRINTS" CALLS THAT GENERATE STATISTICAL REPORTS.
                                ;--

025616                          L$RPT::

                                        .WORD   J$JMP
025620  000000                          .WORD   L10013-2-.

                                        .EVEN

025622                          L10013:
025622  104425                          TRAP    C$RPT
```

```
                        .SBTTL  PROTECTION TABLE
                        ;++
                        ; THIS TABLE IS USED BY THE RUNTIME SERVICES
                        ; TO PROTECT THE LOAD MEDIA.
                        ; -

025624                  L$PROT::
025624  000000                    0               ;P TABLE OFFSET OF CSR
025626  177777                    -1              ;NOT A MASSBUS DEVICE
025630  000006                    6               ;P TABLE OFFSET DRIVE 0
```

```
                                .SBTTL  INITIALIZE SECTION
                                ;++
                                ; THE INITIALIZE SECTION CONTAINS THE CODING THAT IS PERFORMED
                                ; AT THE BEGINNING OF EACH PASS.
                                ;--

025632                          L$INIT::
                                                        ;RESET THE WORLD
025632  104433                  TRAP    C$RESET
025634  012737  015406  002262  MOV     #ABOPAS,BYPASS  ;ABORT PASS ON DEV FATAL ERROR DETECTED IN  ERRABO',
                                                        ;CALLED BY SFTW DRVRS
025642  012737  000001  002244  MOV     #1,ITCNT        ;RESET ITERATION COUNT
025650  005037  002246          CLR     ISRCNT          ;CLEAR INTERRUPT COUNTER
                                                        ;POWER UP SEQUENCE ?
025654  012700  000034          MOV     #EF.PWR,R0
025660  104447                  TRAP    C$REFG
                                                        ;GO TO 4$ IF YES
025662  103432                  BCS     4$
                                                        ;CONTINUE COMMAND ?
025664  012700  000036          MOV     #EF.CON,R0
025670  104447                  TRAP    C$REFG
                                                        ;GO TO 1$ IF NO
025672  103002                  BCC     1$
025674  000137  026276          JMP     CONTIN          ;GO TO 'CONTIN' IF YES
025700                  1$:             ;'STA', 'RES' OR 'NEW PASS' ?
025700  012700  000035          MOV     #EF.NEW,R0
025704  104447                  TRAP    C$REFG
                                                        ;GO TO 3$ IF NO, MUST BE NEW 'SUB-PASS'
025706  103016                  BCC     3$
                                                        ;CR LF
025710  012746  003064          MOV     #CRLF,-(SP)
025714  012746  000001          MOV     #1,-(SP)
025720  010600                  MOV     SP,R0
025722  104417                  TRAP    C$PNTF
025724  062706  000004          ADD     #4,SP
025730  012737  177777  002650  MOV     #-1,UNIT        ;RESET UNIT COUNT
025736  012727  177777          MOV     #-1,(PC)+       ;RESET CLOCK MESSAGE FLAG
025742  000000          2$:     .WORD   0               ;CLOCK MESSAGE FLAG GOES HERE
025744  005237  002650  3$:     INC     UNIT            ;GET NEXT UNIT NUMBER FOR TESTING
025750  023737  002650  002012  4$:     CMP     UNIT,L$UNIT     ;OUT OF UNITS TO TEST ?
025756  002166                  BGE     ABORT           ;BR IF YES
025760  012702  000024          MOV     #20.,R2         ;RHXX/RP07 REGISTER COUNT
025764  012703  002670          MOV     #RPCS1,R3       ;DATA SINK
                                                        ;GET UNIT FROM HARDWARE P-TABLE
025770  013700  002650          MOV     UNIT,R0
025774  104442                  TRAP    C$GPHRD
025776  010005                  MOV     R0,R5
026000  103361                  BCC     3$
026002  011346                  MOV     (R3),-(SP)      ;SAVE R3
026004  011546                  MOV     (R5),-(SP)      ;AND THE BASE ADDRESS
026006  166616  000002          SUB     2(SP),(SP)      ;DERIVE NEW ADDRESS
026012  061623          5$:     ADD     (SP),(R3)+      ;LOG IT IN NEW TABLE
026014  005302                  DEC     R2              ;COUNT LOGGING
026016  001375                  BNE     5$              ;R2 NOT ZERO, CONTINUE LOGGING
026020  004737  011034          JSR     PC,SIZE70       ;SEE IF RH70 IS PRESENT
026024  005737  002662          TST     RHTYPE          ;IS IT AN RH70 ?
```

```
                                                BEQ     6$              ;BR IF NO
                                                MOV     RHEXT,R2        ;GET RPBAE OFFSET
                                                ADD     (R5),R2         ;ADD BASE ADDRESS TO OFFSET
                                                MOV     R2,(R3)+        ;SAVE NEW RPBAE
                                                TST     (R2)+           ;ADD 2
                                                MOV     R2,(R3)         ;SAVE NEW RPCS3

                                        6$:     CMP     (SP)+,(SP)+     ;RESTORE STACK
                                                MOV     (R5)+,RPADR     ;SAVE RPCS1 BASE ADDRESS
                                                MOV     (R5)+,RPVEC     ;SAVE INTERUPT VECTOR ADDRESS
                                                MOV     (R5)+,RPVEC+2   ;SAVE INTERUPT PRIORITY
                                                MOV     (R5),DRVNO      ;SETUP DRIVE NUMBER FOR UNIT N

                                                JSR     PC,RPINIT       ;INITIALIZE THE SUB-SYSTEM
                                                MOV     DRVNO,R5        ;PICKUP DRIVE # AS AN INDEX
                                                TSTB    DRVSTA(R5)      ;CHECK DRIVE STATUS: IF NOT AVAILABLE, TRY ANOTHER DRIVE
                                                BMI     9$              ;UNSAFE BRANCH
                                                BNE     10$             ;DRIVE OK
                                                TSTB    DRVTYP(R5)      ;NED + OFL ?
                                                BEQ     8$              ;NED BRANCH: NON-EXISTENT DRV
                                                BPL     7$              ;OFL BRANCH: OFF-LINE

                                                MOV     R5,-(SP)
                                                MOV     #NOTMSG,-(SP)
                                                MOV     #2,-(SP)
                                                MOV     SP,R0
                                                TRAP    C$PNTF
                                                ADD     #6,SP
                                                BR      3$              ;EXIT BLOCK
                                        7$:
                                                MOV     R5,-(SP)
                                                MOV     #OFLMSG,-(SP)
                                                MOV     #2,-(SP)
                                                MOV     SP,R0
                                                TRAP    C$PNTF
                                                ADD     #6,SP
                                                BR      3$              ;EXIT BLOCK
                                        8$:
                                                MOV     R5,-(SP)
                                                MOV     #NEDMSG,-(SP)
                                                MOV     #2,-(SP)
                                                MOV     SP,R0
                                                TRAP    C$PNTF
                                                ADD     #6,SP
                                                BR      3$              ;EXIT BLOCK
                                        9$:
                                                MOV     R5,-(SP)
                                                MOV     #UNSMSG,-(SP)
                                                MOV     #2,(SP)
                                                MOV     SP,R0
                                                TRAP    C$PNTF
                                                ADD     #6,SP
                                                BR      3$              ;DRV NOT AVAILABLE: TRY ANOTHER

                                        10$:    TST     CLKSTA          ;DRV IS OK! WHAT CLOCK TYPE?
                                                BPL     EXINIT          ;P TYPE, OK!
                                                INC     2$              ;UPDATE, CAN CLOCK MESSAGE BE TYPED ?
```

```
     026252  001056                          BNE     EXINIT          ;BR IF NO
                                             ;PRINT 'NO P CLOCK, TIMING TESTS WILL NOT BE EXECUTED'
     026254  012746  004317                  MOV     #NOCLK, (SP)
     026260  012746  000001                  MOV     #1, (SP)
     026264  010600                          MOV     SP,R0
     026266  104417                          TRAP    C$PNTF
     026270  062706  000004                  ADD     #4,SP
     026274  000445                          BR      EXINIT          ;SKIP NEXT INTERMEDIATE BRANCHING

     026276                          CONTIN:                         ;SETUP RHXX/RP07 VECTOR
     026276  013746  002656                  MOV     RPVEC+2,-(SP)
     026302  012746  023046                  MOV     #ISRV,-(SP)
     026306  013746  002654                  MOV     RPVEC, (SP)
     026312  012746  000003                  MOV     #3,-(SP)
     026316  104437                          TRAP    C$SVEC
     026320  062706  000010                  ADD     #10,SP
     026324  004737  012000                  JSR     PC,ST.CLK       ;START CLOCK
     026330  104432                          TRAP    C$EXIT
     026332  000320                          .WORD   L10015-.

     026334  004737  012364          ABORT:  JSR     PC,STOPCK       ;STOP THE CLOCK
     026340  012777  000040  154332          MOV     #CLR,@RPCS2     ;MASSBUS INIT TO CLEAR IMPENDING INTERRUPTS
     026346  005737  002260                  TST     CLKSTA          ;RELEASE APPROPRIATE CLOCK VECTOR
     026352  001410                          BEQ     2$              ;NO CLOCK, SKIP
     026354  100404                          BMI     1$              ;L-CLK
     026356  013700  012230                  MOV     PKV,R0
     026362  104436                          TRAP    C$CVEC
     026364  000403                          BR      2$              ;SKIP
     026366                          1$:
     026366  013700  012240                  MOV     LKV,R0
     026372  104436                          TRAP    C$CVEC
     026374                          2$:
     026374  013700  002654                  MOV     RPVEC,R0
     026400  104436                          TRAP    C$CVEC
     026402  104444                          TRAP    C$DCLN
     026404  104432                          TRAP    C$EXIT
     026406  000244                          .WORD   L10015-.

     026410  013737  002664  002550  EXINIT: MOV     DRVNO,DPB.A     ;STUFF DRIVE NUMBER IN DPB TABLES
     026416  013737  002664  002570          MOV     DRVNO,DPB.B
     026424  013737  002664  002610          MOV     DRVNO,DPB.C
     026432  013737  002664  002630          MOV     DRVNO,DTADPB

                                             ;PRINT DRIVE SERIAL NUMBER

     026440  012701  000004                  MOV     #4,R1           ;4 DIGITS
     026444  013777  002664  154226          MOV     DRVNO,@RPCS2    ;SELECT DRIVE
     026452  013746  002664                  MOV     DRVNO,-(SP)
     026456  012746  004403                  MOV     #DSNMSG,-(SP)
     026462  012746  000002                  MOV     #2,-(SP)
     026466  010600                          MOV     SP,R0
     026470  104417                          TRAP    C$PNTF
     026472  062706  000006                  ADD     #6,SP
     026476  017746  154216                  MOV     @RPSN,-(SP)     ;FETCH S/N
     026502  005002                  3$:     CLR     R2              ;ZERO OUTPUT
     026504  006116                          ROL     (SP)            ;PUT NEXT DIGIT INTO R2
     026506  006102                          ROL     R2
```

INITIALIZE SECTION

```
119 026510  006116                          ROL     (SP)
120 026512  006102                          ROL     R2
121 026514  006116                          ROL     (SP)
122 026516  006102                          ROL     R2
123 026520  006116                          ROL     (SP)
124 026522  006102                          ROL     R2
125 026524  062702  000060                  ADD     #'0,R2          ;MAKE RESULT ASCII
126 026530  010237  002666                  MOV     R2,DRVSN        ;SAVE R2 FOR PRINT
127 026534  012746  002666                  MOV     #DRVSN,-(SP)
    026540  012746  004427                  MOV     #SNDIGT,-(SP)
    026544  012746  000002                  MOV     #2,-(SP)
    026550  010600                          MOV     SP,R0
    026552  104417                          TRAP    C$PNTF
    026554  062706  000006                  ADD     #6,SP
128 026560  005301                          DEC     R1              ;COUNT DOWN DIGIT
129 026562  003347                          BGT     3$              ;NEXT DIGIT
130 026564  005726                          TST     (SP)+           ;RESTORE STACK
131                                                                 ;CR-LF
132 026566  012746  003064                  MOV     #CRLF,-(SP)
    026572  012746  000001                  MOV     #1, (SP)
    026576  010600                          MOV     SP,R0
    026600  104417                          TRAP    C$PNTF
    026602  062706  000004                  ADD     #4,SP
133
134 026606  004737  012724                  JSR     PC,LDCMD        ;LOAD COMMAND IN DPB.B, DPB.C FOR SEEK TESTS
135 026612  012737  026334  002262          MOV     #ABORT,BYPASS   ;BYPASS ROUTE ON RP DRIVER FATAL ERROR
136 026620  112737  000020  002551          MOVB    #20,DPB.A+1     ;SET 16 BIT FORMAT
137 026626  112737  000147  002552          MOVB    #SETFORM,DPB.A 2        ;SET FORMAT MODE (16 BIT)
138 026634  004437  014374                  JSR     R4,CALL.A       ;GO EXECUTE THE COMMAND
139 026640  012737  015406  002262          MOV     #ABOPAS,BYPASS  ;RESTORE ABORT ADDRESS FOR 'ERRABO' DEV FATAL ERROR
140
164
165 026646  104432                          TRAP    C$EXIT
    026650  000002                          .WORD   L10015 .
166
178                                         .EVEN
179
180 026652                          L10015:
    026652  104411                          TRAP    C$INIT
```

```
                                .SBTTL  AUTODROP SECTION

                                ;++
                                ; THIS CODE IS EXECUTED IMMEDIATELY AFTER THE INITIALIZE CODE IF
                                ; THE "ADR" FLAG WAS SET.  THE UNIT(S) UNDER TEST ARE CHECKED TO
                                ; SEE IF THEY WILL RESPOND.  THOSE THAT DON'T ARE IMMEDIATELY
                                ; DROPPED FROM TESTING.
                                ;--

026654                          L$AUTO::
026654                          L10016:
026654  104461                          TRAP    C$AUTO
```

CLEANUP CODING SECTION

```
                                .SBTTL  CLEANUP CODING SECTION

                                ;++
                                ; THE CLEANUP CODING SECTION CONTAINS THE CODING THAT IS PERFORMED
                                ; AFTER THE HARDWARE TESTS HAVE BEEN PERFORMED.
                                ;

026656                          L$CLEAN::
                                                                ;SET PRIORITY TO 7
026656  012700  000340                  MOV     #PRI07,R0
026662  104441                          TRAP    C$SPRI
026664  012777  000040  154006          MOV     #CLR,@RPCS2     ;MASSBUS INIT TO CLEAR IMPENDING INTERRUPTS
026672  013777  002664  154000          MOV     DRVNO,@RPCS2    ;GET DRIVE NUMBER
026700  004737  012364                  JSR     PC,STOPCK       ;STOP THE CLOCK
026704  005737  002260                  TST     CLKSTA          ;RELEASE APPROPRIATE CLOCK VECTOR
026710  001410                          BEQ     2$              ;NO CLOCK, SKIP
026712  100404                          BMI     1$              ;L-CLK
                                                                ;P-CLK VECTOR RELEASE
026714  013700  012230                  MOV     PKV,R0
026720  104436                          TRAP    C$CVEC
026722  000403                          BR      2$

                                                                ;L-CLK VECTOR RELEASE
026724                          1$:
026724  013700  012240                  MOV     LKV,R0
026730  104436                          TRAP    C$CVEC
026732                          2$:                             ;RP07 VECTOR RELEASE
026732  013700  002654                  MOV     RPVEC,R0
026736  104436                          TRAP    C$CVEC
026740  104432                          TRAP    C$EXIT
026742  000002                          .WORD   L10017 .

026744
026744  104412                  L10017: TRAP    C$CLEAN
```

```
                                .SBTTL  DROP UNIT SECTION

                                ;++
                                ; THE DROP UNIT SECTION CONTAINS THE CODING THAT CAUSES A DEVICE
                                ; TO NO LONGER BE TESTED.
                                ;--

026746                          L$DU::

026746  000167                          .WORD   J$JMP
026750  000000                          .WORD   L10020 2-.

                                        .EVEN

026752                          L10020:
026752  104453                          TRAP    C$DU
```

```
                                .SBTTL  ADD UNIT SECTION

                                ;**
                                ; THE ADD-UNIT SECTION CONTAINS ANY CODE THE PROGRAMMER WISHES
                                ;  TO BE EXECUTED IN CONJUNCTION WITH THE ADDING OF A UNIT BACK
                                ;  TO THE TEST CYCLE.
                                ;

026754                          L$AU::

026754  000167                          .WORD   J$JMP
026756  000000                          .WORD   L10021 2 .

                                        .EVEN

026760                          L10021:
026760  104452                          TRAP    C$AU
```

```
                        .SBTTL  HARDWARE TESTS

                        ;*IN THE DESCRIPTIONS OF THE BELOW TESTS THE VARIABLES USED
                        ;*AND THEIR DEFAULT VALUES (UNLESS SPECIFIED OTHERWISE) ARE:
                        ;*
                        ;*MNEMONIC      VALUE           VARIABLE
                        ;*--- -  -       --              --------
                        ;*
                        ;*ITCNT         1               ITERATIONS
                        ;*FC            0               FIRST CYLINDER ADDRESS
                        ;*LC            629             LAST CYLINDER ADDRESS
                        ;*IC            1               INCREMENT VALUE
                        ;*NC OF NC1     FC+IC           NEW OR MODIFIED CYLINDER
                        ;*                              ADDRRESS
                        ;*NC2           LC-IC           NEW OR MODIFIED CYLINDER
                        ;*                              ADDRESS
                        ;*
                        ;*FT            0               FIRST TRACK ADDRESS
                        ;*LT            31.             LAST TRACK ADDRESS
                        ;*IT            1               INCREMENT VALUE
                        ;*NT            FT+IT           NEW OR MODIFIED TRACK ADDRESS
                        ;*
                        ;*FS            0               FIRST SECTOR ADDRESS
                        ;*LS            49.             LAST SECTOR ADDRESS

                        .SBTTL  SEEK TESTS

                        ;*THE SEEK TESTS WILL BE EXCUTED USING IMPLIED SEEKS. THESE
                        ;*IMPLIED SEEKS WILL BE PERFORMED BY "READ HEADER AND
                        ;*DATA" COMMANDS TO TRACK "FT" SECTOR "FS" OF THE DESIRED CYLINDER.
                        ;*THE WORD COUNT WILL BE SET SUCH THAT ONLY THE CYLINDER AND
                        ;*TRACK/SECTOR WORDS OF THE HEADER ARE READ.
                        ;*HOWEVER, THESE IMPLIED SEEKS CAN BE SUPERSEDED BY EXPLICIT SEEKS
                        ;*VIA OPERATOR DIALOGUE, IN WHICH CASE HEADER INFORMATION IS NOT VERIFIED.
```

```
      1                                 .SBTTL  TEST 1: RECALIBRATE TEST
      2
     37
     39                                 ;;*****************************************************************************
     40                                 ;*      THIS TEST WILL CAUSE THE DRIVE TO EXECUTE A RECALIBRATE
     41                                 ;*      COMMAND CYCLE AND THEN DO A READ HEADER AND DATA COMMAND
     42                                 ;*      TO VERIFY POSITION.
     43                                 ;;*****************************************************************************
     44
     51
     57 026762                          T1::
     58 026762  012737  000012  002244          MOV     #10.,ITCNT      ;SET ITERATION COUNT
     59 026770                          TEST1:
        026770  112737  000107  002552          MOVB    #RECAL,DPB.A+2  ;RECAL=COMMAND
     60 026776  005037  002600                  CLR     DPB.B+10        ;SEC/TRK 0
     61 027002  005037  002602                  CLR     DPB.B+12        ;CYL 0
     62 027006                          T1.1:
        027006  104402                          TRAP    C$BSUB
     63 027010  004437  014374                  JSR     R4,CALL.A       ;GO EXECUTE THE COMMAND
     64 027014  004437  014512                  JSR     R4,CALL.B       ;GO EXECUTE THE COMMAND
     65 027020  005337  002244                  DEC     ITCNT           ;DONE ITERATIONS ?
     66 027024  001361                          BNE     TEST1           ;BR IF NO
     67 027026                          EXIT1:
        027026                          L10023:
        027026  104403                          TRAP    C$ESUB
     68 027030                          L10022:
        027030  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 2: INCREMENT SEEK TEST
                                        ;;*****************************************************************************
                                        ;*      THIS TEST WILL COMMAND FORWARD SEEK CYCLES TO ADVANCE THE
                                        ;*      CYLINDER ADDRESS FROM "FC" TO "LC" BY THE INCREMENT "IC".
                                        ;*      WHEN THE RESULTANT CYLINDER ADDRESS (NC) EXCEEDS
                                        ;*      "LC" REVERSE SEEK CYCLES ARE INITIATED; STARTING
                                        ;*      AT THE LAST LEGAL "NC" AND DECREMENTING BY "IC"
                                        ;*      UNTIL "NC" IS LESS THAN "FC". AT THE COMPLETION OF EACH
                                        ;*      SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO
                                        ;*      ENSURE PROPER OPERATION.
                                        ;;*****************************************************************************
                                        T2::
027032  113737  002220  002600  1$:     MOVB    FS,DPB.B+10     ;FS
027040  113737  002212  002601          MOVB    FT,DPB.B+11     ;FT
027046  013737  002204  002602          MOV     FC,DPB.B+12     ;FC
027054                                  T2.11:
027054                                  T2.1:
027054  104402                          TRAP    C$BSUB
027056  004437  014512                  JSR     R4,CALL.B       ;GO EXECUTE THE COMMAND
027062                                  L10025:
027062  104403                          TRAP    C$ESUB
027064  063737  002210  002602          ADD     IC,DPB.B+12     ;MOVE TO NEXT CYLINDER
027072  023737  002206  002602          CMP     LC,DPB.B+12     ;OUT OF CYLINDERS?
027100  002365                          BGE     T2.11           ;NO--BRANCH
027102  013737  002206  002602          MOV     LC,DPB.B+12
027110                                  T2.21:
027110                                  T2.2:
027110  104402                          TRAP    C$BSUB
027112  004437  014512                  JSR     R4,CALL.B       ;GO EXECUTE THE COMMAND
027116                                  L10026:
027116  104403                          TRAP    C$ESUB
027120  163737  002210  002602          SUB     IC,DPB.B+12
027126  023737  002204  002602          CMP     FC,DPB.B+12
027134  003765                          BLE     T2.21
027136                                  EXIT2:
027136                                  L10024:
027136  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 3: RANDOM SEEK TEST

                                ;;*****************************************************************************
                                ;*      THIS TEST PERFORMS RANDOM SEEK OPERATIONS BETWEEN CYLINDERS 'FC'
                                ;*      'LC'.  AFTER EACH SEEK, THE POSITION OF THE DRIVE IS VERIFIED BY
                                ;*      READING A SECTOR FROM THE CURRENTLY ADDRESSED CYLINDER AND TRACK.
                                ;*      THE TRACK ADDRESS IS INCREMENTED FOR EACH SEEK SO THAT VERIFICATION
                                ;*      OF POSITIONING OCCURS USING EACH HEAD.  TRACK ADDRESSES ARE INCREMENTED
                                ;*      BETWEEN PARAMTERS 'FT' AND 'LT'.
                                ;*      THE RANDOM CYLINDER IS GENERATED BY USING THE 'MOD' FUNCTION:
                                ;*              X MOD Y = X - (X DIV Y) * Y
                                ;*      IF X,Y ARE INTEGERS WITH Y <> 0 THEN:
                                ;*              X MOD Y = REMAINDER OF X DIV Y
                                ;*      THE ACTUAL OPERATION PERFORMED IS:
                                ;*              FC + $RP1 MOD (LC+1)-FC
                                ;*      BY DOING:
                                ;*              CYL = FC + R
                                ;*      WHERE R IS OBTAINED BY:
                                ;*              $RP1 DIV (LC+1)-FC = Q + R
                                ;*      WHERE Q = QUOTIENT,  R = REMAINDER,  $RP1 = A RANDOM NUMBER FROM RAND CALL.
                                ;;*****************************************************************************

027140                          T3::
027140  012737  000012  002244          MOV     #10.,ITCNT      ;SET ITERATION COUNT
027146  113737  002212  002601          MOVB    FT,DPB.B+11     ;LOAD STARTING TRACK ADDRESS
027154  112737  000105  002552          MOVB    #SEEK,DPB.A+2   ;SEEK=COMMAND
027162  013737  002204  002602  TEST3:  MOV     FC,DPB.B+12     ;INITIAL CYLINDER ADDRESS
027170  023737  002204  002206          CMP     FC,LC           ;CYLINDER LIMITS THE SAME ?
027176  001423                          BEQ     T3.11           ;BR IF THEY ARE

                                ;GENERATE A RANDOM CYLINDER

027200  004737  011712                  JSR     PC,RAND         ;CYCLE THE RANDOM NUMBER GENERATOR
027204  013746  011774                  MOV     $RP1,-(SP)      ;USE THE HIGH RANDOM NUMBER
027210  005046                          CLR     -(SP)           ;UPPER DIVIDEND
027212  013746  002206                  MOV     LC,-(SP)        ;FORM THE DIVISOR
027216  005216                          INC     (SP)            ;INCREMENT
027220  163716  002204                  SUB     FC,(SP)         ;SUBTRACT THE LOWER LIMIT
027224  004737  011176                  JSR     PC,$DIV         ;DIVIDE
027230  062637  002602                  ADD     (SP)+,DPB.B+12  ;ADD THE REMAINDER TO THE INITIAL CYLINDER
027234  005726                          TST     (SP)+           ;DISCARD THE QUOTENT

                                ;END OF RANDOM CYL GEN.

027236  013737  002602  002562          MOV     DPB.B+12,DPB.A+12       ;COPY NEW CYLINDER ADDRESS
027244                          T3.1:
027244  104402                  TRAP    C$BSUB
027246                          T3.11:
027246  004437  014374                  JSR     R4,CALL.A       ;GO EXECUTE THE COMMAND
027252                          L10030:
027252  104403                  TRAP    C$ESUB
027254                          T3.2:
027254  104402                  TRAP    C$BSUB
027256  113777  002550  153414          MOVB    DPB.A,@#RPCS2   ;SELECT THE DRIVE
027264  017746  153420                  MOV     @#RPLA,-(SP)    ;GET THE LOOK AHEAD REGISTER
027270  006316                          ASL     (SP)            ;ALIGN THE SECTOR ADDRESS
027272  006316                          ASL     (SP)            ;ALIGN THE SECTOR ADDRESS
```

TEST 3: RANDOM SEEK TEST

```
     027274  000316                                  SWAB    (SP)              ;PUT ADDRESS IN LOWER BYTE
     027276  112637  002600                          MOVB    (SP)+,DPB.B+10    ;LOAD THE DPB
     027302  013746  002274                          MOV     NS1, (SP)         ;PUT LAST SECTOR ADDRESS ON THE STACK
     027306  122637  002600                          CMPB    (SP)+,DPB.B+10    ;NEW SECTOR ADDRESS TOO LARGE ?
     027312  103007                                  BHIS    2$                ;BR IF NOT
     027314  103403                                  BLO     1$                ;BR IF ADDRESS IS 2 GREATER
     027316  105037  002600                          CLRB    DPB.B+10          ;RESET TO SECTOR ADDRESS 0
     027322  000403                                  BR      2$                ;CONTINUE
     027324  112737  000001  002600  1$:     MOVB    #1,DPB.B+10       ;RESET ADDRESS TO SECTOR 1
     027332                          2$:
     027332  004437  014512                          JSR     R4,CALL.B         ;GO EXECUTE THE COMMAND
     027336                          L10031:
     027336  104403                                  TRAP    C$ESUB
     027340  105237  002601                          INCB    DPB.B+11          ;INCREMENT THE TRACK ADDRESS
     027344  123737  002601  002214                  CMPB    DPB.B+11,LT       ;MAXIMUM ?
     027352  101703                                  BLOS    TEST3             ;BR IF NOT
     027354  113737  002212  002601                  MOVB    FT,DPB.B+11       ;RELOAD STARTING TRACK ADDRESS
     027362  005337  002244          EXIT3:  DEC     ITCNT             ;DONE ITERATIONS ?
     027366  001275                                  BNE     TEST3             ;BR IF NO
     027370                          L10027:
     027370  104401                                  TRAP    C$ETST
```

```
                                .SBTTL  TEST 4: RECAL, RANDOM SEEK TEST

                                ;;*************************************************************************
                                ;*      THIS TEST EXECUTES A RECAL COMMAND, THEN A SEEK IMPLIED IN A READ HEADER
                                ;*      AND DATA COMMAND, TO A RANDOMLY SELECTED CYLINDER.
                                ;*      THIS SEQUENCE IS REPEATED 10 TIMES.
                                ;*      THE TRACK AD OF THE RANDOMLY SELECTED CYLINDER IS INCREMENTED BY ONE,
                                ;*      STARING FROM FC, AT EACH TEST ITERATION.
                                ;*      THE RANDOM CYLINDER IS GENERATED BY USING THE 'MOD' FUNCTION:
                                ;*              X MOD Y = X - (X DIV Y) * Y
                                ;*      IF X,Y ARE INTEGERS WITH Y <> 0 THEN:
                                ;*              X MOD Y = REMAINDER OF X DIV Y
                                ;*      THE ACTUAL OPERATION PERFORMED IS:
                                ;*              FC + $RP1 MOD (LC+1) FC
                                ;*      BY DOING:
                                ;*              CYL = FC + R
                                ;*      WHERE R IS OBTAINED BY:
                                ;*              $RP1 DIV (LC+1)-FC = Q + R
                                ;*      WHERE Q = QUOTIENT,  R = REMAINDER,  $RP1 = A RANDOM NUMBER FROM RAND CALL.
                                ;;*************************************************************************

027372                          T4::
027372  012737  000012  002244          MOV     #10.,ITCNT      ;SET ITERATION COUNT
027400  113737  002212  002601          MOVB    FT,DPB.B+11     ;LOAD STARTING TRACK ADDRESS
027406  112737  000107  002552          MOVB    #RECAL,DPB.A+2  ;RECAL=COMMAND
027414  013737  002204  002602  TEST4:  MOV     FC,DPB.B+12     ;INITIAL CYLINDER ADDRESS

                                        ;GENERATE A RANDOM CYLINDER

027422  004737  011712                  JSR     PC,RAND         ;CYCLE THE RANDOM NUMBER GENERATOR
027426  013746  011774                  MOV     $RP1,-(SP)      ;USE THE HIGH RANDOM NUMBER
027432  005046                          CLR     -(SP)           ;UPPER DIVIDEND
027434  013746  002206                  MOV     LC,-(SP)        ;FORM THE DIVISOR
027440  005216                          INC     (SP)            ;INCREMENT
027442  163716  002204                  SUB     FC,(SP)         ;SUBTRACT THE LOWER LIMIT
027446  004737  011176                  JSR     PC,$DIV         ;DIVIDE
027452  062637  002602                  ADD     (SP)+,DPB.B+12  ;ADD THE REMAINDER TO THE INITIAL CYLINDER
027456  005726                          TST     (SP)+           ;DISCARD THE QUOTENT

                                ;END OF RANDOM CYL GEN.

027460                          T4.1:
027460  104402                          TRAP    C$BSUB
027462  004437  014374                  JSR     R4,CALL.A       ;GO EXECUTE THE COMMAND
027466                          L10033:
027466  104403                          TRAP    C$ESUB
027470                          T4.2:
027470  104402                          TRAP    C$BSUB
027472  113777  002550  153200          MOVB    DPB.A,@RPCS2    ;SELECT THE DRIVE
027500  017746  153204                  MOV     @RPLA,-(SP)     ;GET THE LOOK AHEAD REGISTER
027504  006316                          ASL     (SP)            ;ALIGN THE SECTOR ADDRESS
027506  006316                          ASL     (SP)            ;ALIGN THE SECTOR ADDRESS
027510  000316                          SWAB    (SP)            ;PUT ADDRESS IN LOWER BYTE
027512  112637  002600          1$:     MOVB    (SP)+,DPB.B+10  ;LOAD THE DPB
027516  013746  002274                  MOV     NS1,-(SP)       ;PUT LAST SECTOR ADDRESS ON THE STACK
027522  122637  002600                  CMPB    (SP)+,DPB.B+10  ;NEW SECTOR ADDRESS TOO LARGE ?
027526  103007                          BHIS    3$              ;BR IF NOT
027530  103403                          BLO     2$              ;BR IF ADDRESS IS 2 GREATER
```

TEST 4: RECAL, RANDOM SEEK TEST

```
     55 027532  105037  002600                 CLRB    DPB.B+10        ;RESET TO SECTOR ADDRESS 0
     56 027536  000403                          BR      3$              ;CONTINUE
     57
     58 027540  112737  000001  002600  2$:    MOVB    #1,DPB.B+10     ;RESET ADDRESS TO SECTOR 1
     59 027546                          3$:
        027546  004437  014512                 JSR     R4,CALL.B       ;GO EXECUTE THE COMMAND
     60 027552                          L10034:
        027552  104403                          TRAP    C$ESUB
     61 027554  105237  002601                 INCB    DPB.B+11        ;INCREMENT THE TRACK ADDRESS
     62 027560  123737  002601  002214         CMPB    DPB.B+11,LT     ;MAXIMUM ?
     63 027566  101712                          BLOS    TEST4           ;BR IF NOT
     64 027570  113737  002212  002601         MOVB    FT,DPB.B+11     ;RELOAD STARTING TRACK ADDRESS
     65 027576  005337  002244          EXIT4:  DEC     ITCNT           ;DONE ITERATIONS ?
     66 027602  001304                          BNE     TEST4           ;BR IF NO
     67 027604                          L10032:
        027604  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 5: DIFFERENTIAL SEEK TEST
                                ;
                                ;;*************************************************************************
                                ;*      THIS TEST CONSISTS OF 3 SUBTESTS TO TEST THE HEAD POSITIONER AND SERVO
                                ;*      SYSTEM RESPONSE TO 3 UNIQUE DIFFERENTIAL SEEK PROFILES:
                                ;*      1. 6 CYL DIF SEEK:  FORCES A SLEW RATE CHANGE BY SEEKING FROM CYL 0 TO 5,
                                ;*      2 TO 7, ... 624 TO 629, TO TEST THE POSITIONAL LOGIC.
                                ;*
                                ;*      2. 33 CYL DIF SEEK:  WORST CASE SEEK OVERSHOOT TEST, FORCED BY SEEKING
                                ;*      FROM CYL 0 TO 32, 1 TO 33, 2 TO 34, ... 597 TO 629.
                                ;*
                                ;*      3. 400 CYL DIF SEEK:  FORCES MAX ACCELERATION AND DECELERATION OF CARRIAGE
                                ;*      ASSEMBLY, FORCED BY SEEKING FROM CYL 0 TO 399, 1 TO 400, 2 TO 401, ...
                                ;*      230 TO 629.
                                ;;*************************************************************************
                                ;
027606                          T5::
027606  113737  002220  002600          MOVB    FS,DPB.B+10     ;FIRST SEEK OF THE PAIR OF SEEKS READS FS, FT
027614  113737  002212  002601          MOVB    FT,DPB.B+11
027622  113737  002222  002620          MOVB    LS,DPB.C+10     ;SECOND SEEK OF THE PAIR OF SEEKS READS LS, LT
027630  113737  002214  002621          MOVB    LT,DPB.C+11
                                ;
                                        ;6 CYL DIFF SEEK
                                ;
027636  005037  002602          TEST5:  CLR     DPB.B+12        ;FIRST SEEK STARTS AT 0
027642  012737  000005  002622          MOV     #5,DPB.C+12     ;SECOND SEEK IS TO FIRST CYL + 5
027650                          T5.1:
        104402                          TRAP    C$BSUB
027652                          T5.11:
        004437  014512                  JSR     R4,CALL.B       ;GO EXECUTE THE COMMAND
027656                          L10036:
        104403                          TRAP    C$ESUB
027660                          T5.2:
        104402                          TRAP    C$BSUB
027662  004437  014674                  JSR     R4,CALL.C       ;GO EXECUTE THE COMMAND
027666                          L10037:
        104403                          TRAP    C$ESUB
027670  005237  002602                  INC     DPB.B+12        ;NEXT CYL OF FIRST SEEK
027674  005237  002622                  INC     DPB.C+12        ;NEXT CYL OF SECOND SEEK
027700  023737  002266  002622          CMP     NC1,DPB.C+12    ;REACHED LAST USER CYL ON SECOND(LAST?) SEEK?
027706  002361                          BGE     T5.11           ;NOT YET, REPEAT ABOVE SEQ UNTIL OUT OF CYL
                                ;
                                        ;33 CYL DIFF SEEK
                                ;
027710  005037  002602                  CLR     DPB.B+12        ;FIRST SEEK STARTS AT 0
027714  012737  000040  002622          MOV     #32.,DPB.C+12   ;SECOND SEEK IS TO FIRST CYL + 32.
027722                          T5.3:
        104402                          TRAP    C$BSUB
027724                          T5.31:
        004437  014512                  JSR     R4,CALL.B       ;GO EXECUTE THE COMMAND
027730                          L10040:
        104403                          TRAP    C$ESUB
027732                          T5.4:
        104402                          TRAP    C$BSUB
027734  004437  014674                  JSR     R4,CALL.C       ;GO EXECUTE THE COMMAND
027740                          L10041:
        104403                          TRAP    C$ESUB
```

TEST 5: DIFFERENTIAL SEEK TEST

```
     48 027742  005237  002602                    INC     DPB.B+12        ;NEXT CYL OF FIRST SEEK
     49 027746  005237  002622                    INC     DPB.C+12        ;NEXT CYL OF SECOND SEEK
     50 027752  023737  002266  002622            CMP     NC1,DPB.C+12    ;REACHED LAST USER CYL ON SECOND(LAST?) SEEK?
     51 027760  002361                            BGE     T5.31           ;NOT YET, REPEAT ABOVE SEQ UNTIL OUT OF CYL
     52
     53                                           ;400 CYL DIFF SEEK
     54
     55 027762  005037  002602                    CLR     DPB.B+12        ;FIRST SEEK STARTS AT 0
     56 027766  012737  000617  002622            MOV     #399.,DPB.C+12  ;SECOND SEEK IS TO FIRST CYL + 399.
     57 027774                          T5.5:
        027774  104402                            TRAP    C$BSUB
     58 027776                          T5.51:
        027776  004437  014512                    JSR     R4,CALL.B       ;GO EXECUTE THE COMMAND
     59 030002                          L10042:
        030002  104403                            TRAP    C$ESUB
     60 030004                          T5.6:
        030004  104402                            TRAP    C$BSUB
     61 030006  004437  014674                    JSR     R4,CALL.C       ;GO EXECUTE THE COMMAND
     62 030012                          L10043:
        030012  104403                            TRAP    C$ESUB
     63 030014  005237  002602                    INC     DPB.B+12        ;NEXT CYL OF FIRST SEEK
     64 030020  005237  002622                    INC     DPB.C+12        ;NEXT CYL OF SECOND SEEK
     65 030024  023737  002266  002622            CMP     NC1,DPB.C+12    ;REACHED LAST USER CYL ON SECOND(LAST?) SEEK?
     66 030032  002361                            BGE     T5.51           ;NOT YET, REPEAT ABOVE SEQ UNTIL OUT OF CYL
     67 030034                          EXIT5:
        030034                          L10035:
        030034  104401                            TRAP    C$ETST
```

TEST 6: OSCILLATING SEEK TEST

```
                                        .SBTTL  TEST 6: OSCILLATING SEEK TEST
                                        ;;*****************************************************************************
                                        ;*      THIS TEST PERFORMS A SERIES OF SEEK OPERATIONS TO CAUSE AN OSCILLATING
                                        ;*      MOVEMENT OF THE HEAD POSITIONER.
                                        ;;*****************************************************************************
030036                                  T6::
030036  113737  002220  002600                  MOVB    FS,DPB.B+10     ;FS
030044  113737  002212  002601                  MOVB    FT,DPB.B+11     ;FT
030052  113737  002222  002620                  MOVB    LS,DPB.C+10     ;LS
030060  113737  002214  002621                  MOVB    LT,DPB.C+11     ;LT
030066  013737  002204  002602  TEST6:  MOV     FC,DPB.B+12     ;FC
030074  013737  002206  002622                  MOV     LC,DPB.C+12     ;LC
030102                                  T6.1:
030102  104402                                  TRAP    C$BSUB
030104                                  T6.11:
030104  004437  014512                          JSR     R4,CALL.B       ;GO EXECUTE THE COMMAND
030110                                  L10045:
030110  104403                                  TRAP    C$ESUB
030112                                  T6.2:
030112  104402                                  TRAP    C$BSUB
030114  004437  014674                          JSR     R4,CALL.C       ;GO EXECUTE THE COMMAND
030120                                  L10046:
030120  104403                                  TRAP    C$ESUB
030122  005237  002602                          INC     DPB.B+12
030126  005337  002622                          DEC     DPB.C+12
030132  023737  002622  002204                  CMP     DPB.C+12,FC     ;UNTIL
030140  002361                                  BGE     T6.11
030142                                  EXIT6:
030142                                  L10044:
030142  104401                                  TRAP    C$ETST
```

```
                                        .SBTTL  TIMING TESTS

                                        ;;*******************************************************************
                                        ;*THE TIMING TESTS WILL ENSURE THAT THOSE FUNCTIONS BEING
                                        ;*TIMED ARE WITHIN THE TOLERANCES SPECIFIED IN THE "RP07
                                        ;*ENGINEERING SPECIFICATIONS".
                                        ;*THE SEEK TIMING WILL BE PERFORMED USING EXPLICIT SEEK
                                        ;*OPERATIONS. AT THE COMPLETION OF EACH OF THE TIMING
                                        ;*TESTS THE MINIMUM, MAXIMUM AND AVERAGE TIMES WILL BE
                                        ;*TYPED, IF TIMTYP=1.

                                        .SBTTL  TEST 7: ROTATIONAL SPEED TIMING TEST

                                        ;;*******************************************************************
                                        ;*       THIS TEST WILL START A SEARCH TO CYLINDER FC, TRACK FT, SECTOR
                                        ;*       FS.  AS SOON AS THE INTERRUPT OCCURS, THE GO BIT IS SET AGAIN
                                        ;*       AND THE OPERATION IS TIMED.  THIS PROCEDURE IS REPEATED 10
                                        ;*       TIMES THEN THE AVERAGE TIME IS CALCULATED AND CHECKED TO
                                        ;*       ENSURE IT IS WITHIN TOLERANCE:
                                        ;*               16.515 MS/REV + OR - 3%
                                        ;;*******************************************************************

030144                                  T7::
030144  005737  002260                          TST     CLKSTA          ;KW11 P CLOCK?
030150  003002                                  BGT     1$              ;YES--START TEST
030152  104432                                  TRAP    C$EXIT
030154  001044                                  .WORD   L10047-.
030156  004437  015612                  1$:     JSR     R4,SRCH00       ;DO A MASSBUS INIT & RECAL
030162  000402                                  BR      2$              ;RETURN HERE IF NO ERROR
030164  000137  031172                          JMP     EXIT7           ;RETURN HERE IF ERROR

030170  005005                          2$:     CLR     R5              ;COUNT UP
030172  012703  002442                          MOV     #T7A,R3         ;TIMING LIMITS
030176  012701  000012                  TEST7:  MOV     #10.,R1         ;TIME 10 SEARCHES
030202  004737  015742                          JSR     PC,STRTMR       ;INITIALIZE THE TIMERS
030206  004737  012364                          JSR     PC,STOPCK       ;STOP THE CLOCK
                                                                        ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
030212  012746  000300                          MOV     #PRI06,-(SP)
030216  012746  031032                          MOV     #T7.7$,-(SP)
030222  013746  012230                          MOV     PKV,-(SP)
030226  012746  000003                          MOV     #3,-(SP)
030232  104437                                  TRAP    C$SVEC
030234  062706  000010                          ADD     #10,SP
                                                                        ;SETUP RHXX/RP07 VECTOR
030240  012746  000000                          MOV     #PRI00,-(SP)
030244  012746  015740                          MOV     #DORTI,-(SP)
030250  013746  002654                          MOV     RPVEC,-(SP)
030254  012746  000003                          MOV     #3,-(SP)
030260  104437                                  TRAP    C$SVEC
030262  062706  000010                          ADD     #10,SP
030266  013777  002204  152430                  MOV     FC,@RPDC        ;FC
030274  013746  002220                          MOV     FS,-(SP)        ;FS
030300  113766  002212  000001                  MOVB    FT,1(SP)        ;FT
030306  012677  152364                          MOV     (SP)+,@RPDA     ;LOAD FT/FS
030312                                  T7.1:
030312  104402                                  TRAP    C$BSUB
030314  005077  161704                  T7.1$:  CLR     @PKB            ;START COUNTING AT ZERO
```

TEST 7: ROTATIONAL SPEED TIMING TEST

```
     030320  012777  000131  161674          MOV     #131,@PKCS      ;INT.EN., COUNT UP AT 100KHZ
     030326  012777  000131  152334          MOV     #SEARCH,@RPCS1  ;START A SEARCH
     030334  000001                          WAIT                    ;WAIT ON INTERRUPT
     030336  017746  161664                  MOV     @PKC,-(SP)      ;SAVE THE CLOCK
     030342  042777  000101  161652          BIC     #101,@PKCS      ;STOP THE CLOCK
     030350  012677  161650                  MOV     (SP)+,@PKB      ;AND RESTORE THE COUNTED VALUE
     030354  032777  040000  152320          BIT     #BIT14,@RPDS    ;ERROR?
     030362  001516                          BEQ     T7.2$           ;NO--BRANCH
     030364  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0-R5
     030370  012702  002630                  MOV     #DTADPB,R2      ;DPB POINTER
     030374  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
     030400  012777  000040  152272          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
     030406  013777  002630  152264          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
     030414  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
     030420  004537  012766                  JSR     R5,ERRANY
     030424  002630                          DTADPB                  ;FIND OUT WHAT ERROR
     030426                          L10050:
     030426  104403                          TRAP    C$ESUB
     030430  032737  000210  002264          BIT     #BIT3!BIT7,SVSTAT       ;RETRY ALLOWED ?
     030436  001022                          BNE     T7.44$          ;BRANCH IS SO
     030440                          T7.10$:
     030440  012746  004511                  MOV     #SEAERR,-(SP)
     030444  012746  000001                  MOV     #1,-(SP)
     030450  010600                          MOV     SP,R0
     030452  104417                          TRAP    C$PNTF
     030454  062706  000004                  ADD     #4,SP
     030460  012746  004614                  MOV     #ABOTST,-(SP)
     030464  012746  000001                  MOV     #1,-(SP)
     030470  010600                          MOV     SP,R0
     030472  104417                          TRAP    C$PNTF
     030474  062706  000004                  ADD     #4,SP
     030500  000137  031136                  JMP     T7.8$

     030504  012737  000020  002350  T7.44$: MOV     #16.,WCEFLG     ;RETRY 16 TIMES
     030512  012777  000131  152150  1$:     MOV     #SEARCH,@RPCS1
     030520  000001                          WAIT                    ;WAIT FOR INTERRUPT
     030522  032777  040000  152152          BIT     #BIT14,@RPDS    ;ANY ERROR ?
     030530  001433                          BEQ     T7.2$           ;EXIT IF NONE
     030532  012777  000040  152140          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
     030540  013777  002630  152132          MOV     DTADPB,@RPCS2   ;DRIVE ADDRESS
     030546  005337  002350                  DEC     WCEFLG          ;OVER RETRY LIMIT ?
     030552  001357                          BNE     1$              ;BRANCH IF NOT
     030554                          T7.20$:
     030554  012746  004550                  MOV     #SEABAD,-(SP)
     030560  012746  000001                  MOV     #1,-(SP)
     030564  010600                          MOV     SP,R0
     030566  104417                          TRAP    C$PNTF
     030570  062706  000004                  ADD     #4,SP
     030574  012746  004614                  MOV     #ABOTST,-(SP)
     030600  012746  000001                  MOV     #1,-(SP)
     030604  010600                          MOV     SP,R0
     030606  104417                          TRAP    C$PNTF
     030610  062706  000004                  ADD     #4,SP
     030614  000550                          BR      T7.8$           ;EXIT
     030616                          T7.2:
     030616  104402                          TRAP    C$BSUB
     030620  005077  161400          T7.2$:  CLR     @PKB            ;START THE COUNT AT ZERO
```

```
                030624  012777  000131  152036          MOV     #SEARCH,@RPCS1  ;START A SEARCH
                030632  012777  000131  161362          MOV     #131,@PKCS      ;START THE CLOCK
                030640  000001                          WAIT                    ;WAIT ON INTERRUPT
                030642  017746  161360                  MOV     @PKC, (SP)      ;SAVE THE CLOCK
                030646  042777  000101  161346          BIC     #101,@PKCS      ;STOP THE CLOCK
                030654  012677  161344                  MOV     (SP)+,@PKB      ;AND RESTORE THE COUNTED VALUE
                030660  032777  040000  152014          BIT     #BIT14,@RPDS    ;IS "ERR=1"?
                030666  001453                          BEQ     T7.3$           ;NO--BRANCH
                030670  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0-R5
                030674  012702  002630                  MOV     #DTADPB,R2      ;DPB POINTER
                030700  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
                030704  012777  000040  151766          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
                030712  013777  002630  151760          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
                030720  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
                030724  004537  012766                  JSR     R5,ERRANY       ;FIND OUT WHAT ERROR
                030730  002630                          DTADPB
                030732                          L10051:
                030732  104403                          TRAP    C$ESUB
                030734  032737  000210  002264          BIT     #BIT3!BIT7,SVSTAT       ;RETRY ALLOWED ?
                030742  001636                          BEQ     T7.10$          ;BRANCH IF NOT, ABORT TEST
                030744  012737  000020  002350          MOV     #16.,WCEFLG     ;RETRY 16 TIMES
                030752  012777  000131  151710  1$:     MOV     #SEARCH,@RPCS1  ;START TO SEARCH
                030760  000001                          WAIT
                030762  032777  040000  151712          BIT     #BIT14,@RPDS    ;ANY ERROR
                030770  001412                          BEQ     T7.3$           ;BRANCH IF NONE
                030772  012777  000040  151700          MOV     #CLR,@RPCS2     ;MASS BUS CLEAR
                031000  013777  002630  151672          MOV     DTADPB,@RPCS2   ;LOAD THE DRIVE ADDRESS
                031006  005337  002350                  DEC     WCEFLG          ;DECREMENT THE RETRY COUNT
                031012  001357                          BNE     1$              ;BRANCH IF NOT OVER THE LIMIT
                031014  000657                          BR      T7.20$          ;EXIT

                031016  004737  016212          T7.3$:  JSR     PC,COUNT        ;UPDATE THE COUNT
                031022  005301                          DEC     R1              ;DONE?
                031024  003444                          BLE     T7.8$           ;YES--GO TO THE EXIT
                031026  000137  030314                  JMP     T7.1$           ;NO, LOOP

                031032  004737  012426          T7.7$:  JSR     PC,FORSEC       ;RESET TIMER TO 4 SEC, CHANGE CLK SERVICE AD
                                                                                ;DROP THE PRIORITY
                031036  012700  000000                  MOV     #PRI00,R0
                031042  104441                          TRAP    C$SPRI
                031044  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0-R5
                031050  012702  002630                  MOV     #DTADPB,R2      ;DPB POINTER
                031054  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
                031060  012777  000040  151612          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
                031066  013777  002630  151604          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
                031074  016102  000014                  MOV     14(R1),R2       ;ADDRESS OF SAVED REGISTER TABLE
                031100  016237  000036  002276          MOV     36(R2),CYL.RD   ;GET CURRENT CYLINDER
                031106  116237  000006  002302          MOVB    6(R2),SEC.RD    ;GET CURRENT SECTOR
                031114  116237  000007  002300          MOVB    7(R2),TRK.RD    ;GET CURRENT TRACK
                031122  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
                031126  104456                          TRAP    C$ERHRD
                031130  000024                          .WORD   20
                031132  006201                          .WORD   EM20
                031134  007672                          .WORD   DH44
                031136                          T7.8$:
                031136  012777  000040  151534          MOV     #CLR,@RPCS2     ;CLEAR THE MASSBUS
                031144  013777  002630  151526          MOV     DTADPB,@RPCS2   ;& SELECT DRIVE
```

```
    114 031152  004737  012000                  JSR     PC,ST.CLK       ;INITIALIZE THE CLOCK
    115 031156  004437  016504                  JSR     R4,TYPTIM       ;GO TYPE THE TIMES
        031162  002442                          T/A                     ;POINTER
    116 031164  004437  016354                  JSR     R4,SPTYP        ;TYPE THE SPECIFICATION VALUE
    117 031170  002512                          SP7
    118 031172                          EXIT7:                          ;SETUP RHXX/RP07 VECTOR
    119 031172  013746  002656                  MOV     RPVEC+2,-(SP)
        031176  012746  023046                  MOV     #ISRV,-(SP)
        031202  013746  002654                  MOV     RPVEC,-(SP)
        031206  012746  000003                  MOV     #3,-(SP)
        031212  104437                          TRAP    C$SVEC
        031214  062706  000010                  ADD     #10,SP
    120 031220                          L10047:
        031220  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 8: ONE CYLINDER SEEK TIMING TEST

                                ;;*************************************************************************
                                ;*      THIS TEST WILL COMMAND FORWARD SEEK CYCLES TO ADVANCE THE
                                ;*      CYLINDER BY ONE FROM FC  UNTIL THE INCREMENT IS GREATER THAN THE
                                ;*      CYLINDER 'LC', THEN REVERSE SEEK TO CYLINDER 'FC'. DO IT TWICE.
                                ;*      THE TIME TO PERFORM EACH SEEK IS CHECKED TO ENSURE IT DOES NOT
                                ;*      EXCEED THE MAXIMUM TIME PERMITTED FOR A ONE CYLINDER SEEK.
                                ;*      THE TIME MUST BE LESS THAN 4MS.
                                ;;*************************************************************************

031222                          T8::
031222  005737  002260                TST     CLKSTA          ;KW11-P CLOCK?
031226  003002                        BGT     1$              ;YES--START TEST
031230  104432                        TRAP    C$EXIT
031232  000756                        .WORD   L10052-.
031234  004437  015612        1$:     JSR     R4,SRCH00       ;DO A MASSBUS INIT. AND RECAL
031240  000402                        BR      2$              ;NO ERROR RETURN
031242  104432                        TRAP    C$EXIT
031244  000744                        .WORD   L10052-.
031246  012703  002452        2$:     MOV     #TIMT10,R3      ;PARAMETER POINTER
031252  005037  002256        TEST8:  CLR     DOTWO           ;SET-UP FOR TWO ITERATIONS
031256  013737  002204  002642        MOV     FC,DTADPB+12    ;START WITH BEGINNING CYLINDER
031264  005737  002204                TST     FC              ;IF FC <> 0
031270  001407                        BEQ     T8.5$           ;ELSE SKIP
031272  012737  000105  002632        MOV     #SEEK,DTADPB+2  ;THEN SEEK TO FC BEFORE TIMING PORTION OF TEST
031300                          T8.1:
031300  104402                        TRAP    C$BSUB
031302  004437  015056                JSR     R4,DRVCAL       ;SEEK TO FC
031306                          L10053:
031306  104403                        TRAP    C$ESUB
031310  005005                  T8.5$:  CLR     R5              ;SET THE UP/DOWN SWITCH TO UP
031312  004737  015742                JSR     PC,STRTMR       ;INITIALIZE THE TIMERS
031316  004737  012364                JSR     PC,STOPCK       ;STOP THE CLOCK
                                                                ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
031322  012746  000300                MOV     #PRI06,-(SP)
031326  012746  032022                MOV     #T8.7$,-(SP)
031332  013746  012230                MOV     PKV,-(SP)
031336  012746  000003                MOV     #3,-(SP)
031342  104437                        TRAP    C$SVEC
031344  062706  000010                ADD     #10,SP
                                                                ;SETUP RHXX/RP07 VECTOR
031350  012746  000000                MOV     #PRI00,-(SP)
031354  012746  015740                MOV     #DORTI,-(SP)
031360  013746  002654                MOV     RPVEC,-(SP)
031364  012746  000003                MOV     #3,-(SP)
031370  104437                        TRAP    C$SVEC
031372  062706  000010                ADD     #10,SP

                                ;SEEK FORWARD:  FC --> LC

031376  005237  002642          T8.1$:  INC     DTADPB+12       ;MOVE TO NEXT CYLINDER UP
031402  023737  002642  002206        CMP     DTADPB+12,LC    ;OUT OF CYLINDERS?
031410  003063                        BGT     T8.3$           ;YES, GO SEEK REVERSE
031412                          T8.2:
031412  104402                        TRAP    C$BSUB
031414  005077  160604                CLR     @PKB            ;START THE COUNTER AT ZERO
```

TEST 8: ONE CYLINDER SEEK TIMING TEST

```
     031420  013777  002642  151276          MOV     DTADPB+12,@RPDC ;LOAD DESIRED CYLINDER
     031426  012777  000105  151234          MOV     #SEEK,@RPCS1    ;START A SEEK
     031434  012777  000131  160560          MOV     #131,@PKCS      ;START THE CLOCK
     031442  000001                          WAIT                    ;WAIT ON INTERRUPT
     031444  017746  160556                  MOV     @PKC,-(SP)      ;GET THE CURRENT COUNT
     031450  042777  000101  160544          BIC     #101,@PKCS      ;STOP THE CLOCK
     031456  012677  160542                  MOV     (SP)+,@PKB      ;AND RESTORE THE VALUE
     031462  032777  040000  151212          BIT     #BIT14,@RPDS    ;ANY DISK ERRORS?
     031470  001426                          BEQ     T8.2$           ;NO--BRANCH
     031472  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0-R5
     031476  012702  002630                  MOV     #DTADPB,R2      ;DPB POINTER
     031502  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
     031506  012777  000040  151164          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
     031514  013777  002630  151156          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
     031522  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
     031526  004537  012766                  JSR     R5,ERRANY       ;FIND OUT WHAT ERROR
     031532  002630                          DTADPB
     031534                          L10054:
     031534  104403                          TRAP    C$ESUB
     031536  032737  000040  002264          BIT     #BIT5,SVSTAT    ;POSITION ERROR?
     031544  001075                          BNE     T8.9$           ;YES, ABORT TEST
     031546  004737  016212          T8.2$:  JSR     PC,COUNT        ;COUNT THIS SEEKS TIME
     031552  004737  012552                  JSR     PC,TWOMS        ;STALL TWO MILLISECONDS
     031556  000707                          BR      T8.1$           ;LOOP, SEEK FORWARD
     031560  005337  002642          T8.3$:  DEC     DTADPB+12       ;MOVE TO NEXT CYLINDER DOWN
     031564  012705  177777                  MOV     #-1,R5          ;SET UP/DOWN SWITCH TO DOWN

                                             ;SEEK REVERSE:  FC <-- LC

     031570  005337  002642          T8.4$:  DEC     DTADPB+12       ;MOVE TO NEXT CYLINDER DOWN
     031574  023737  002642  002204          CMP     DTADPB+12,FC    ;OUT OF CYLINDERS?
     031602  002474                          BLT     T8.6$           ;YES, EXIT LOOP
     031604                          T8.3:
     031604  104402                          TRAP    C$BSUB
     031606  005077  160412                  CLR     @PKB            ;START THE COUNTER AT ZERO
     031612  013777  002642  151104          MOV     DTADPB+12,@RPDC ;LOAD DESIRED CYLINDER
     031620  012777  000105  151042          MOV     #SEEK,@RPCS1    ;START A SEEK
     031626  012777  000131  160366          MOV     #131,@PKCS      ;START THE CLOCK
     031634  000001                          WAIT                    ;WAIT ON INTERRUPT
     031636  017746  160364                  MOV     @PKC,-(SP)      ;GET THE CURRENT COUNT
     031642  042777  000101  160352          BIC     #101,@PKCS      ;STOP THE CLOCK
     031650  012677  160350                  MOV     (SP)+,@PKB      ;AND RESTORE THE VALUE
     031654  032777  040000  151020          BIT     #BIT14,@RPDS    ;ANY DISK ERRORS?
     031662  001437                          BEQ     T8.10$          ;NO--BRANCH
     031664  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0-R5
     031670  012702  002630                  MOV     #DTADPB,R2      ;DPB POINTER
     031674  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
     031700  012777  000040  150772          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
     031706  013777  002630  150764          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
     031714  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
     031720  004537  012766                  JSR     R5,ERRANY       ;FIND OUT WHAT ERROR
     031724  002630                          DTADPB
     031726                          L10055:
     031726  104403                          TRAP    C$ESUB
     031730  032737  000040  002264          BIT     #BIT5,SVSTAT    ;POSITION ERROR?
     031736  001411                          BEQ     T8.10$          ;NO, CONTINUE
     031740                          T8.9$:
```

```
        031740  012746  004633                  MOV     #POSERR, (SP)
        031744  012746  000001                  MOV     #1,-(SP)
        031750  010600                          MOV     SP,R0
        031752  104417                          TRAP    C$PNTF
        031754  062706  000004                  ADD     #4,SP
     87 031760  000462                          BR      T8.8$
     88 031762  004737  016212          T8.10$: JSR     PC,COUNT        ;COUNT THIS SEEKS TIME
     89 031766  004737  012552                  JSR     PC,TWOMS        ;STALL TWO MILLISECONDS
     90 031772  000676                          BR      T8.4$           ;LOOP, SEEK REVERSE
     91 031774  005237  002642          T8.6$:  INC     DTADPB+12       ;MOVE TO NEXT CYLINDER
     92 032000  005737  002256                  TST     DOTWO           ;DONE TWICE?
     93 032004  100450                          BMI     T8.8$           ;IF MINUS, YES...
     94 032006  012737  177777  002256          MOV     #-1,DOTWO       ;MARK THE FIRST ITERATION
     95 032014  005005                          CLR     R5              ;SEEK FORWARD AGAIN
     96 032016  000137  031376                  JMP     T8.1$           ;NOW!!!
     97
     98 032022  004737  012426          T8.7$:  JSR     PC,FORSEC       ;RESET TIMER TO 4 SEC, CHANGE CLK SERVICE AD
     99                                                                  ;DROP THE PRIORITY
    100 032026  012700  000000                  MOV     #PRI00,R0
        032032  104441                          TRAP    C$SPRI
    101 032034  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0-R5
        032040  012702  002630                  MOV     #DTADPB,R2      ;DPB POINTER
        032044  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
        032050  012777  000040  150622          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
        032056  013777  002630  150614          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
        032064  016102  000014                  MOV     14(R1),R2       ;ADDRESS OF SAVED REGISTER TABLE
        032070  016237  000036  002276          MOV     36(R2),CYL.RD   ;GET CURRENT CYLINDER
        032076  116237  000006  002302          MOVB    6(R2),SEC.RD    ;GET CURRENT SECTOR
        032104  116237  000007  002300          MOVB    7(R2),TRK.RD    ;GET CURRENT TRACK
        032112  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
    102 032116  104456                          TRAP    C$ERHRD
        032120  000024                          .WORD   20
        032122  006201                          .WORD   EM20
        032124  007672                          .WORD   DH44
    103 032126                          T8.8$:
        032126  012777  000040  150544          MOV     #CLR,@RPCS2     ;CLEAR THE MASSBUS
        032134  013777  002630  150536          MOV     DTADPB,@RPCS2   ;& SELECT DRIVE
    104 032142  004737  012000                  JSR     PC,ST.CLK       ;INITIALIZE THE CLOCK
    105 032146  004437  016504                  JSR     R4,TYPTIM       ;GO TYPE THE TIMES
        032152  002452                          TIMT10                  ;POINTER
    106 032154  004437  016354                  JSR     R4,SPTYP
    107 032160  002520                          SP10
    108                                                                 ;SETUP RHXX/RP07 VECTOR
    109 032162  013746  002656                  MOV     RPVEC+2,-(SP)
        032166  012746  023046                  MOV     #ISRV,-(SP)
        032172  013746  002654                  MOV     RPVEC,-(SP)
        032176  012746  000003                  MOV     #3,-(SP)
        032202  104437                          TRAP    C$SVE
        032204  062706  000010                  ADD     #10,SP
    110 032210                          L10052:
        032210  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 9: AVERAGE SEEK TIME MEASUREMENT TEST

                                ;;*****************************************************************************
                                ;       THIS TEST WILL MEASURE THE AVERAGE SEEK TIME AS FOLLOWS:
                                ;
                                ;                    2 X [ (T1 X 629) + (T2 X 628) + (T3 X 627) +....+ (T629 X 1)]
                                ;       T (AVG)= ------------------------------------------------------------------
                                ;                                        629 X 629
                                ;
                                ;       WHERE:  THE TN IS THE MEASURED TIME INTERVAL FOR SEEKING FROM
                                ;                 CYLINDER 0 TO CYLINDER N OR FROM CYL N TO CYL 0.
                                ;               2X629 IS THE TOTAL NUMBER OF SEEKS.
                                ;;*****************************************************************************

032212                          T9::
032212  005737  002260                  TST     CLKSTA          ;KW11-P CLOCK?
032216  003002                          BGT     1$              ;YES--START TEST
032220  104432                          TRAP    C$EXIT
032222  000702                          .WORD   L10056
032224  004437  015612          1$:     JSR     R4,SRCH00       ;DO A MASSBUS INIT & RECAL
032230  000402                          BR      2$              ;RETURN HERE IF NO ERROR
032232  104432                          TRAP    C$EXIT
032234  000670                          .WORD   L10056
032236  012703  002462          2$:     MOV     @TIMT11,R3      ;PARAMETER POINTER
032242  013701  002266          TEST9:  MOV     NC1,R1          ;COUNT AND COEFFICIENT
032246  004737  015742                  JSR     PC,STRTMR       ;INIT. THE COUNTERS
032252  004737  012364                  JSR     PC,STOPCK       ;STOP THE CLOCK
                                                                ;SETUP VE. OR IN CASE OF CLOCK OVERFLOW
032256  012746  000300                  MOV     @PRI06,-(SP)
032262  012746  032710                  MOV     @T9.7$,-(SP)
032266  013746  012230                  MOV     PKV,-(SP)
032272  012746  000003                  MOV     @3,-(SP)
032276  104437                          TRAP    C$SVEC
032300  062706  000010                  ADD     @10,SP
                                                                ;SETUP RHXX/RP07 VECTOR
032304  012746  000000                  MOV     @PRI00,-(SP)
032310  012746  015740                  MOV     @DORTI,(SP)
032314  013746  002654                  MOV     RPVEC,-(SP)
032320  012746  000003                  MOV     @3,-(SP)
032324  104437                          TRAP    C$SVEC
032326  062706  000010                  ADD     @10,SP
032332  005037  033126                  CLR     INCCYL          ;INITIALIZE THE SEEK CYLINDER ADDRESS
032336  005237  033126          T9.1$:  INC     INCCYL          ;INCREMENT THE SEEK CYLINDER ADDRESS
032342  013777  033126  150354          MOV     INCCYL,@RPDC    ;SEEK ADDRESS
032350  005077  157650                  CLR     @PKB            ;START COUNT AT ZERO
032354                          T9.1:
032354  104402                          TRAP    C$BSUB
032356  012777  000105  150304          MOV     @SEEK,@RPCS1    ;START A SEEK
032364  012777  000131  157630          MOV     @131,@PKCS      ;START THE CLOCK
032372  000001                          WAIT                    ;WAIT ON INTERRUPT
032374  017746  157626                  MOV     @PKC,-(SP)      ;STORE THE COUNTED VALUE
032400  042777  000101  157614          BIC     @101,@PKCS      ;STOP CLOCK
032406  012677  157612                  MOV     (SP)+,@PKB      ;AND RESTORE THE COUNT
032412  032777  040000  150262          BIT     @BIT14,@RPDS    ;ERR=1?
032420  001426                          BEQ     T9.2$           ;NO--BRANCH
032422  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0-R5
032426  012702  002530                  MOV     @DTADPB,R2      ;DPB POINTER
```

TEST 9: AVERAGE SEEK TIME MEASUREMENT TEST

```
                032432  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
                032436  012777  000040  150234          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
                032444  013777  002630  150226          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
                032452  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
            44  032456  004537  012766                  JSR     R5,ERRANY       ;FINDOUT WHAT ERROR
            45  032462  002630                          DTADPB
            46  032464                          L10057:
                032464  104403                          TRAP    C$ESUB
            47  032466  032737  000040  002264          BIT     #BIT5,SVSTAT    ;POSITION ERROR?
            48  032474  001063                          BNE     T9.4$           ;YES, ABORT TEST
            49  032476  005005                  T9.2$:  CLR     R5              ;SET UP/DOWN SWITCH TO UP
            50  032500  004737  016012                  JSR     PC,COUNT2       ;UPDATE THE COUNT
            51  032504  004737  012552                  JSR     PC,TWOMS        ;STALL 2 MSEC
            52  032510                          T9.2:
                032510  104402                          TRAP    C$BSUB
            53  032512  005077  157506                  CLR     @PKB            ;START THE COUNT AT ZERO
            54  032516  012777  000000  150200          MOV     #0,@RPDC        ;ALWAYS SEEK BACK TO THE FIRST CYLINDER
            55  032524  012777  000105  150136          MOV     #SEEK,@RPCS1    ;START A SEEK
            56  032532  012777  000131  157462          MOV     #131,@PKCS      ;START THE CLOCK
            57  032540  000001                          WAIT                    ;WAIT ON INTERRUPT
            58  032542  017746  157460                  MOV     @PKC,-(SP)      ;SAVE THE CLOCK VALUE
            59  032546  042777  000101  157446          BIC     #101,@PKCS      ;STOP THE CLOCK
            60  032554  012677  157444                  MOV     (SP)+,@PKB      ;NOW RESTORE THE VALUE
            61  032560  032777  040000  150114          BIT     #BIT14,@RPDS    ;ERR=1?
            62  032566  001437                          BEQ     T9.3$           ;NO--BRANCH
            63  032570  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0 R5
                032574  012702  002630                  MOV     #DTADPB,R2      ;DPB POINTER
                032600  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
                032604  012777  000040  150066          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
                032612  013777  002630  150060          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
                032620  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
            64  032624  004537  012766                  JSR     R5,ERRANY       ;FIND OUT WHAT ERROR
            65  032630  002630                          DTADPB
            66  032632                          L10060:
                032632  104403                          TRAP    C$ESUB
            67  032634  032737  000040  002264          BIT     #BIT5,SVSTAT    ;POSITION ERROR?
            68  032642  001411                          BEQ     T9.3$           ;NO, CONTINUE
            69  032644                          T9.4$:
                032644  012746  004633                  MOV     #POSERR,-(SP)
                032650  012746  000001                  MOV     #1,-(SP)
                032654  010600                          MOV     SP,R0
                032656  104417                          TRAP    C$PNTF
                032660  062706  000004                  ADD     #4,SP
            70  032664  000466                          BR      T9.8$
            71  032666  012705  177777          T9.3$:  MOV     #-1,R5          ;SET UP/DOWN SWITCH TO DOWN
            72  032672  004737  016012                  JSR     PC,COUNT2       ;UPDATE THE COUNT
            73  032676  004737  012552                  JSR     PC,TWOMS        ;STALL 2 MSEC
            74  032702  005301                          DEC     R1              ;DONE?
            75  032704  003214                          BGT     T9.1$           ;NO--BRANCH
            76  032706  000455                          BR      T9.8$           ;YES--EXIT
            77
            78  032710  004737  012426          T9.7$:  JSR     PC,FORSEC       ;RESET TIMER TO 4 SEC, CHANGE CLK SERVICE AD
            79                                                                  ;DROP THE PRIORITY
            80  032714  012700  000000                  MOV     #PRI00,R0
                032720  104441                          TRAP    C$SPRI
            81  032722  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0-R5
                032726  012702  002630                  MOV     #DTADPB,R2      ;DPB POINTER
```

```
                032732  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
                032736  012777  000040  147734          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
                032744  013777  002630  147726          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
                032752  016102  000014                  MOV     14(R1),R2       ;ADDRESS OF SAVED REGISTER TABLE
                032756  016237  000036  002276          MOV     36(R2),CYL.RD   ;GET CURRENT CYLINDER
                032764  116237  000006  002302          MOVB    6(R2),SEC.RD    ;GET CURRENT SECTOR
                032772  116237  000007  002300          MOVB    7(R2),TRK.RD    ;GET CURRENT TRACK
                033000  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
     82                                                                         ;SETUP RHXX/RP07 VECTOR
     83         033004  013746  002656                  MOV     RPVEC+2,-(SP)
                033010  012746  023046                  MOV     #ISRV, (SP)
                033014  013746  002654                  MOV     RPVEC, (SP)
                033020  012746  000003                  MOV     #3,-(SP)
                033024  104437                          TRAP    C$SVEC
                033026  062706  000010                  ADD     #10,SP
     84         033032  104456                          TRAP    C$ERHRD
                033034  000024                          .WORD   20
                033036  006201                          .WORD   EM20
                033040  007672                          .WORD   DH44
     85         033042                          T9.8$:
                033042  012777  000040  147630          MOV     #CLR,@RPCS2     ;CLEAR THE MASSBUS
                033050  013777  002630  147622          MOV     DTADPB,@RPCS2   ;& SELECT DRIVE
     86         033056  004737  012000                  JSR     PC,ST.CLK       ;INITIALIZE THE CLOCK
     87         033062  004437  016504                  JSR     R4,TYPTIM       ;GO TYPE THE TIMES
                033066  002462                          TIMT11                  ;POINTER
     88         033070  004437  016354                  JSR     R4,SPTYP
     89         033074  002526                          SP11
     90                                                                         ;SETUP RHXX/RP07 VECTOR
     91         033076  013746  002656                  MOV     RPVEC+2,-(SP)
                033102  012746  023046                  MOV     #ISRV,-(SP)
                033106  013746  002654                  MOV     RPVEC,-(SP)
                033112  012746  000003                  MOV     #3,-(SP)
                033116  104437                          TRAP    C$SVEC
                033120  062706  000010                  ADD     #10,SP
     92         033124                          L10056:
                033124  104401                          TRAP    C$ETST
     93
     94         033126  000000                  INCCYL: .WORD   0               ;CYL ADR COUNTER
```

```
                                .SBTTL  TEST 10: MAXIMUM SEEK TIMING TEST
                                ;
                                ;;*****************************************************************************
                                ;*      THIS TEST WILL COMMAND A FORWARD SEEK FROM CYLINDER 0 TO
                                ;*      CYLINDER 'LC', THEN A REVERSE SEEK FROM CYLINDER 'LC' TO
                                ;*      CYLINDER 0.  BOTH SEEKS ARE TIMED AND CHECKED TO ENSURE
                                ;*      THEY ARE WITHIN THE TOLERANCE ALLOWED FOR THE MAXIMUM SEEK
                                ;*      TIME.  THIS SEQUENCE IS REPEATED 512 TIMES (FOR
                                ;*      A TOTAL OF 1024 SEEKS).  THE MAXIMUM SEEK TIME MUST BE LESS THAN
                                ;*      46 MS.  'LC' DEFAULTS TO 629 (10)
                                ;*      FOR RP07'S.
                                ;;*****************************************************************************
                                ;
033130                          T10::
033130  005737  002260                  TST     CLKSTA          ;KW11-P CLOCK
033134  003002                          BGT     1$              ;YES -START TEST
033136  104432                          TRAP    C$EXIT
033140  000642                          .WORD   L10061 .
033142  004437  015612          1$:     JSR     R4,SRCH00       ;DO A MASSBUS INIT & RECAL
033146  000402                          BR      2$              ;RETURN HERE IF NO ERROR
033150  104432                          TRAP    C$EXIT
033152  000630                          .WORD   L10061-.
033154  012703  002472          2$:     MOV     #TIMT12,R3      ;PARAMETER POINTER
033160  012701  001000          TEST10: MOV     #512.,R1        ;REPEAT "0-'LC'-0' 512 TIMES
033164  004737  015742                  JSR     PC,STRTMR       ;INIT. THE TIMERS
033170  004737  012364                  JSR     PC,STOPCK       ;STOP THE CLOCK
                                                                ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
033174  012746  000300                  MOV     #PRIO6, (SP)
033200  012746  033614                  MOV     #T10.7$,-(SP)
033204  013746  012230                  MOV     PKV,-(SP)
033210  012746  000003                  MOV     #3,-(SP)
033214  104437                          TRAP    C$SVEC
033216  062706  000010                  ADD     #10,SP
                                                                ;SETUP RHXX/RP07 VECTOR
033222  012746  000000                  MOV     #PRI00,-(SP)
033226  012746  015740                  MOV     #DORTI,-(SP)
033232  013746  002654                  MOV     RPVEC,-(SP)
033236  012746  000003                  MOV     #3,-(SP)
033242  104437                          TRAP    C$SVEC
033244  062706  000010                  ADD     #10,SP
033250                          T10.1:
033250  104402                          TRAP    C$BSUB
033252  005077  156746          T10.1$: CLR     @PKB            ;START COUNTING FROM ZERO
033256  013777  002206  147440          MOV     LC,@RPDC        ;MAXIMUM CYLINDER
033264  012777  000105  147376          MOV     #SEEK,@RPCS1    ;START A SEEK
033272  012777  000131  156722          MOV     #131,@PKCS      ;START THE CLOCK
033300  000001                          WAIT                    ;WAIT ON INTERRUPT
033302  017746  156720                  MOV     @PKC,-(SP)      ;SAVE THE CLOCK
033306  042777  000101  156706          BIC     #101,@PKCS      ;STOP THE CLOCK
033314  012677  156704                  MOV     (SP)+,@PKB      ;AND RESTORE THE COUNTED VALUE
033320  032777  040000  147354          BIT     #BIT14,@RPDS    ;ERR=1?
033326  001426                          BEQ     T10.2$          ;NO--BRANCH
033330  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0-R5
033334  012702  002630                  MOV     #DTADPB,R2      ;DPB POINTER
033340  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
033344  012777  000040  147326          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
033352  013777  002630  147320          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
```

TEST 10: MAXIMUM SEEK TIMING TEST

```
                033360  004737  011002                 JSR     PC,RESREG       ;;RESTORE R0 R5
     41         033364  004537  012766                 JSR     R5,ERRANY       ;FIND OUT WHAT ERROR
     42         033370  002630                         DTADPB
     43         033372                          L10062:
                033372  104403                         TRAP    C$ESUB
     44         033374  032737  000040  002264         BIT     #BIT5,SVSTAT    ;POSITION ERROR?
     45         033402  001062                         BNE     T10.4$          ;YES, ABORT TEST
     46         033404  005005                 T10.2$: CLR     R5              ;SET THE UP/DOWN SWITCH TO UP
     47         033406  004737  016212                 JSR     PC,COUNT        ;UP THE COUNT
     48         033412  004737  012552                 JSR     PC,TWOMS        ;STALL FOR TWO MILLISEC
     49         033416                          T10.2:
                033416  104402                         TRAP    C$BSUB
     50         033420  005077  156600                 CLR     @PKB            ;START COUNT AT ZERO
     51         033424  005077  147274                 CLR     @RPDC           ;BEGINNING CYLINDER IS 0
     52         033430  012777  000105  147232         MOV     #SEEK,@RPCS1    ;START A SEEK
     53         033436  012777  000131  156556         MOV     #131,@PKCS      ;START THE CLOCK
     54         033444  000001                         WAIT                    ;WAIT ON INTERRUPT
     55         033446  017746  156554                 MOV     @PKC, (SP)      ;SAVE THE CLOCK
     56         033452  042777  000101  156542         BIC     #101,@PKCS      ;STOP THE CLOCK
     57         033460  012677  156540                 MOV     (SP)+,@PKB      ;NOW RESTORE CLOCK
     58         033464  032777  040000  147210         BIT     #BIT14,@RPDS    ;"ERR"=1?
     59         033472  001437                         BEQ     T10.3$          ;NO--BRANCH
     60         033474  004737  010750                 JSR     PC,SAVREG       ;;SAVE R0-R5
                033500  012702  002630                 MOV     #DTADPB,R2      ;DPB POINTER
                033504  004737  024644                 JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
                033510  012777  000040  147162         MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
                033516  013777  002630  147154         MOV     DTADPB,@RPCS2   ;SELECT DRIVE
                033524  004737  011002                 JSR     PC,RESREG       ;;RESTORE R0-R5
     61         033530  004537  012766                 JSR     R5,ERRANY       ;FIND OUT WHAT ERROR
     62         033534  002630                         DTADPB
     63         033536                          L10063:
                033536  104403                         TRAP    C$ESUB
     64         033540  032737  000040  002264         BIT     #BIT5,SVSTAT    ;POSITION ERROR?
     65         033546  001411                         BEQ     T10.3$          ;NO, CONTINUE
     66         033550                          T10.4$:
                033550  012746  004633                 MOV     #POSERR,-(SP)
                033554  012746  000001                 MOV     #1,-(SP)
                033560  010600                         MOV     SP,R0
                033562  104417                         TRAP    C$PNTF
                033564  062706  000004                 ADD     #4,SP
     67         033570  000453                         BR      T10.8$
     68         033572  012705  177777         T10.3$: MOV     #-1,R5          ;SET THE UP/DOWN SWITCH TO DOWN
     69         033576  004737  016212                 JSR     PC,COUNT        ;UPDATE THE COUNT
     70         033602  004737  012552                 JSR     PC,TWOMS        ;STALL FOR TWO MILLISEC
     71         033606  005301                         DEC     R1              ;DONE?
     72         033610  003220                         BGT     T10.1$          ;NO--BRANCH
     73         033612  000442                         BR      T10.8$          ;YES--EXIT
     74
     75         033614  004737  012426         T10.7$: JSR     PC,FORSEC       ;RESET TIMER TO 4 SEC, CHANGE CLK SERVICE AD
     76                                                                         ;DROP THE PRIORITY
     77         033620  012700  000000                 MOV     #PRI00,R0
                033624  104441                         TRAP    C$SPRI
     78         033626  004737  010750                 JSR     PC,SAVREG       ;;SAVE R0-R5
                033632  012702  002630                 MOV     #DTADPB,R2      ;DPB POINTER
                033636  004737  024644                 JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
                033642  012777  000040  147030         MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
                033650  013777  002630  147022         MOV     DTADPB,@RPCS2   ;SELECT DRIVE
```

```
                033656  016102  000014                  MOV     14(R1),R2       ;ADDRESS OF SAVED REGISTER TABLE
                033662  016237  000036  002276          MOV     36(R2),CYL.RD   ;GET CURRENT CYLINDER
                033670  116237  000006  002302          MOVB    6(R2),SEC.RD    ;GET CURRENT SECTOR
                033676  116237  000007  002300          MOVB    7(R2),TRK.RD    ;GET CURRENT TRACK
                033704  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0 R5
     79         033710  104456                          TRAP    C$ERHRD
                033712  000024                          .WORD   20
                033714  006201                          .WORD   EM20
                033716  007672                          .WORD   DH44
     80         033720                          T10.8$:
                033720  012777  000040  146752          MOV     #CLR,@RPCS2     ;CLEAR THE MASSBUS
                033726  013777  002630  146744          MOV     DTADPB,@RPCS2   ;& SELECT DRIVE
     81         033734  004737  012000                  JSR     PC,ST.CLK       ;INITIALIZE THE CLOCK
     82         033740  004437  016504                  JSR     R4,TYPTIM       ;GO TYPE THE TIMES
                033744  002472                          TIMT12                  ;POINTER
     83         033746  004437  016354                  JSR     R4,SPTYP
     84         033752  002534                          SP12
     85                                                                          ;SETUP RHXX/RP07 VECTOR
     86         033754  013746  002656                  MOV     RPVEC+2,-(SP)
                033760  012746  023046                  MOV     #ISRV,-(SP)
                033764  013746  002654                  MOV     RPVEC,-(SP)
                033770  012746  000003                  MOV     #3,-(SP)
                033774  104437                          TRAP    C$SVEC
                033776  062706  000010                  ADD     #10,SP
     87         034002                          L10061:
                034002  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 11: MID TRANSFER SEEK TEST

                                        ;;*************************************************************************************
                                        ;THIS TEST EXECUTES READ-DATA COMMMANDS TO EVERY TRACK IN THE
                                        ;FIRST(STARTING) CYLINDER.
                                        ;
                                        ;THE FULL TRACK TRANSFER IS MADE IN 2 PASSES:
                                        ;       1ST PASS, SECTORS:  00. THRU 24.
                                        ;       2ND PASS, SECTORS:  25. THRU (49. +1)
                                        ;
                                        ;THE PARAMETERS:
                                        ;       STARTING CYLINDER       = FC
                                        ;       STARTING TRACK          = FT
                                        ;       ENDING TRACK            = LT
                                        ;       INCREMENT TRACK         = 1
                                        ;       STARTING SECTOR         = 0
                                        ;
                                        ;;*************************************************************************************

034004                                  T11::
034004  004737  020400                          JSR     PC,RPINIT       ;INITIALIZE THE SUB-SYSTEM
034010  004737  012364                          JSR     PC,STOPCK       ;STOP THE CLOCK
034014  113737  002664  002630                  MOVB    DRVNO,DTADPB    ;DRIVE ADDRESS
034022  112737  000171  002632                  MOVB    #RDDAT,DTADPB+2 ;READ-DATA COMMAND
034030  013737  002354  002634                  MOV     TRKWC,DTADPB+4  ;ASSUME HALF FULL TRACK
034036  012737  042762  002636                  MOV     #DBUFF,DTADPB+6 ;BUFFER ADDRESS
034044  112737  000000  002640                  MOVB    #0,DTADPB+10    ;SECTOR ADDR
034052  113737  002212  002641                  MOVB    FT,DTADPB+11    ;TRACK ADDR
034060  013737  002204  002642                  MOV     FC,DTADPB+12    ;CYLINDER ADDRESS
034066  012737  002754  002644                  MOV     #REG,DTADPB+14  ;RHXX/RP07 REGISTER
034074  005037  002256                          CLR     DOTWO           ;RESET 2 ITERATIONS CONTROL
034100                                  T11.1:
034100  104402                          T11.1:  TRAP    C$BSUB
034102                                  T11.2$:
034102  004437  015056                          JSR     R4,DRVCAL       ;START A DATA TRANSFER
034106  005737  002256                          TST     DOTWO           ;DONE HALF TRACK TWICE?
034112  100411                          BMI     2$              ;YES, EXIT 2 ITERATIONS LOOP
034114  005337  002256                          DEC     DOTWO           ;NO, MARK 2ND ITERATION
034120  112737  000031  002640                  MOVB    #25.,DTADPB+10  ;TFR 2ND HALF OF TRACK
034126  062737  177400  002634                  ADD     #-256.,DTADPB+4 ;YES, SET WC FOR 2ND HALF TRACK + 1 SECTOR
034134  000762                          1$:     BR      T11.2$          ;LOOP TO TFR 2ND HALF TTRACK

034136  005037  002256                  2$:     CLR     DOTWO           ;RESET PARAMETERS FOR 1ST LOOP
034142  105037  002640                          CLRB    DTADPB+10       ;RESTART AT SECTOR 0
034146  162737  177400  002634                  SUB     #-256.,DTADPB+4 ;WC FOR 1ST HALF TRACK
034154                                  L10065:
034154  104403                          L10065: TRAP    C$ESUB
034156  113702  002641                  T11.5$: MOVB    DTADPB+11,R2    ;UPDATE THE TRACK ADDRESS
034162  063702  002216                          ADD     IT,R2           ;ADD THE DESIRED TRACK NUMBER
034166  023702  002214                          CMP     LT,R2           ;OVER THE TRACK LIMIT?
034172  101403                          BLOS    EXIT11          ;BRANCH IF SO
034174  110237  002641                          MOVB    R2,DTADPB+11    ;TO NEXT TRACK
034200  000740                          BR      T11.2$          ;LOOP BACK
034202  004737  020400                  EXIT11: JSR     PC,RPINIT
034206                                  L10064:
034206  104401                          L10064: TRAP    C$ETST
```

TEST 12: ERROR REGISTER BIT TEST

```
                                        .SBTTL  TEST 12: ERROR REGISTER BIT TEST

                                        ;;*************************************************************************
                                        ;*      THIS TEST FORCES LBT & AOE ERROR BITS THAT ARE NOT FULLY CHECKED BY THE
                                        ;*        MICRO DIAGNOSTICS
                                        ;*      LBT,AOE:  READ THE LAST USER SECTOR WITH A WORD COUNT >256.
                                        ;;*************************************************************************

034210                                  T12::
034210  004737  020400                          JSR     PC,RPINIT       ;INITIALIZE THE SUB-SYSTEM
034214  004737  012364                          JSR     PC,STOPCK       ;STOP THE CLOCK
034220  113737  002664  002630                  MOVB    DRVNO,DTADPB    ;DRIVE AD
034226  112737  000171  002632                  MOVB    #RDDAT,DTADPB+2 ;SET READ CMD IN DPB
034234  012737  177400  002634                  MOV     #SCTRWC,DTADPB+4        ;SET WORD COUNT TO READ ONE SECTOR
034242  012737  042762  002636                  MOV     #DBUFF,DTADPB+6 ;DATA BUFFER
034250  113737  002274  002640                  MOVB    NS1,DTADPB+10   ;SET LAST USER SECTOR IN DPB
034256  113737  002272  002641                  MOVB    NT1,DTADPB+11   ;I.E., CYL 629, TRK 31, SEC 49
034264  013737  002266  002642                  MOV     NC1,DTADPB+12
034272  012737  002754  002644                  MOV     #REG,DTADPB+14  ;POINT TO RHXX/RP07 REG TABLE SAVED ON CMD DONE
034300                                  T12.1:
034300  104402                                  TRAP    C$BSUB
034302  004737  015160                          JSR     PC,EXECMD       ;EXEC CMD
034306  032762  002000  000012                  BIT     #LST,12(R2)     ;LBT=1?
034314  001005                                  BNE     TST12           ;OK, SKIP
034316  104456                                  TRAP    C$ERHRD
034320  000062                                  .WORD   50
034322  007335                                  .WORD   EM50
034324  000000                                  .WORD   0
034326                                  L10067:
034326  104403                                  TRAP    C$ESUB
034330  032762  040000  000012  TST12:  BIT     #ERR,12(R2)     ;OTHER ERRORS?
034336  001403                                  BEQ     1$              ;NO, SKIP
034340  004537  012766                          JSR     R5,ERRANY       ;YES, FLAG THEM
034344  002630                                  DTADPB
034346  062737  177400  002634  1$:     ADD     #SCTRWC,DTADPB+4        ;SET DPB TO READ BEYOND LAST SECTOR
034354                                  T12.2:
034354  104402                                  TRAP    C$BSUB
034356  004737  015160                          JSR     PC,EXECMD       ;ATTEMPT TO READ PAST LAST SECTOR
034362  032762  001000  000014                  BIT     #AOE,14(R2)     ;AOE=1?
034370  001005                                  BNE     TST12A          ;OK, SKIP
034372  104456                                  TRAP    C$ERHRD
034374  000063                                  .WORD   51
034376  007427                                  .WORD   EM51
034400  000000                                  .WORD   0
034402                                  L10070:
034402  104403                                  TRAP    C$ESUB
034404  042762  001000  000014  TST12A: BIC     #AOE,14(R2)     ;CLEAR ERROR IN ERROR TABLE
034412  001005                                  BNE     1$              ;FLAG OTHER ERROR, IF ANY
034414  032762  000200  000042                  BIT     #DVC,42(R2)     ;(ER2)(ER3) = 0 ?
034422  001001                                  BNE     1$              ;NO, FLAG OTHER ERRORS
034424  000403                                  BR      2$              ;SKIP ON (ER1)(ER2)(ER3) = 0
034426  004537  012766          1$:     JSR     R5,ERRANY       ;FLAG ERRORS
034432  002630                                  DTADPB
034434                                  2$:
034434                                  EXIT12:
034434                                  L10066:
034434  104401                                  TRAP    C$ETST
```

```
                                        .SBTTL  TEST 13: OFFSET/RETURN-TO-CENTER-LINE TEST

                                        ;;*****************************************************************************
                                        ;*      ISSUE AN OFFSET COMMAND, PROCESS THE ATTENTION INTERRUPT AND CHECK FOR
                                        ;*      ERRORS,VERIFY THE ASSERTION OF OM OF RPDS.
                                        ;*      ISSUE THE RETURN TO CENTER LINE COMMAND, PROCESS THE ATTENTION INTERRUPT
                                        ;*      AND CHECK FOR ERRORS, VERIFY THE RESETTING OF OM.
                                        ;;*****************************************************************************

034436                                  T13::
034436  004737  020400                          JSR     PC,RPINIT       ;INITIALIZE THE SUB-SYSTEM
034442  012737  000012  002244                  MOV     #10.,ITCNT      ;SET ITERATION COUNT
034450  013737  002664  002630          TEST13: MOV     DRVNO,DTADPB    ;GET DRIVE NUMBER
034456  113737  002220  002640                  MOVB    FS,DTADPB+10    ;OPERATE ON FS,FT,FC
034464  113737  002212  002641                  MOVB    FT,DTADPB+11
034472  013737  002204  002642                  MOV     FC,DTADPB+12
034500  012737  002754  002644                  MOV     #REG,DTADPB+14  ;POINTER TO RHXX/RP07 REG TABLE SAVED ON CMD DONE
034506  012737  000115  002632                  MOV     #OFFSET,DTADPB+2        ;LOAD OFFSET CMD
034514                                  T13.1:
034514  104402                                  TRAP    C$BSUB
034516  004437  015056                          JSR     R4,DRVCAL       ;START A DATA TRANSFER
034522  013702  002644                          MOV     DTADPB+14,R2    ;POINTER TO RHXX/RP07 REG TBL SAVED ON CMD DONE
034526  032762  000001  000012                  BIT     #OM,12(R2)      ;OM = 1?
034534  001005                                  BNE     TST13           ;OK
034536  104456                                  TRAP    C$ERHRD
034540  000066                                  .WORD   54
034542  007547                                  .WORD   EM54
034544  000000                                  .WORD   0
034546                                  L10072:
034546  104403                                  TRAP    C$ESUB

034550  012737  000117  002632          TST13:  MOV     #RTC,DTADPB+2   ;LOAD RETURN TO CENTER LINE CMD
034556                                  T13.2:
034556  104402                                  TRAP    C$BSUB
034560  004437  015056                          JSR     R4,DRVCAL       ;START A DATA TRANSFER
034564  013702  002644                          MOV     DTADPB+14,R2    ;POINTER TO RHXX/RP07 REG TBL SAVED ON CMD DONE
034570  032762  000001  000012                  BIT     #OM,12(R2)      ;OM = 0?
034576  001407                                  BEQ     T13.1$          ;OK
034600  104456                                  TRAP    C$ERHRD
034602  000067                                  .WORD   55
034604  007610                                  .WORD   EM55
034606  000000                                  .WORD   0
034610                                  L10073:
034610  104403                                  TRAP    C$ESUB
034612  104432                                  TRAP    C$EXIT
034614  000010                                  .WORD   L10071-.
034616  005337  002244          T13.1$: DEC     ITCNT           ;DONE ITERATIONS ?
034622  001312                                  BNE     TEST13          ;BR IF NO
034624                                  EXIT13:
034624                                  L10071:
034624  104401                                  TRAP    C$ETST
```

```
                                .SBTTL  TEST 14: RANDOM READ TEST
                                
                                ;;*************************************************************************
                                ;THIS TEST RANDOMLY SELECTS A SECTOR ADDRESS: CYL BETWEEN FC AND LC,
                                ;                                             TRK BETWEEN FT AND LT,
                                ;                                             SEC BETWEEN FS AND LS.
                                ;IF THERE IS NO P-CLOCK, IT THEN EXECUTES A READ DATA COMMAND  TO 1 SECTOR
                                ;AFTER EACH READ-DATA COMMAND, THE PROGRAM VERIFIES THE
                                ;BUS, DATA  AND VERIOUS RHXX/RP07 REGISTERS.
                                ;IF THERE IS A P-CLOCK,THE PROGRAM PERFORMS AN ADDRESS MARK DETECTION TEST:
                                ;IT VERIFIES THAT DATA CAN BE READ CORRECTLY WITHIN THE SAME DISC REVOLUTION
                                ;AS A SECTOR DETECTION. SEARCH FOR THE LOGICAL SECTOR PRECEDING THE SELECTED
                                ;SECTOR TO READ, THEN READ THE SELECTED SECTOR. TIME THE SEARCH DONE READ DONE
                                ;TO BE WITHIN A DISC REVOLUTION. FLAG LOST REVOLUTIONS.
                                ;;*************************************************************************
                                
034626                          T14::
034626  013737  002250  002244          MOV     XTIMES,ITCNT    ;SET ITERATION COUNT
034634  005737  002260                  TST     CLKSTA          ;P-CLK PRESENT?
034640  003036                          BGT     TST14A          ;YES, EXEC RAND READ TEST + AD MARK DET
034642  004737  020400                  JSR     PC,RPINIT       ;INITIALIZE THE SUB-SYSTEM
034646  004737  012364                  JSR     PC,STOPCK       ;STOP THE CLOCK
034652  113737  002664  002630          MOVB    DRVNO,DTADPB    ;LOAD THE DRIVE ADDRESS
034660  112737  000171  002632          MOVB    #RDDAT,DTADPB+2 ;EXECUTE READ COMMAND
034666  012737  177400  002634          MOV     #-256.,DTADPB+4 ;WORD COUNT = 1 SECTOR
034674  012737  042762  002636          MOV     #DBUFF,DTADPB+6 ;BUFFER ADDRESS
034702  012737  002754  002644          MOV     #REG,DTADPB+14  ;RHXX/RP07 REGISTER TABLE

034710  004437  017716          TEST14: JSR     R4,RANADR       ;GENERATE A STARTING ADDRESS
034714                          T14.1:
034714  104402                  TRAP    C$BSUB
034716  004437  015056          JSR     R4,DRVCAL       ;START A DATA TRANSFER
034722                          L10075:
034722  104403                  TRAP    C$ESUB
034724  005337  002244          DEC     ITCNT           ;DONE ITERATIONS ?
034730  001367                  BNE     TEST14          ;BR IF NO
034732  104432                  TRAP    C$EXIT
034734  001206                  .WORD   L10074-.

034736  004437  015612          TST14A: JSR     R4,SRCH00       ;MASS BUS INIT & RECAL
034742  000402                  BR      1$              ;NO RECAL ERROR, CONTINUE
034744  000137  036114          JMP     XIT14           ;EXIT ON RECAL ERROR

034750  004737  015742          1$:     JSR     PC,STRTMR       ;INIT THE TIMERS
034754  042777  000101  155240          BIC     #101,@PKCS      ;STOP THE P-CLOCK
                                                        ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
034762  012746  000300                  MOV     #PRI06,-(SP)
034766  012746  035754                  MOV     #T14.7$,-(SP)
034772  013746  012230                  MOV     PKV,-(SP)
034776  012746  000003                  MOV     #3,-(SP)
035002  104437                  TRAP    C$SVEC
035004  062706  000010                  ADD     #10,SP
                                                        ;SETUP RHXX/RP07 VECTOR
035010  012746  000000                  MOV     #PRI00,-(SP)
035014  012746  015740                  MOV     #DORTI,-(SP)
035020  013746  002654                  MOV     RPVEC,-(SP)
035024  012746  000003                  MOV     #3,-(SP)
```

TEST 14: RANDOM READ TEST

```
   035030  104437                          TRAP    C$SVEC
   035032  062706  000010                  ADD     #10,SP
47 035036  005005                          CLR     R5              ;SET COUNT-UP FLAG FOR COUNT SUBR
48 035040  005037  002240                  CLR     TEMPO           ;CLEAR TEMPORARY LOST REVOLUTION COUNT
49
50                                         ;REDUCE THE TARGET SECTOR BY 2, TO COMPUTE THE VALUE OF THE 2ND LOGICAL
51                                         ;SECTOR.
52
53 035044  004437  017716          T14.1$: JSR     R4,RANADR       ;GEN A RAND ADR: CYL, TRK, SEC
54 035050  113701  002640                  MOVB    DTADPB+10,R1    ;GET TARGET SECTOR ADDRESS TO READ AND
55 035054  010137  002254                  MOV     R1,TRGSEC       ;SAVE IT FOR LATER
56 035060  032777  000004  145614          BIT     #ILV,@RPDS      ;IS INTERLEAVED SECTOR ENABLED ?
57 035066  001006                          BNE     2$              ;BR IF YES
58 035070  162701  000002                  SUB     #2,R1           ;BACKUP THE SECTOR ADDRESS FOR THE SEARCH
59 035074  002002                          BGE     1$              ;BR IF < SECTOR 0
60 035076  062701  000062                  ADD     #50.,R1         ;ADJUST FOR ADDRESS BEFORE SECTOR 0
61 035102  000411                  1$:     BR      4$              ;EXIT
62
63 035104  005701                  2$:     TST     R1              ;IS IT SECTOR ADDR 0 ?
64 035106  001405                          BEQ     3$              ;BR IF YES
65 035110  162701  000031                  SUB     #25.,R1         ;IS IT SECTOR ADDR 25 ?
66 035114  001002                          BNE     3$              ;BR IF NO
67 035116  062701  000031                  ADD     #25.,R1         ;ADJUST FOR THE ADDRESS BEFORE SECTOR 0
68 035122  062701  000030          3$:     ADD     #24.,R1         ;REDUCE THE TARGET SECTOR BY 2
69 035126                          4$:
70                                         ;PREPARE TO SEARCH
71 035126                          T1410$:
   035126                          T14.2:
   035126  104402                          TRAP    C$BSUB
72 035130  010137  002252                  MOV     R1,SRHSEC       ;SAVE SEARCH SECTOR FOR LATER
73 035134  013777  002642  145562          MOV     DTADPB+12,@RPDC ;CYL
74 035142  110146                          MOVB    R1,-(SP)        ;MERGE SECTOR
75 035144  113766  002641  000001          MOVB    DTADPB+11,1(SP) ;AND TRK
76 035152  012677  145520                  MOV     (SP)+,@RPDA     ;LOAD TRK/SEC
77 035156  012777  177400  145506          MOV     #-256.,@RPWC    ;READ 1 SECTOR
78 035164  012777  042762  145502          MOV     #DBUFF,@RPBA    ;SET DATA BUFFER ADR
79 035172  012703  002502                  MOV     #T1418,R3       ;TIMING LIMITS FOR COUNT SUBR
80 035176  012777  000006  155020          MOV     #6,@PKB         ;ALLOW > 6 REVOLUTIONS PER SEARCH:
81
82                                         ;3 FOR IMPLIED MAX SEEK (46 MSEC OR ABOUT 3 REVOLUTIONS)
83                                         ;3 FOR WORST CASE SEARCH(SECT CMP ERR OR HDR CRC ERR)
84
85 035204  012777  000105  155010          MOV     #105,@PKCS      ;START P-CLOCK:IE,COUNT DOWN,LINE FREQ
86 035212  012777  000131  145450          MOV     #SEARCH,@RPCS1  ;START A SEARCH
87 035220  000001                          WAIT                    ;WAIT ON INTERRUPT
88 035222  017746  155000                  MOV     @PKC,-(SP)      ;SAVE THE CLOCK
89 035226  042777  000101  154766          BIC     #101,@PKCS      ;STOP THE CLOCK
90 035234  012677  154764                  MOV     (SP)+,@PKB      ;AND RESTORE THE COUNTED VALUE
91 035240  032777  040000  145434          BIT     #BIT14,@RPDS    ;ERROR?
92 035246  001533                          BEQ     T1411$          ;NO--BRANCH
93 035250  004737  010750                  JSR     PC,SAVREG       ;;SAVE R0-R5
   035254  012702  002630                  MOV     #DTADPB,R2      ;DPB POINTER
   035260  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
   035264  012777  000040  145406          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
   035272  013777  002630  145400          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
   035300  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
94 035304  004537  012766                  JSR     R5,ERRANY
```

TEST 14: RANDOM READ TEST

```
 95 035310  002630                          DTADPB                  ;FIND OUT WHAT ERROR
 96 035312                          L10076:
    035312  104403                          TRAP    C$ESUB
 97 035314  032773  000210  002264          BIT     #BIT3!BIT7,SVSTAT       ;RETRY ALLOWED ?
 98 035322  001022                          BNE     1$                      ;BRANCH IS SO
 99 035324  012746  004511                  MOV     #SEAERR,-(SP)
    035330  012746  000001                  MOV     #1,-(SP)
    035334  010600                          MOV     SP,R0
    035336  104417                          TRAP    C$PNTF
    035340  062706  000004                  ADD     #4,SP
100 035344  012746  004614                  MOV     #ABOTST,-(SP)
    035350  012746  000001                  MOV     #1,-(SP)
    035354  010600                          MOV     SP,R0
    035356  104417                          TRAP    C$PNTF
    035360  062706  000004                  ADD     #4,SP
101 035364  000137  036060                  JMP     T14.8$
102 035370                          1$:
103 035370  012737  000020  002350          MOV     #16.,WCEFLG     ;RETRY 16 TIMES
104 035376  012777  000006  154620  2$:     MOV     #6,@PKB         ;ALLOW > 6 REVOLUTIONS PER SEARCH:
105
106                                         ;3 FOR IMPLIED MAX SEEK (46 MSEC OR ABOUT 3 REVOLUTIONS)
107                                         ;3 FOR WORST CASE SEARCH(SECT CMP ERR OR HDR CRC ERR)
108
109 035404  012777  000105  154610          MOV     #105,@PKCS      ;START P-CLOCK:IE,COUNT DOWN,LINE FREQ
110 035412  012777  000131  145250          MOV     #SEARCH,@RPCS1  ;START A SEARCH
111 035420  000001                          WAIT                    ;WAIT ON INTERRUPT
112 035422  017746  154600                  MOV     @PKC,-(SP)      ;SAVE THE CLOCK
113 035426  042777  000101  154566          BIC     #101,@PKCS      ;STOP THE CLOCK
114 035434  012677  154564                  MOV     (SP)+,@PKB      ;AND RESTORE THE COUNTED VALUE
115 035440  032777  040000  145234          BIT     #BIT14,@RPDS    ;ERROR?
116 035446  001433                          BEQ     T1411$          ;EXIT IF NONE
117 035450  012777  000040  145222          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
118 035456  013777  002630  145214          MOV     DTADPB,@RPCS2   ;DRIVE ADDRESS
119 035464  005337  002350                  DEC     WCEFLG          ;OVER RETRY LIMIT ?
120 035470  001342                          BNE     2$              ;BRANCH IF NOT
121 035472  012746  004550                  MOV     #SEABAD,-(SP)
    035476  012746  000001                  MOV     #1,-(SP)
    035502  010600                          MOV     SP,R0
    035504  104417                          TRAP    C$PNTF
    035506  062706  000004                  ADD     #4,SP
122 035512  012746  004614                  MOV     #ABOTST,-(SP)
    035516  012746  000001                  MOV     #1,-(SP)
    035522  010600                          MOV     SP,R0
    035524  104417                          TRAP    C$PNTF
    035526  062706  000004                  ADD     #4,SP
123 035532  000552                          BR      T14.8$          ;EXIT
124 035534                          T14.3:
    035534  104402                          TRAP    C$BSUB
125 035536  013777  002640  145132  T1411$: MOV     DTADPB+10,@RPDA ;SET TRK/SECT TO READ
126 035544  005077  154454                  CLR     @PKB            ;CLEAR P-CLK BUFFER COUNT
127 035550  012777  000171  145112          MOV     #RDDAT,@RPCS1   ;START A READ
128 035556  012777  000121  154436          MOV     #121,@PKCS      ;START THE CLOCK:IE=1,UP,SINGLE,10US
129 035564  000001                          WAIT                    ;WAIT ON INTERRUPT
130 035566  017746  154434                  MOV     @PKC,-(SP)      ;SAVE THE CLOCK
131 035572  042777  000101  154422          BIC     #101,@PKCS      ;STOP THE CLOCK
132 035600  012677  154420                  MOV     (SP)+,@PKB      ;AND RESTORE THE COUNTED VALUE
133 035604  032777  040000  145070          BIT     #BIT14,@RPDS    ;ERR=1?
```

```
134 035612  001437                        BEQ     T1412$          ;NO--BRANCH
135 035614  004737  010750                JSR     PC,SAVREG       ;;SAVE R0-R5
    035620  012702  002630                MOV     #DTADPB,R2      ;DPB POINTER
    035624  004737  024644                JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
    035630  012777  000040  145042        MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
    035636  013777  002630  145034        MOV     DTADPB,@RPCS2   ;SELECT DRIVE
    035644  004737  011002                JSR     PC,RESREG       ;;RESTORE R0-R5
136 035650  004537  012766                JSR     R5,ERRANY       ;FIND OUT WHAT ERROR
137 035654  002630                        DTADPB
138 035656                          L10077:
    035656  104403                        TRAP    C$ESUB
139 035660  032737  000040  002264        BIT     #BIT5,SVSTAT    ;POSITION ERROR?
140 035666  001411                        BEQ     T1412$          ;NO, CONTINUE
141 035670  012746  004633                MOV     #POSERR,-(SP)
    035674  012746  000001                MOV     #1,-(SP)
    035700  010600                        MOV     SP,R0
    035702  104417                        TRAP    C$PNTF
    035704  062706  000004                ADD     #4,SP
142 035710  000463                        BR      T14.8$
143
144 035712  004737  016212          T1412$: JSR   PC,COUNT        ;COUNT TIME SEARCH DONE-READ DONE
145 035716  023737  002320  002240        CMP     TIM.UP+6,TEMP0  ;ANY LOST REVOLUTIONS ?
146 035724  001406                        BEQ     1$              ;BRANCH IF NO
147 035726  005237  002240                INC     TEMP0           ;UPDATE TEMPORARY LOST REVOLUTION COUNT
148 035732  104455                        TRAP    C$ERDF
    035734  000064                        .WORD   52
    035736  007521                        .WORD   EM52
    035740  010560                        .WORD   DH52
149 035742  021237  002250          1$:     CMP   (R2),XTIMES     ;REPEATED 1024 TIMES?
150 035746  002044                        BGE     T14.8$          ;YES, CONCLUDE TEST
151 035750  000137  035044                JMP     T14.1$          ;NO, CONTINUE
152
153 035754  004737  012426          T14.7$: JSR   PC,FORSEC       ;RESET TIMER TO 4 SEC, CHANGE CLK SERVICE AD
154                                                               ;DROP THE PRIORITY
155 035760  012700  000000                MOV     #PRI00,R0
    035764  104441                        TRAP    C$SPRI
156 035766  004737  010750                JSR     PC,SAVREG       ;;SAVE R0-R5
    035772  012702  002630                MOV     #DTADPB,R2      ;DPB POINTER
    035776  004737  024644                JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
    036002  012777  000040  144670        MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
    036010  013777  002630  144662        MOV     DTADPB,@RPCS2   ;SELECT DRIVE
    036016  016102  000014                MOV     14(R1),R2       ;ADDRESS OF SAVED REGISTER TABLE
    036022  016237  000036  002276        MOV     36(R2),CYL.RD   ;GET CURRENT CYLINDER
    036030  116237  000006  002302        MOVB    6(R2),SEC.RD    ;GET CURRENT SECTOR
    036036  116237  000007  002300        MOVB    7(R2),TRK.RD    ;GET CURRENT TRACK
    036044  004737  011002                JSR     PC,RESREG       ;;RESTORE R0-R5
157 036050  104456                        TRAP    C$ERHRD
    036052  000024                        .WORD   20
    036054  006201                        .WORD   EM20
    036056  007672                        .WORD   DH44
158 036060                          T14.8$:
    036060  012777  000040  144612        MOV     #CLR,@RPCS2     ;CLEAR THE MASSBUS
    036066  013777  002630  144604        MOV     DTADPB,@RPCS2   ;& SELECT DRIVE
159 036074  004737  012000                JSR     PC,ST.CLK       ;INITIALIZE THE CLOCK
160 036100  004437  016504                JSR     R4,TYPTIM       ;GO TYPE THE TIMES
    036104  002502                        T1418                   ;POINTER
161 036106  004437  016354                JSR     R4,SPTYP
```

```
    162 036112  002542                        SP1418
    163 036114                          XIT14:                          ;SETUP RMXX/RP07 VECTOR
    164 036114  013746  002656                  MOV     RPVEC+2, (SP)
        036120  012746  023046                  MOV     #ISRV,-(SP)
        036124  013746  002654                  MOV     RPVEC, (SP)
        036130  012746  000003                  MOV     #3,-(SP)
        036134  104437                          TRAP    C$SVEC
        036136  062706  000010                  ADD     #10,SP
    165 036142                          L10074:
        036142  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 15: FE CYLINDER ADDRESSING TEST

                                ;;*************************************************************************
                                ;       THIS TEST LOCATES THE FE CYLINDERS;
                                ;       THE FE CYLINDERS ARE CYL 630 AND 631,
                                ;
                                ;       AT THE FIRST TEST CYCLE, THE TEST SETS
                                ;       "DMD" BIT OF THE RPMR REGISTER IN ORDER TO ACCESS
                                ;       FE CYLINDERS.
                                ;
                                ;       THEN, THIS TEST EXECUTES READ HEADER AND DATA COMMANDS
                                ;       SEQUENTIALLY TO VERIFY THE ADDRESSING OF THE SECTOR 0
                                ;       OF EACH TRACK ( 0 TO 31 ) ON THE FIRST FE CYLINDER.
                                ;
                                ;       AT THE SECOND TEST CYCLE,
                                ;       A SEEK COMMAND IS EXECUTED TO ACCESS THE SECOND FE CYLINDER.
                                ;;*************************************************************************

036144                          T15::
036144  004737  020400                  JSR     PC,RPINIT       ;INITIALIZE THE SUB SYSTEM
036150  004737  012364                  JSR     PC,STOPCK       ;STOP THE CLOCK
036154  012737  000012  002244          MOV     #10.,ITCNT      ;SET ITERATION COUNT
036162  113737  002664  002630  TEST15: MOVB    DRVNO,DTADPB    ;LOAD THE DRIVE ADDRESS INTO DPB
036170  012737  177400  002634          MOV     #SCTRWC,DTADPB+4        ;256 WORDS
036176  012737  042762  002636          MOV     #DBUFF,DTADPB+6 ;BUFFER ADDRESS
036204  012737  000000  002640          MOV     #0,DTADPB+10    ;TRACK 0, SECTOR 0
036212  013737  002270  002642          MOV     NC2,DTADPB+12   ;ASSUME NO FIX HEAD OPTION
036220  013704  002664                  MOV     DRVNO,R4        ;TO FIND OUT FIX HEAD OPTION
036224  122764  000005  020320          CMPB    #5,DRVTYP(R4)   ;BRANCH IF NO FIX HEAD
036232  001411                          BEQ     1$
036234  122764  000004  020320          CMPB    #4,DRVTYP(R4)   ;DOES IT CONTAIN FIX HEAD
036242  001405                          BEQ     1$              ;BRANCH IS SO
036244  104455                          TRAP    C$ERDF
036246  000044                          .WORD   36
036250  007017                          .WORD   EM36
036252  010702                          .WORD   DH25
036254  104444                          TRAP    C$DCLN
036256  052737  100000  002630  1$:     BIS     #DMD,DTADPB     ;SET MAINTENACE MODE FLAG AT THE 2ND BYTE
036264  112737  000105  002632          MOVB    #SEEK,DTADPB+2  ;DO AN EXPLICIT SEEK
036272                          T15.1:
036272  104402                          TRAP    C$BSUB
036274  004437  015056                  JSR     R4,DRVCAL       ;START A DATA TRANSFER
036300                          L10101:
036300  104403                          TRAP    C$ESUB
036302  005737  002646                  TST     DTADPB+16       ;ANY ERROR CONDITION EXISTS ?
036306  100437                          BMI     EXIT15          ;EXIT IF SO
036310                          T15.2:
036310  104402                          TRAP    C$BSUB
036312  112737  000173  002632  TST15:  MOVB    #RDHD,DTADPB+2  ;READ THE HEADER AND DATA
036320  004437  015056                  JSR     R4,DRVCAL       ;START A DATA TRANSFER
036324                          L10102:
036324  104403                          TRAP    C$ESUB
036326  005737  002646                  TST     DTADPB+16       ;ANY ERROR
036332  100425                          BMI     EXIT15          ;EXIT IF SO
036334  123737  002272  002641          CMPB    NT1,DTADPB+11   ;LAST TRACK CHECKED ?
036342  101403                          BLOS    1$              ;BRANCH IF NOT
036344  105237  002641                  INCB    DTADPB+11
```

```
     51 036350  000760                          BR      TST15
     52
     53 036352  105037  002641          1$:     CLRB    DTADPB+11       ;RESET TO TRACK 0
     54 036356  005237  002642                  INC     DTADPB+12       ;ACCESS 2ND FE CYL
     55 036362  112737  000105  002632          MOVB    #SEEK,DTADPB+2  ;DO AN EXPLICIT SEEK
     56 036370                          T15.3:
        036370  104402                          TRAP    C$BSUB
     57 036372  004437  015056                  JSR     R4,DRVCAL       ;START A DATA TRANSFER
     58 036376                          L10103:
        036376  104403                          TRAP    C$ESUB
     59 036400  005337  002244                  DEC     ITCNT           ;DONE ITERATIONS ?
     60 036404  001266                          BNE     TEST15          ;BR IF NO
     61 036406  004737  020400          EXIT15: JSR     PC,RPINIT       ;INITIALIZE THE SUB SYSTEM
     62 036412  042737  100000  002630          BIC     #DMD,DTADPB     ;CLEAR THE DMD BIT IN THE DPB
     63 036420                          L10100:
        036420  104401                          TRAP    C$ETST
```

TEST 16: FE CYLINDER WRITE AND WRITE CHECK TEST

```
                                .SBTTL  TEST 16: FE CYLINDER WRITE AND WRITE CHECK TEST
                                ;
                                ;;*************************************************************************
                                ;THIS TEST EXECUTES WRITE-DATA SEQUENTIALLY FROM TRACK FT TO TRACK LT
                                ;ON THE FIRST FE CYLINDER WHICH IS ACCESSIBLE IN MAINTENANCE MODE.
                                ;THE PARAMETERS ARE AS FOLLOWS:
                                ;
                                ;THE FULL TRACK TRANSFER IS MADE IN 2 PASSES:
                                ;       1ST PASS, SECTORS:  00. THRU 24.
                                ;       2ND PASS, SECTORS:  25. THRU 49.
                                ;
                                ;       STARTING TRACK          = FT
                                ;       ENDING TRACK            = LT
                                ;       INCREMENT TRACK         = IT
                                ;       STARTING SECTOR         = FS
                                ;;*************************************************************************
                                ;
036422                          T16::
036422  004737  020400          JSR     PC,RPINIT       ;INITIALIZE THE SUB-SYSTEM
036426  113737  002664  002630  MOVB    DRVNO,DTADPB    ;LOAD THE DRIVE ADDRESS
036434  013737  002354  002634  MOV     TRKWC,DTADPB+4  ;WORD COUNT = HALF TRACK
036442  012737  042762  002636  MOV     @DBUFF,DTADPB+6 ;BUFFER ADDRESS
036450  113737  002212  002641  MOVB    FT,DTADPB+11    ;FIRST  TRACK
036456  013737  002270  002642  MOV     NC2,DTADPB+12   ;FIRST FE CYLINDER W/O FIX H
036464  012737  002754  002644  MOV     @REG,DTADPB+14  ;SAVED RHXX/RP07 REGISTER
036472  105037  002631          CLRB    DTADPB+1        ;CLEAR THE HCI
036476  052737  100000  002630  BIS     @DMD,DTADPB     ;SET THE MAINTENANCE MODE FLAG
036504  004737  012364          JSR     PC,STOPCK       ;STOP THE CLOCK
                                ;
036510  005037  002256  TEST16: CLR     DOTWO           ;RESET 2 ITERATIONS CONTROL
036514  105037  002640          CLRB    DTADPB+10       ;RESTART AT SECTOR 0
036520  013702  002224          MOV     PAT,R2          ;FILL THE DATA PATTERN
036524  013703  002636          MOV     DTADPB+6,R3     ;BUFFER ADDRESS
036530  013704  002634          MOV     DTADPB+4,R4     ;WORD COUNT
036534  010223          1$:     MOV     R2,(R3)+
036536  005204                  INC     R4
036540  001375                  BNE     1$              ;BRANCH IF PATTERN IS WRITTEN TO ALL BUFF LOC
036542                  T16.1:
036542  104402                  TRAP    C$BSUB
036544  112737  000105  002632  WRPAT:  MOVB    @SEEK,DTADPB+2  ;DO A SEEK FIRST
036552  004437  015056          JSR     R4,DRVCAL       ;START A DATA TRANSFER
036556                  L10105:
036556  104403                  TRAP    C$ESUB
036560                  T16.2:
036560  104402                  TRAP    C$BSUB
036562  112737  000161  002632          MOVB    @WRTDAT,DTADPB+2        ;WRITE DATA COMMAND
036570  004437  015056          JSR     R4,DRVCAL       ;START A DATA TRANSFER
036574  112737  000151  002632          MOVB    @WCKD,DTADPB+2  ;CHANGE TO WRITE CHECK DATA COMMAND
036602  004437  015056          JSR     R4,DRVCAL       ;START A DATA TRANSFER
036606                  L10106:
036606  104403                  TRAP    C$ESUB
036610  005737  002256          TST     DOTWO           ;DONE HALF TRACK TWICE?
036614  100406                  BMI     1$              ;YES, EXIT 2 ITERATIONS LOOP
036616  005337  002256          DEC     DOTWO           ;NO, MARK 2ND ITERATION
036622  112737  000031  002640  MOVB    @25.,DTADPB+10  ;TFR 2ND HALF OF TRACK
036630  000745                  BR      WRPAT           ;LOOP TO TFR 2ND HALF TRACK
                                ;
```

TEST 16: FE CYLINDER WRITE AND WRITE CHECK TEST

```
     036632  005037  002256          1$:     CLR     DOTWO           ;RESET PARAMETERS FOR 1ST LOOP
     036636  105037  002640                  CLRB    DTADPB+10       ;RESTART AT SECTOR 0
     036642  013702  002224          2$:     MOV     PAT,R2          ;COMPLEMENT THE PATTERN
     036646  005102                          COM     R2
     036650  013703  002636                  MOV     DTADPB+6,R3     ;BUFFER ADDRESS
     036654  013704  002634                  MOV     DTADPB+4,R4     ;WORD COUNT
     036660  010223                  3$:     MOV     R2,(R3)+        ;FILL THE BUFFER WITH COMPLEMENT DATA
     036662  005204                          INC     R4
     036664  001375                          BNE     3$              ;BRANCH IF NOT DONE
     036666                          T16.3:
     036666  104402                          TRAP    C$BSUB
     036670  112737  000105  002632  WRPATN: MOVB    #SEEK,DTADPB+2  ;SEEK COMMAND
     036676  004437  015056                  JSR     R4,DRVCAL       ;START A DATA TRANSFER
     036702                          L10107:
     036702  104403                          TRAP    C$ESUB
     036704                          T16.4:
     036704  104402                          TRAP    C$BSUB
     036706  112737  000161  002632          MOVB    #WRTDAT,DTADPB+2        ;WRITE DATA FIRST
     036714  004437  015056                  JSR     R4,DRVCAL       ;START A DATA TRANSFER
     036720  112737  000151  002632          MOVB    #WCKD,DTADPB+2  ;CHANGE TO WRITE-CHECK
     036726  004437  015056                  JSR     R4,DRVCAL       ;START A DATA TRANSFER
     036732                          L10110:
     036732  104403                          TRAP    C$ESUB
     036734  005737  002256                  TST     DOTWO           ;DONE HALF TRACK TWICE?
     036740  100406                          BMI     1$              ;YES, EXIT 2 ITERATIONS LOOP
     036742  005337  002256                  DEC     DOTWO           ;NO, MARK 2ND ITERATION
     036746  112737  000031  002640          MOVB    #25.,DTADPB+10  ;TFR 2ND HALF OF TRACK
     036754  000745                          BR      WRPATN          ;2ND ITERATION

     036756  11370?  002641          1$:     MOVB    DTADPB+11,R2    ;UPDATE THE TRACK ADDRESS
     036762  063702  002216                  ADD     IT,R2
     036766  110237  002641                  MOVB    R2,DTADPB+11
     036772  023702  002214                  CMP     LT,R2
     036776  101244                          BHI     TEST16
     037000  042737  100000  002630  EXIT16: BIC     #DMD,DTADPB     ;RESET THE MAINTENANCE FLAG
     037006                          L10104:
     037006  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 17: WRITE TEST
                                ;
                                ;;*****************************************************************************
                                ;THIS TEST EXECUTES WRITE + WRITE CHECK DATA ON EVERY TRACK OF STARTING
                                ;CYLINDER AND ENDING CYLINDER. AFTER EACH WRITE + WRITE CHECK OPERATION,
                                ;THE TRACK ADDRESS IS UPDATE BY THE AMOUNT SPECIFIED IN THE "INCREMENT
                                ;TRACK".
                                ;
                                ;NOTE: CYLINDER 629. WILL NOT BE USED. IN ORDER TO PRESERVE THE BAD
                                ;      SECTOR FILE DATA.
                                ;
                                ;THE FULL TRACK TRANSFER IS MADE IN 2 PASSES:
                                ;       1ST PASS. SECTORS:  00. THRU 24.
                                ;       2ND PASS. SECTORS:  25. THRU 49.
                                ;
                                ;THE PARAMETERS:
                                ;       STARTING CYLINDER
                                ;       ENDING CYLINDER
                                ;       STARTING TRACK
                                ;       ENDING TRACK
                                ;       INCREMENT TRACK
                                ;       STARTING SECTOR
                                ;;*****************************************************************************

037010                          T17::
037010  004737  020400                  JSR     PC,RPINIT       ;INITIALIZE THE SUB-SYSTEM
037014  105737  002235                  TSTB    WRTALL          ;DID OPERATOR WANT TO WRITE ON MEDIUM?
037020  001015                          BNE     1$              ;BR IF YES
                                                                ;NOTIFY OPERATOR THAT TEST WAS NOT RUN
037022  013746  002114                  MOV     L$TEST,-(SP)
037026  012746  004432                  MOV     #WRTENM,-(SP)
037032  012746  000002                  MOV     #2,-(SP)
037036  010600                          MOV     SP,R0
037040  104417                          TRAP    C$PNTF
037042  062706  000006                  ADD     #6,SP
037046  005000                          CLR     R0              ;CLEAR R0 FOR TRAP
037050  104432                          TRAP    C$EXIT
037052  000256                          .WORD   L10111-.

037054  113737  002664  002630  1$:     MOVB    DRVNO,DTADPB    ;DRIVE ADDRESS
037062  013737  002354  002634          MOV     TRKWC,DTADPB+4  ;HALF TRACK
037070  012737  042762  002636          MOV     #DBUFF,DTADPB+6 ;BUFFER ADDRESS
037076  112737  000000  002640          MOVB    #0,DTADPB+10    ;SECTOR ADDRESS
037104  113737  002212  002641          MOVB    FT,DTADPB+11    ;TRACK ADDRESS
037112  013737  002204  002642          MOV     FC,DTADPB+12    ;CYLINDER ADDRESS
037120  012737  002754  002644          MOV     #REG,DTADPB+14  ;THE SAVED REGISTER TABLE ADDRESS
037126  005037  002256                  CLR     DOTWO           ;RESET 2 ITERATION CONTROL
037132  013702  002224                  MOV     PAT,R2          ;PATTERN IN R2,FILL
037136  013703  002636                  MOV     DTADPB+6,R3     ;BUFFER ADDRESS
037142  013704  002634                  MOV     DTADPB+4,R4     ;TOTAL NUMBER OF WORD COUNT
037146  010223                  2$:     MOV     R2,(R3)+        ;LOAD DATA PATTERN BUFFER
037150  005204                          INC     R4              ;INCREMENT WORD COUNT
037152  001375                          BNE     2$              ;BRANCH IF NOT DONE
037154  004737  012364                  JSR     PC,STOPCK       ;STOP THE CLOCK
037160  005005                          CLR     R5              ;1ST PASS FLAG
037162                          T17.1:
037162  104402                          TRAP    C$BSUB
```

TEST 17: WRITE TEST

```
                                TEST17: CMP     DTADPB+12,#629. ;IS THIS THE LAST USER CYLINDER ?
                                        BNE     1$              ;BR IF NO
                                        DEC     DTADPB+12       ;DON'T WRITE ON LAST USER CYLINDER
                                1$:     MOVB    #WRTDAT,DTADPB+2        ;WRITE DATA COMMAND
                                        JSR     R4,DRVCAL       ;DO THE WRITE COMMAND
                                        MOVB    #WCKD,DTADPB+2  ;DO THE WRITE CHECK COMMAND
                                        JSR     R4,DRVCAL       ;DO THE WRITE CHECK COMMAND
                                L10112:
                                        TRAP    C$ESUB
                                        TST     DOTWO           ;DONE HALF TRACK TWICE?
                                        BMI     3$              ;YES, EXIT 2 ITERATIONS LOOP
                                        DEC     DOTWO           ;NO, MARK 2ND ITERATION
                                        MOVB    #25.,DTADPB+10  ;GET STARTING SECTOR FOR 2ND HALF OF TRACK
                                2$:     BR      TEST17          ;LOOP TO XFER 2ND HALF OF TRACK

                                3$:     CLR     DOTWO           ;RESET PARAMETERS FOR 1ST LOOP
                                        CLRB    DTADPB+10       ;RESTART AT SECTOR 0
                                4$:     MOVB    DTADPB+11,R2    ;UPDATE THE TRACK ADDRESS
                                        ADD     IT,R2           ;INCREMENT BY THE SPECIFIED AMOUNT
                                        CMP     LT,R2           ;OVER THE LIMIT ?
                                        BLO     5$              ;BRANCH IF SO
                                        MOVB    R2,DTADPB+11    ;UPDATE THE TRACK ADDRESS
                                        BR      TEST17          ;LOOP BACK

                                5$:     TST     R5              ;IS IT 2ND PASS?
                                        BNE     EXIT17          ;YES, EXIT
                                        INC     R5              ;NO, FLAG 2ND PASS
                                        MOVB    FT,DTADPB+11    ;RESET THE STARTING TRACK
                                        MOV     LC,DTADPB+12    ;UPDATE THE CYLINDER ADDRESS TO LC
                                        BR      TEST17          ;LOOP BACK

                                EXIT17:
                                L10111:
                                        TRAP    C$ETST
```

```
                                .SBTTL  TEST 18: RANDOM WRITE TEST
                                ;
                                ;;*****************************************************************************
                                ;THIS TEST EXECUTES WRITE + WRITE CHECK DATA RANDOMLY;
                                ;IN THE PACK AREA BONDED BY THE (STARTING CYLINDER, ENDING CYLINDER)
                                ;                              (STARTING TRACK, ENDING TRACK)
                                ;                              (STARTING SECTOR, ENDING SECTOR)
                                ;THE TRANSFER SIZE IS ALWAYS EQUAL TO ONE SECTOR.
                                ;
                                ;IF THERE IS A P-CLOCK,THE PROGRAM PERFORMS AN ADDRESS MARK DETECTION TEST:
                                ;IT VERIFIES THAT DATA CAN BE WRITTEN CORRECTLY WITHIN THE SAME DISC REVOLUTION
                                ;AS A SECTOR DETECTION. SEARCH FOR THE SECOND LOGICAL SECTOR PRECEDING THE
                                ;SELECTED SECTOR TO WRITE, THEN WRITE THE SELECTED SECTOR. TIME THE SEARCH
                                ;DONE WRITE DONE TO BE WITHIN A DISC REVOLUTION. FLAG LOST REVOLUTIONS.
                                ;
                                ;NOTE: CYLINDER 629. WILL NOT BE USED, IN ORDER TO PRESERVE THE BAD
                                ;      SECTOR FILE DATA.
                                ;
                                ;PARAMETERS:
                                ;       STARTING CYLINDER
                                ;       ENDING CYLINDER
                                ;       STARTING TRACK
                                ;       ENDING TRACK
                                ;       STARTING SECTOR
                                ;       ENDING SECTOR
                                ;       PATTERN
                                ;;*****************************************************************************
037332                          T18::
037332  004737  020400                JSR     PC,RPINIT       ;INITIALIZE THE SUB-SYSTEM
037336  105737  002235                TSTB    WRTALL          ;DID OPERATOR WANT TO WRITE ON MEDIUM?
037342  001015                      BNE     1$              ;BR IF YES
                                                            ;NOTIFY OPERATOR THAT TEST WAS NOT RUN
037344  013746  002114                MOV     L$TEST,-(SP)
037350  012746  004432                MOV     @WRTENM,-(SP)
037354  012746  000002                MOV     @2,-(SP)
037360  010600                      MOV     SP,R0
037362  104417                      TRAP    C$PNTF
037364  062706  000006                ADD     @6,SP
037370  005000                      CLR     R0              ;CLEAR R0 FOR TRAP
037372  104432                      TRAP    C$EXIT
037374  001600                      .WORD   L10113-.

037376  013737  002250  002244  1$:   MOV     XTIMES,ITCNT    ;SET ITERATION COUNT
037404  113737  002664  002630        MOVB    DRVNO,DTADPB    ;YES, PROCEED:  SET UP THE PAPAMETERS
037412  012737  177400  002634        MOV     @-256.,DTADPB+4 ;WORD COUNT SET TO ONE SECTOR
037420  012737  042762  002636        MOV     @DBUFF,DTADPB+6 ;BUFFER ADDRESS
037426  012737  002754  002644        MOV     @REG,DTADPB+14  ;THE SAVED RHXX/RP07 REGISTER TABLE
037434  013702  002634                MOV     DTADPB+4,R2     ;WORD COUNT
037440  013703  002636                MOV     DTADPB+6,R3     ;BUFFER ADDRESS
037444  013704  002224                MOV     PAT,R4          ;PATTERN
037450  010423                  2$:   MOV     R4,(R3)+        ;FILL THE BUFFER WITH DEFAULT PATTERN
037452  005202                      INC     R2              ;INCREMENT THE WORD COUNT
037454  001375                      BNE     2$              ;LOOP IF NOT DONE
037456  005737  002260                TST     CLKSTA          ;P-CLK PRESENT?
037462  003055                      BGT     TST18A          ;YES, EXEC RAND WRT TST + AD MRK DET TST
037464  004737  020400                JSR     PC,RPINIT       ;INITIALIZE THE SUB-SYSTEM
```

```
TEST 18: RANDOM WRITE TEST

     54
     55 037470  004737  012364          TEST18: JSR     PC,STOPCK       ;STOP THE CLOCK
     56 037474  004437  017716          1$:     JSR     R4,RANADR       ;GENERATE THE RANDOM STARTING ADDRESS
     57                                                                  ;MAKE SURE YOU DON'T WRITE IN THE BAD SEC FILE
     58 037500  123727  002641  000037          CMPB    DTADPB+11,#31.  ;IS THIS THE LAST TRACK ?
     59 037506  001004                          BNE     2$              ;BR IF NO
     60 037510  023727  002642  001165          CMP     DTADPB+12,#629. ;IS THIS THE LAST USER CYLINDER ?
     61 037516  001766                          BEQ     1$              ;BR IF YES
     62 037520  105737  002234          2$:     TSTB    RANPAT          ;SELECT RANDOM PATTERN ?
     63 037524  001413                          BEQ     5$              ;BRANCH IF NOT
     64 037526  013702  002634                  MOV     DTADPB+4,R2     ;WORD COUNT 2'S COMPLEMENT
     65 037532  013703  002636                  MOV     DTADPB+6,R3     ;BUFFER ADDRESS
     66 037536  004737  011712          3$:     JSR     PC,RAND         ;GERERATE NEW RANDOM NUMBER
     67 037542  013723  011774          4$:     MOV     $RP1,(R3)+      ;FILL THE BUFFER WITH RANDOM PATTERN
     68 037546  062702  000001                  ADD     #1,R2           ;FINISH ?
     69 037552  100773                          BMI     4$              ;LOOP BACK , IF NOT DONE
     70 037554                          5$:
        037554                          T18.1:
        037554  104402                          TRAP    C$BSUB
     71 037556  112737  000161  002632          MOVB    #WRTDAT,DTADPB+2        ;DO A WRITE DATA
     72 037564  004437  015056                  JSR     R4,DRVCAL
     73 037570  112737  000151  002632          MOVB    #WCKD,DTADPB+2  ;DO A WRITE CHECK DATA
     74 037576  004437  015056                  JSR     R4,DRVCAL
     75 037602                          L10114:
        037602  104403                          TRAP    C$ESUB
     76 037604  005337  002244                  DEC     ITCNT           ;DONE ITERATIONS ?
     77 037610  001327                          BNE     TEST18          ;BR IF NO
     78 037612                          EXIT18:
        037612  104432                          TRAP    C$EXIT
        037614  001360                          .WORD   L10113-.
     79
     80 037616  004437  015612          TST18A: JSR     R4,SRCH00       ;MASS BUS INIT & RECAL
     81 037622  000402                          BR      1$              ;NO RECAL ERROR, CONTINUE
     82 037624  000137  041146                  JMP     XIT18           ;EXIT ON RECAL ERROR
     83 037630  004737  015742          1$:     JSR     PC,STRTMR       ;INIT THE TIMERS
     84 037634  042777  000101  152360          BIC     #101,@PKCS      ;STOP THE P-CLOCK
     85                                                                  ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
     86 037642  012746  000300                  MOV     #PRI06,-(SP)
        037646  012746  041006                  MOV     #T18OFL,-(SP)
        037652  013746  012230                  MOV     PKV,-(SP)
        037656  012746  000003                  MOV     #3,-(SP)
        037662  104437                          TRAP    C$SVEC
        037664  062706  000010                  ADD     #10,SP
     87                                                                  ;SETUP RHXX/RP07 VECTOR
     88 037670  012746  000000                  MOV     #PRI00,-(SP)
        037674  012746  015740                  MOV     #DORTI,-(SP)
        037700  013746  002654                  MOV     RPVEC,-(SP)
        037704  012746  000003                  MOV     #3,-(SP)
        037710  104437                          TRAP    C$SVEC
        037712  062706  000010                  ADD     #10,SP
     89 037716  005005                          CLR     R5              ;SET COUNT-UP FLAG FOR COUNT SUBR
     90 037720  005037  002240                  CLR     TEMP0           ;CLEAR TEMPORARY LOST REVOLUTION COUNT
     91
     92 037724  105737  002234          TST18B: TSTB    RANPAT          ;SELECT RANDOM PATTERN ?
     93 037730  001413                          BEQ     2$              ;BRANCH IF NOT
     94 037732  013702  002634                  MOV     DTADPB+4,R2     ;WORD COUNT 2'S COMPLEMENT
     95 037736  013703  002636                  MOV     DTADPB+6,R3     ;BUFFER ADDRESS
```

```
037742  004737  011712                     JSR     PC,RAND             ;GERERATE NEW RANDOM NUMBER
037746  013723  011774             1$:     MOV     $RP1,(R3)+          ;FILL THE BUFFER WITH RANDOM PATTERN
037752  062702  000001                     ADD     #1,R2               ;FINISH ?
037756  100773                             BMI     1$                  ;LOOP BACK , IF NOT DONE

                                           ;REDUCE THE TARGET SECTOR BY 2, TO COMPUTE THE VALUE OF THE 2ND LOGICAL
                                           ;SECTOR.

037760  004437  017716             2$:     JSR     R4,RANADR           ;GEN A RAND ADR: CYL, TRK, SEC
                                                                       ;MAKE SURE YOU DON'T WRITE IN THE BAD SEC FILE
037764  123727  002641  000037             CMPB    DTADPB+11,#31.      ;IS THIS THE LAST TRACK ?
037772  001004                             BNE     3$                  ;BR IF NO
037774  023727  002642  001165             CMP     DTADPB+12,#629.     ;IS THIS THE LAST USER CYLINDER ?
040002  001766                             BEQ     2$                  ;BR IF YES
040004  113701  002640             3$:     MOVB    DTADPB+10,R1        ;GET TARGET SECTOR ADDRESS TO WRITE AND
040010  010137  002254                     MOV     R1,TRGSEC           ;SAVE IT FOR LATER.
040014  032777  000004  142660             BIT     #ILV,@RPDS          ;IS INTERLEAVED SECTOR ENABLED ?
040022  001006                             BNE     5$                  ;BR IF YES
040024  162701  000002                     SUB     #2,R1               ;BACKUP THE SECTOR ADDRESS FOR THE SEARCH
040030  002002                             BGE     4$                  ;BR IF < SECTOR 0
040032  062701  000062                     ADD     #50.,R1             ;ADJUST FOR THE ADDRESS BEFORE SECTOR 0
040036  000411                     4$:     BR      7$                  ;EXIT

040040  005701                     5$:     TST     R1                  ;IS IT SECTOR ADDR 0 ?
040042  001405                             BEQ     6$                  ;BR IF YES
040044  162701  000031                     SUB     #25.,R1             ;IS IT SECTOR ADDR 25 ?
040050  001002                             BNE     6$                  ;BR IF NO
040052  062701  000031                     ADD     #25.,R1             ;ADJUST FOR THE ADDRESS BEFORE SECTOR 0
040056  062701  000030             6$:     ADD     #24.,R1             ;REDUCE THE TARGET SECTOR BY 2

                                           ;PREPARE TO SEARCH
040062                             7$:
040062                             T18.2:
040062  104402                             TRAP    C$BSUB
040064  010137  002252                     MOV     R1,SRHSEC           ;SAVE SEARCH SECTOR FOR LATER
040070  013777  002642  142626             MOV     DTADPB+12,@RPDC     ;CYL
040076  110146                             MOVB    R1,-(SP)            ;MERGE SECTOR
040100  113766  002641  000001             MOVB    DTADPB+11,1(SP)     ;AND TRK
040106  012677  142564                     MOV     (SP)+,@RPDA         ;LOAD TRK/SEC
040112  013777  002634  142552             MOV     DTADPB+4,@RPWC      ;WRITE 1 SECTOR
040120  013777  002636  142546             MOV     DTADPB+6,@RPBA      ;SET DATA BUFFER ADR
040126  012703  002502                     MOV     #T1418,R3           ;TIMING LIMITS FOR COUNT SUBR
040132  012777  000006  152064             MOV     #6,@PKB             ;ALLOW > 6 REVOLUTIONS PER SEARCH:

                                           ;3 FOR IMPLIED MAX SEEK (46 MSEC OR ABOUT 3 REVOLUTIONS)
                                           ;3 FOR WORST CASE SEARCH(SECT CMP ERR OR HDR CRC ERR)

040140  012777  000105  152054             MOV     #105,@PKCS          ;START P-CLOCK:IE=1,COUNT DOWN,LINE FREQ
040146  012777  000131  142514             MOV     #SEARCH,@RPCS1      ;START A SEARCH
040154  000001                             WAIT                        ;WAIT ON INTERRUPT
040156  017746  152044                     MOV     @PKC,-(SP)          ;SAVE THE CLOCK
040162  042777  000101  152032             BIC     #101,@PKCS          ;STOP THE CLOCK
040170  012677  152030                     MOV     (SP)+,@PKB          ;AND RESTORE THE COUNTED VALUE
040174  032777  040000  142500             BIT     #BIT14,@RPDS        ;ERROR?
040202  001534                             BEQ     T1811$              ;NO--BRANCH
040204  004737  010750                     JSR     PC,SAVREG           ;;SAVE R0-R5
040210  012702  002630                     MOV     #DTADPB,R2          ;DPB POINTER
```

```
        040214  004737  024644                  JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
        040220  012777  000040  142452          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
        040226  013777  002630  142444          MOV     DTADPB,@RPCS2   ;SELECT DRIVE
        040234  004737  011002                  JSR     PC,RESREG       ;;RESTORE R0-R5
    150 040240  004537  012766                  JSR     R5,ERRANY
    151 040244  002630                          DTADPB                  ;FIND OUT WHAT ERROR
    152 040246                          L10115:
        040246  104403                          TRAP    C$ESUB
    153 040250  032737  000210  002264          BIT     #BIT3!BIT7,SVSTAT       ;RETRY ALLOWED ?
    154 040256  001022                          BNE     8$              ;BRANCH IS SO
    155 040260  012746  004511                  MOV     #SEAERR,-(SP)
        040264  012746  000001                  MOV     #1,-(SP)
        040270  010600                          MOV     SP,R0
        040272  104417                          TRAP    C$PNTF
        040274  062706  000004                  ADD     #4,SP
    156 040300  012746  004614                  MOV     #ABOTST,-(SP)
        040304  012746  000001                  MOV     #1,-(SP)
        040310  010600                          MOV     SP,R0
        040312  104417                          TRAP    C$PNTF
        040314  062706  000004                  ADD     #4,SP
    157 040320  000137  041112                  JMP     T18END
    158
    159 040324  012737  000020  002350  8$:     MOV     #16.,WCEFLG     ;RETRY 16 TIMES
    160 040332  012777  000006  151664  9$:     MOV     #6,@PKB         ;ALLOW > 6 REVOLUTIONS PER SEARCH:
    161
    162                                         ;3 FOR IMPLIED MAX SEEK (46 MSEC OR ABOUT 3 REVOLUTIONS)
    163                                         ;3 FOR WORST CASE SEARCH (SECT CMP ERR OR HDR CRC ERR)
    164
    165 040340  012777  000105  151654          MOV     #105,@PKCS      ;START P-CLOCK:IE,COUNT DOWN,LINE FREQ
    166 040346  012777  000131  142314          MOV     #SEARCH,@RPCS1  ;START A SEARCH
    167 040354  000001                          WAIT                    ;WAIT ON INTERRUPT
    168 040356  017746  151644                  MOV     @PKC,-(SP)      ;SAVE THE CLOCK
    169 040362  042777  000101  151632          BIC     #101,@PKCS      ;STOP THE CLOCK
    170 040370  012677  151630                  MOV     (SP)+,@PKB      ;AND RESTORE THE COUNTED VALUE
    171 040374  032777  040000  142300          BIT     #BIT14,@RPDS    ;ERROR?
    172 040402  001434                          BEQ     T1811$          ;EXIT IF NONE
    173 040404  012777  000040  142266          MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
    174 040412  013777  002630  142260          MOV     DTADPB,@RPCS2   ;DRIVE ADDRESS
    175 040420  005337  002350                  DEC     WCEFLG          ;OVER RETRY LIMIT ?
    176 040424  001342                          BNE     9$              ;BRANCH IF NOT
    177 040426  012746  004550                  MOV     #SEABAD,-(SP)
        040432  012746  000001                  MOV     #1,-(SP)
        040436  010600                          MOV     SP,R0
        040440  104417                          TRAP    C$PNTF
        040442  062706  000004                  ADD     #4,SP
    178 040446  012746  004614                  MOV     #ABOTST,-(SP)
        040452  012746  000001                  MOV     #1,-(SP)
        040456  010600                          MOV     SP,R0
        040460  104417                          TRAP    C$PNTF
        040462  062706  000004                  ADD     #4,SP
    179 040466  000137  041112                  JMP     T18END          ;OTHERWISE EXIT
    180 040472                          T18.3:
        040472  104402                          TRAP    C$BSUB
    181 040474  013777  002640  142174  T1811$: MOV     DTADPB+10,@RPDA ;SET TRK/SECT TO WRITE
    182 040502  005077  151516                  CLR     @PKB            ;CLEAR P-CLK BUFFER COUNT
    183 040506  012777  000161  142154          MOV     #WRTDAT,@RPCS1  ;START A WRITE
    184 040514  012777  000121  151500          MOV     #121,@PKCS      ;START THE CLOCK.IE=1,UP,SINGLE,10US
```

```
                                        WAIT                    ;WAIT ON INTERRUPT
                                        MOV     @PKC,-(SP)      ;SAVE THE CLOCK
                                        BIC     #101,@PKCS      ;STOP THE CLOCK
                                        MOV     (SP)+,@PKB      ;AND RESTORE THE COUNTED VALUE
                                        BIT     #BIT14,@RPDS    ;ERR=1?
                                        BEQ     T1812$          ;NO--BRANCH
                                        JSR     PC,SAVREG       ;;SAVE R0 R5
                                        MOV     #DTADPB,R2      ;DPB POINTER
                                        JSR     PC,SVRHXX       ;SAVE ALL THE RHXX/RP07 REGISTERS
                                        MOV     #CLR,@RPCS2     ;MASSBUS CLEAR
                                        MOV     DTADPB,@RPCS2   ;SELECT DRIVE
                                        JSR     PC,RESREG       ;;RESTORE R0 R5
                                        JSR     R5,ERRANY       ;FIND OUT WHAT ERROR
                                        DTADPB
                                L10116:
                                        TRAP    C$ESUB
                                        BIT     #BIT5,SVSTAT    ;POSITION ERROR?
                                        BEQ     T1812$          ;NO, CONTINUE
                                        MOV     #POSERR,-(SP)
                                        MOV     #1,-(SP)
                                        MOV     SP,R0
                                        TRAP    C$PNTF
                                        ADD     #4,SP
                                        BR      T18END

                                T1812$: JSR     PC,COUNT        ;COUNT TIME SEARCH DONE WRITE DONE
                                        MOV     RPVEC+2,-(SP)
                                        MOV     #ISRV,-(SP)
                                        MOV     RPVEC,-(SP)
                                        MOV     #3,-(SP)
                                        TRAP    C$SVEC
                                        ADD     #10,SP
                                        MOVB    #WCKD,DTADPB+2  ;DO A WRITE CHECK DATA CMD
                                        TRAP    C$BSEG
                                        JSR     R4,DRVCAL       ;DO RECALIBRATE
                                10000$:
                                        TRAP    C$ESEG
                                        CMP     TIM.UP+6,TEMP0  ;ANY LOST REVOLUTIONS ?
                                        BEQ     1$              ;BRANCH IF NO
                                        INC     TEMP0           ;UPDATE TEMPORARY LOST REVOLUTION COUNT
                                        TRAP    C$ERDF
                                        .WORD   52
                                        .WORD   EM52
                                        .WORD   DH52
                                                                ;SETUP RHXX/RP07 VECTOR
                                1$:     CMP     TIM.UP+14,XTIMES        ;REPEATED 1024 TIMES?
                                        BGE     T18END          ;YES, CONCLUDE TEST
                                                                ;SETUP RHXX/RP07 VECTOR
                                        MOV     RPVEC+2,-(SP)
                                        MOV     #DORTI,-(SP)
                                        MOV     RPVEC,-(SP)
                                        MOV     #3,-(SP)
                                        TRAP    C$SVEC
                                        ADD     #10,SP
                                        JMP     TST18B          ;CONTINUE

                                T180FL: JSR     PC,FORSEC       ;RESET TIMER TO 4 SEC, CHANGE CLK SERVICE AD
```

```
218
219 041012  012700  000000                  MOV     #PRI00,R0               ;DROP THE PRIORITY
    041016  104441                          TRAP    C$SPRI
220 041020  004737  010750                  JSR     PC,SAVREG               ;;SAVE R0-R5
    041024  012702  002630                  MOV     #DTADPB,R2              ;DPB POINTER
    041030  004737  024644                  JSR     PC,SVRHXX               ;SAVE ALL THE RHXX/RP07 REGISTERS
    041034  012777  000040  141636          MOV     #CLR,@RPCS2             ;MASSBUS CLEAR
    041042  013777  002630  141630          MOV     DTADPB,@RPCS2           ;SELECT DRIVE
    041050  016102  000014                  MOV     14(R1),R2               ;ADDRESS OF SAVED REGISTER TABLE
    041054  016237  000036  002276          MOV     36(R2),CYL.RD           ;GET CURRENT CYLINDER
    041062  116237  000006  002302          MOVB    6(R2),SEC.RD            ;GET CURRENT SECTOR
    041070  116237  000007  002300          MOVB    7(R2),TRK.RD            ;GET CURRENT TRACK
    041076  004737  011002                  JSR     PC,RESREG               ;;RESTORE R0-R5
221 041102  104456                          TRAP    C$ERHRD
    041104  000024                          .WORD   20
    041106  006201                          .WORD   EM20
    041110  007672                          .WORD   DH44
222 041112                          T18END:
    041112  012777  000040  141560          MOV     #CLR,@RPCS2             ;CLEAR THE MASSBUS
    041120  013777  002630  141552          MOV     DTADPB,@RPCS2           ;& SELECT DRIVE
223 041126  004737  012000                  JSR     PC,ST.CLK               ;INITIALIZE THE CLOCK
224
225 041132                          TST18C:
    041132  004437  016504                  JSR     R4,TYPTIM               ;GO TYPE THE TIMES
    041136  002502                          T1418                           ;POINTER
226 041140  004437  016354                  JSR     R4,SPTYP
227 041144  002542                          SP1418
228 041146                          XIT18:                                  ;SETUP RHXX/RP07 VECTOR
229 041146  013746  002656                  MOV     RPVEC+2,-(SP)
    041152  012746  023046                  MOV     #ISRV,-(SP)
    041156  013746  002654                  MOV     RPVEC,-(SP)
    041162  012746  000003                  MOV     #3,-(SP)
    041166  104437                          TRAP    C$SVEC
    041170  062706  000010                  ADD     #10,SP
246                                         .EVEN
247 041174                          L10113:
    041174  104401                          TRAP    C$ETST
248
255
```

```
                        .TITLE PARAMETER CODING

                        .SBTTL  HARDWARE PARAMETER CODING SECTION

                        ;++
                        ; THE HARDWARE PARAMETER CODING SECTION CONTAINS MACROS
                        ; THAT ARE USED BY THE SUPERVISOR TO BUILD P-TABLES.  THE
                        ; MACROS ARE NOT EXECUTED AS MACHINE INSTRUCTIONS BUT ARE
                        ; INTERPRETED BY THE SUPERVISOR AS DATA STRUCTURES.  THE
                        ; MACROS ALLOW THE SUPERVISOR TO ESTABLISH COMMUNICATIONS
                        ; WITH THE OPERATOR.
                        ;

041176  000022                  .WORD L10117-L$HARD/2
041200                  L$HARD::
                                                        ;PRINT  RPCS1 ADRS?
041200  000031                  .WORD   T$CODE
041202  041244                  .WORD   MESG1
041204  160000                  .WORD   T$LOLIM
041206  177777                  .WORD   T$HILIM
                                                        ;PRINT  VECTOR ADRS?'
041210  001031                  .WORD   T$CODE
041212  041257                  .WORD   MESG2
041214  000000                  .WORD   T$LOLIM
041216  000377                  .WORD   T$HILIM
                                                        ;PRINT 'BR LEVEL?'
041220  002032                  .WORD   T$CODE
041222  041273                  .WORD   MESG3
041224  000340                  .WORD   340
041226  000000                  .WORD   T$LOLIM
041230  000007                  .WORD   T$HILIM
                                                        ;PRINT 'DRIVE #?'
041232  003032                  .WORD   T$CODE
041234  041304                  .WORD   MESG4
041236  000007                  .WORD   7
041240  000000                  .WORD   T$LOLIM
041242  000007                  .WORD   T$HILIM
                                .EVEN
041244                  L10117:

041244      122     120     103 MESG1:  .ASCIZ  /RPCS1 ADRS/
041257      126     105     103 MESG2:  .ASCIZ  /VECTOR ADRS/
041273      102     122     040 MESG3:  .ASCIZ  /BR LEVEL/
041304      104     122     111 MESG4:  .ASCIZ  /DRIVE #/

                                .EVEN
```

```
                                .SBTTL  SOFTWARE PARAMETER CODING SECTION

                                ;++
                                ; THE SOFTWARE PARAMETER CODING SECTION CONTAINS MACROS
                                ; THAT ARE USED BY THE SUPERVISOR TO BUILD P TABLES.  THE
                                ; MACROS ARE NOT EXECUTED AS MACHINE INSTRUCTIONS BUT ARE
                                ; INTERPRETED BY THE SUPERVISOR AS DATA STRUCTURES.  THE
                                ; MACROS ALLOW THE SUPERVISOR TO ESTABLISH COMMUNICATIONS
                                ; WITH THE OPERATOR.
                                ;

041314  000116                          .WORD L10120 L$SOFT/2
041316                          L$SOFT::
                                                                ;PRINT 'CHANGE DRIVE PARAMETERS?'
041316  015130                          .WORD   T$CODE
041320  041552                          .WORD   PARMSG
041322  000001                          .WORD   1
                                                                ;GO TO 1$ IF NO
041324  056044                          .WORD   T$CODE
                                                                ;PRINT 'STARTING  CYL?'
041326  000052                          .WORD   T$CODE
041330  041602                          .WORD   FCMSG
041332  001777                          .WORD   1777
041334  000000                          .WORD   T$LOLIM
041336  001164                          .WORD   T$HILIM
                                                                ;PRINT 'ENDING    CYL?'
041340  001052                          .WORD   T$CODE
041342  041620                          .WORD   LCMSG
041344  001777                          .WORD   1777
041346  000001                          .WORD   T$LOLIM
041350  001165                          .WORD   T$HILIM
                                                                ;PRINT 'INCREMENT CYL?'
041352  002052                          .WORD   T$CODE
041354  041636                          .WORD   ICMSG
041356  001777                          .WORD   1777
041360  000001                          .WORD   T$LOLIM
041362  001164                          .WORD   T$HILIM
                                                                ;PRINT 'STARTING  TRK?'
041364  003052                          .WORD   T$CODE
041366  041654                          .WORD   FTMSG
041370  000037                          .WORD   37
041372  000000                          .WORD   T$LOLIM
041374  000036                          .WORD   T$HILIM
                                                                ;PRINT 'ENDING    TRK?
041376  004052                          .WORD   T$CODE
041400  041672                          .WORD   LTMSG
041402  000037                          .WORD   37
041404  000001                          .WORD   T$LOLIM
041406  000037                          .WORD   T$HILIM
                                                                ;PRINT 'INCREMENT TRK?'
041410  005052                          .WORD   T$CODE
041412  041710                          .WORD   ITMSG
041414  000037                          .WORD   37
041416  000001                          .WORD   T$LOLIM
041420  000036                          .WORD   T$HILIM
                                                                ;PRINT 'STARTING  SEC?'
041422  006052                          .WORD   T$CODE
```

```
                041424  041726                          .WORD   FSMSG
                041426  000077                          .WORD   77
                041430  000000                          .WORD   T$LOLIM
                041432  000060                          .WORD   T$HILIM
           31
           32   041434  007052                          .WORD   T$CODE
                041436  041744                          .WORD   LSMSG
                041440  000077                          .WORD   77
                041442  000001                          .WORD   T$LOLIM
                041444  000061                          .WORD   T$HILIM
           33
           34   041446  010032                          .WORD   T$CODE
                041450  041762                          .WORD   PATMSG
                041452  177777                          .WORD   177777
                041454  000000                          .WORD   T$LOLIM
                041456  177777                          .WORD   T$HILIM
           35   041460                          1$:
           37
           38   041460  014120                          .WORD   T$CODE
                041462  042000                          .WORD   WRITMG
                041464  000400                          .WORD   400
           39
           40   041466  007044                          .WORD   T$CODE
           41
           42
           43
           44   041470  014120                          .WORD   T$CODE
                041472  042047                          .WORD   WRSAFM
                041474  000400                          .WORD   400
           46
ST?
           47   041476  014130                          .WORD   T$CODE
                041500  042202                          .WORD   RPATMG
                041502  000001                          .WORD   1
           48   041504                          2$:
           49   041504  011130                          .WORD   T$CODE
                041506  042261                          .WORD   RDHDMG
                041510  000001                          .WORD   1
           50
           51   041512  011130                          .WORD   T$CODE
                041514  042331                          .WORD   TIMMSG
                041516  000400                          .WORD   400
           52
           53   041520  013130                          .WORD   T$CODE
                041522  042353                          .WORD   STOMSG
                041524  000400                          .WORD   400
           54
STEAD OF 2 MSEC?'
           55   041526  012130                          .WORD   T$CODE
                041530  042405                          .WORD   STLTIM
                041532  000001                          .WORD   1
           56
NG TESTS?
           57   041534  012130                          .WORD   T$CODE
                041536  042501                          .WORD   STALMG
                041540  000400                          .WORD   400
           58
           59   041542  004044                          .WORD   T$CODE
           60   041544  013130                          .WORD   T$CODE
                041546  042566                          .WORD   STALRM

;PRINT 'ENDING    SEC?'

;PRINT 'DATA  PATTERN?'

;PRINT 'DO YOU WANT TO WRITE ANYWHERE ON MEDIA?'

;GO TO 2$ IF NO

;PRINT '! CUSTOMER DATA WILL BE OVERWRITTEN !
;       --- ---- -    --- - ---- ----------
;  CONTINUE?'

;PRINT 'USE RANDOM DATA PATTERNS FOR RANDOM WRI E TE

;PRINT 'PERFORM READ HEADER & DATA DURING SEEKS?'

;PRINT 'TYPE TIME REPORTS?'

;PRINT 'INHIBIT SOFTWARE TIMEOUTS?'

;PRINT 'TIMING TESTS, STALL BETWEEN SEEKS: RANDOM IN

;PRINT 'STALL AFTER EVERY DRIVE FUNCTION IN NON TIMI

;GO TO 3$ IF NO
```

```
                041550  000001                          .WORD   1
     61         041552                          3$:
     62
     71                                                  .EVEN
                041552                          L10120:
     72
     76         041552      103     110     101  PARMSG: .ASCIZ  /CHANGE DRIVE PARAMETERS/
     77         041602      123     124     101  FCMSG:  .ASCIZ  /STARTING  CYL/
     78         041620      105     116     104  LCMSG:  .ASCIZ  /ENDING    CYL/
     79         041636      111     116     103  ICMSG:  .ASCIZ  /INCREMENT CYL/
     80         041654      123     124     101  FTMSG:  .ASCIZ  /STARTING  TRK/
     81         041672      105     116     104  LTMSG:  .ASCIZ  /ENDING    TRK/
     82         041710      111     116     103  ITMSG:  .ASCIZ  /INCREMENT TRK/
     83         041726      123     124     101  FSMSG:  .ASCIZ  /STARTING  SEC/
     84         041744      105     116     104  LSMSG:  .ASCIZ  /ENDING    SEC/
     85         041762      104     101     124  PATMSG: .ASCIZ  /DATA  PATTERN/
     87         042000      104     117     040  WRITMG: .ASCIZ  /DO YOU WANT TO WRITE ANYWHERE ON MEDIA/
     88         042047      007     011     041  WRSAFM: .ASCII  <BELL>/ ! CUSTOMER DATA WILL BE OVERWRITTEN !/<CR><LF>
     89         042120      007     011     055          .ASCII  <BELL>/ ---------- ----- ---- -/<CR><LF>
     90         042171      103     117     116          .ASCIZ  /CONTINUE/
     92         042202      125     123     105  RPATMG: .ASCIZ  /USE RANDOM DATA PATTERNS FOR RANDOM WRITE TEST/
     93         042261      120     105     122  RDHDMG: .ASCIZ  /PERFORM READ HEADER & DATA DURING SEEKS/
     94         042331      124     131     120  TIMMSG: .ASCIZ  /TYPE TIME REPORTS/
     95         042353      111     116     110  STOMSG: .ASCIZ  /INHIBIT SOFTWARE TIMEOUTS/
     96         042405      124     111     115  STLTIM: .ASCIZ  /TIMING TESTS, STALL BETWEEN SEEKS: RANDOM INSTEAD OF 2 MSEC/
     97         042501      123     124     101  STALMG: .ASCIZ  /STALL AFTER EVERY DRIVE FUNCTION IN NON TIMING TESTS/
     98         042566      125     123     105  STALRM: .ASCIZ  /USE RANDOM STALL TIMES/
     99
    100
    110                                                  .EVEN
    111         042616                          $PATCH::.BLKW   50.              ;PROGRAM PATCH AREA (50. WORDS)
    112
    113         042762                          DBUFF:: .BLKW   256.*25.         ;DATA BUFFER FOR HALF A TRACK
    114         073762                                  .BLKW   256.             ;ONE SECTOR EXTRA FOR MID-TRANSFER SEEK TEST
    115
    122                                                 .EVEN
                074762  075002                          .WORD T$FREE
                074764  000006                          .WORD T$SIZE
                074766                          L$LAST::
```

```
      1
     14
     16 074766  000000                        .WORD   0
        074770  000004                        .WORD   L10123-./2 1
        074772                        L10121:
     17 074772  176700                        .WORD   176700
     18 074774  000254                        .WORD   254
     19 074776  000240                        .WORD   240
     20 075000  000000                        .WORD   0
     21 075002                        L10123:
     23         000001                .END
```

```
ABOPAS  015406          CI7     022536          C$RDBU= 000007          DSNMSG  004403 G        ERRANY  012766
ABORT   026334          CI7B    022552          C$REFG= 000047          DTADPB  002630 G        ERRVEC  000004
ABOTST  004614 G        CI8     022624          C$RESE= 000033          DTE     = 010000 G      EVL     = 000004 G
ACTDRV  020354          CLKSTA  002260 G        C$REVI= 000003          DTUW    020376          EWN     = 000002 G
ACTSTR  020355          CLR     = 000040 G      C$RFLA= 000021          DVA     = 004000 G      EXECMD  015160
ADJUST  014322          CLRQUE  025350          C$RPT = 000025          DVC     = 000200 G      EXINIT  026410
ADR     = 000020 G      CMOD    = 100000 G      C$SEFG= 000046          ECH     = 000100 G      EXIT1   027026
AOE     = 001000 G      CONTIN  026276          C$SPRI= 000041          ECI     = 004000 G      EXIT11  034202
ASSEMB= 000010          COUNT   016212          C$SVEC= 000037          EF.CON= 000036 G        EXIT12  034434
ATA     = 100000 G      COUNT2  016012          C$TPRI= 000013          EF.NEW= 000035 G        EXIT13  034624
ATABIT  002744 G        CR      = 000015 G      DBUFF   042762 G        EF.PWR= 000034 G        EXIT14  034724
AVERAG  017266          CRLF    003064 G        DCK     = 100000 G      EF.RES= 000037 G        EXIT15  036406
AVERGE  005010 G        CYL.DS  002304 G        DCU     = 000040 G      EF.STA= 000040 G        EXIT16  037000
AVGVAL  017347          CYL.RD  002276 G        DELTA   002352 G        EMPTYQ  025432          EXIT17  037330
A16     = 000400 G      C$AU    = 000052        DFPTBL  002172 G        EM1     005420 G        EXIT18  037612
A17     = 001000 G      C$AUTO= 000061          DH25    010702 G        EM11    005733 G        EXIT2   027136
BELL    = 000007 G      C$BRK   = 000022        DH25A   003067 G        EM12    005755 G        EXIT3   027362
BITS    002362 G        C$BSEG= 000004          DH44    007672 G        EM13    005776 G        EXIT4   027576
BIT0    = 000001 G      C$BSUB= 000002          DH44A   003105 G        EM14    006017 G        EXIT5   030034
BIT00   = 000001 G      C$CEFG= 000045          DH44D   003154 G        EM15    006054 G        EXIT6   030142
BIT01   = 000002 G      C$CLCK= 000062          DH44E   003203 G        EM16    006121 G        EXIT7   031172
BIT02   = 000004 G      C$CLEA= 000012          DH44F   003274 G        EM17    006154 G        E$END   = 002100
BIT03   = 000010 G      C$CLOS= 000035          DH44G   003354 G        EM2     005465 G        E$LOAD= 000035
BIT04   = 000020 G      C$CLP1= 000006          DH44H   003445 G        EM20    006201 G        FC      002204
BIT05   = 000040 G      C$CVEC= 000036          DH44I   003525 G        EM21    006250 G        FCMSG   041602
BIT06   = 000100 G      C$DCLN= 000044          DH44J   003617 G        EM22    006274 G        FER     = 000020 G
BIT07   = 000200 G      C$DODU= 000051          DH44K   003701 G        EM23    006324 G        FMTRK   = 000163 G
BIT08   = 000400 G      C$DRPT= 000024          DH44L   003721 G        EM24    006360 G        FMT16   = 010000 G
BIT09   = 001000 G      C$DU    = 000053        DH45    010366 G        EM25    006417 G        FORSEC  012426
BIT1    = 000002 G      C$EDIT= 000003          DH45A   003740 G        EM26    006455 G        FS      002220
BIT10   = 002000 G      C$ERDF= 000055          DH45B   003771 G        EM27    006525 G        FSMSG   041726
BIT11   = 004000 G      C$ERHR= 000056          DH45C   004027 G        EM3     005527 G        FT      002212
BIT12   = 010000 G      C$ERRO= 000060          DH45D   004104 G        EM30    006564 G        FTMSG   041654
BIT13   = 020000 G      C$ERSF= 000054          DH52    010560 G        EM31    006641 G        FWD     005167 G
BIT14   = 040000 G      C$ERSO= 000057          DH52A   004172 G        EM32    006703 G        F$AU    = 000015
BIT15   = 100000 G      C$ESCA= 000010          DH52B   004246 G        EM33    006726 G        F$AUTO= 000020
BIT2    = 000004 G      C$ESEG= 000005          DIAG    = 000135 G      EM34    006746 G        F$BGN   = 000040
BIT3    = 000010 G      C$ESUB= 000003          DIAGMC= 000000          EM35    006763 G        F$CLEA= 000007
BIT4    = 000020 G      C$ETST= 000001          DLT     = 100000 G      EM36    007017 G        F$DU    = 000016
BIT5    = 000040 G      C$EXIT= 000032          DMD     = 100000 G      EM4     005605 G        F$END   = 000041
BIT6    = 000100 G      C$GETB= 000026          DORTI   015740          EM41    007054 G        F$HARD= 000004
BIT7    = 000200 G      C$GETW= 000027          DOTWO   002256 G        EM42    007107 G        F$HW    = 000013
BIT8    = 000400 G      C$GMAN= 000043          DPB.A   002550 G        EM43    007134 G        F$INIT= 000006
BIT9    = 001000 G      C$GPHR= 000042          DPB.B   002570 G        EM44    007156 G        F$JMP   = 000050
BOE     = 000400 G      C$GPLO= 000030          DPB.C   002610 G        EM45    007224 G        F$MOD   = 000000
BSE     = 100000 G      C$GPRI= 000040          DPE     = 000010 G      EM46    007255 G        F$MSG   = 000011
BYPASS  002262 G        C$INIT= 000011          DPINT   020330          EM47    007305 G        F$PROT= 000021
CALL.A  014374          C$INLP= 000020          DPRQS   020340          EM5     005627 G        F$PWR   = 000017
CALL.B  014512          C$MANI= 000050          DRVACT  020300          EM50    007335 G        F$RPT   = 000012
CALL.C  014674          C$MEM   = 000031        DRVCAL  015056          EM51    007427 G        F$SEG   = 000003
CHANGE  002236          C$MSG   = 000023        DRVCLR= 000111 G        EM52    007521 G        F$SOFT= 000005
CHKAVG  017634          C$OPEN= 000034          DRVINT  020566          EM54    007547 G        F$SRV   = 000010
CI1     021630          C$PNTB= 000014          DRVNO   002664 G        EM55    007610 G        F$SUB   = 000002
CI3     022014          C$PNTF= 000017          DRVQUE  025452          EM6     005647 G        F$SW    = 000014
CI4     022126          C$PNTS= 000016          DRVSN   002666 G        EM7     005705 G        F$TEST= 000001
CI5     022452          C$PNTX= 000015          DRVSTA  020310          ERR     = 040000 G      GETREG= 000141 G
CI6     022474          C$QIO   = 000377        DRVTYP  020320          ERRABO  015214          GETREQ  025526
```

H13

SYMBOL TABLE

```
G$CNTO= 000200          I$SEG = 000041          L$LAST  074766 G        L10046  030120          MSGMAX  017313
G$DELM= 000372          I$SETU= 000041          L$LOAD  002100 G        L10047  031220          MSGMIN  017270
G$DISP= 000003          I$SFT = 000041          L$LUN   002074 G        L10050  030426          MSGNON  017615
G$EXCP= 000400          I$SRV = 000041          L$MREV  002050 G        L10051  030732          MSGNUM  017506
G$HILI= 000002          I$SUB = 000041          L$NAME  002000 G        L10052  032210          MSGOPE  017563 G
G$LOLI= 000001          I$TST = 000041          L$PRIO  002042 G        L10053  031306          MSGSEA  017533
G$NO  = 000000          J$JMP = 000167          L$PROT  025624 G        L10054  031534          MSPGE = 002000 G
G$OFFS= 000400          KWSRV   012414          L$PRT   002112 G        L10055  031726          MSSC  = 100000 G
G$OFSI= 000376          LBC   = 002000 G        L$REPP  002062 G        L10056  033124          MXF   = 001000 G
G$PRMA= 000001          LC      002206          L$REV   002010 G        L10057  032464          MXSEEK  005055 G
G$PRMD= 000002          LCE   = 001000 G        L$RPT   025616 G        L10060  032632          NC1     002266 G
G$PRML= 000000          LCLKTB  012234          L$SOFT  041316 G        L10061  034002          NC2     002270 G
G$RADA= 000140          LCMSG   041620          L$SPC   002056 G        L10062  033372          NED   = 010000 G
G$RADB= 000000          LDCMD   012724          L$SPCP  002020 G        L10063  033536          NEDMSG  005270 G
G$RADD= 000040          LF    = 000012 G        L$SPTP  002024 G        L10064  034206          NEM   = 004000 G
G$RADL= 000120          LKS     012236          L$STA   002030 G        L10065  034154          NOCLK   004317 G
G$RADO= 000020          LKV     012240          L$SW    002204 G        L10066  034434          NOOP  = 000101 G
G$XFER= 000004          LOE   = 040000 G        L$TEST  002114 G        L10067  034326          NOTMSG  005362 G
G$YES = 000010          LOT   = 000010 G        L$TIML  002014 G        L10070  034402          NS1     002274 G
HCE   = 000200 G        LS      002222          L$UNIT  002012 G        L10071  034624          NT1     002272 G
HCI   = 002000 G        LSMSG   041744          L10000  002202          L10072  034546          OCTHEX  011532
HCRC  = 000400 G        LST   = 002000 G        L10001  002240          L10073  034610          OFFSET= 000115 G
HELP  = 000000          LT      002214          L10002  010364          L10074  036142          OFLMSG  005327 G
HERTZ   012244          LTMSG   041672          L10003  010556          L10075  034722          OM    = 000001 G
HOE   = 100000 G        L$ACP   002110 G        L10004  010700          L10076  035312          ONECYL  004736 G
IAE   = 002000 G        L$APT   002036 G        L10005  010746          L10077  035656          ONEFIL= 000001
IBE   = 010000 G        L$AU    026754 G        L10006  012424          L10100  036420          OPI   = 020000 G
IC      002210          L$AUT   002070 G        L10007  012516          L10101  036300          OPT     021364
ICMSG   041636          L$AUTO  026654 G        L10010  012670          L10102  036324          O$APTS= 000000
IDU   = 000040 G        L$CCP   002106 G        L10011  015740          L10103  036376          O$AU  = 000000
IE    = 000100 G        L$CLEA  026656 G        L10012  023114          L10104  037006          O$BGNR= 000000
IER   = 020000 G        L$CO    002032 G        L10013  025622          L10105  036556          O$BGNS= 000001
ILF   = 000001 G        L$DEPO  002011 G        L10015  026652          L10106  036606          O$DU  = 000000
ILLCMD= 000143 G        L$DESC  003036 G        L10016  026654          L10107  036702          O$ERRT= 000000
ILR   = 000002 G        L$DESP  002076 G        L10017  026744          L10110  036732          O$GNSW= 000001
ILV   = 000004 G        L$DEVP  002060 G        L10020  026752          L10111  037330          O$POIN= 000001
INCCYL  033126          L$DISP  002124 G        L10021  026760          L10112  037224          O$SETU= 000001
ISR   = 000100 G        L$DLY   002116 G        L10022  027030          L10113  041174          PARMSG  041552
ISRCNT  002246 G        L$DTP   002040 G        L10023  027026          L10114  037602          PAT     002224
ISRV    023046          L$DTYP  002034 G        L10024  027136          L10115  040246          PATMSG  041762
IT      002216          L$DU    026746 G        L10025  027062          L10116  040614          PCLKTB  012220
ITCNT   002244 G        L$DUT   002072 G        L10026  027116          L10117  041244          PGE   = 100000 G
ITMSG   041710          L$DVTY  003030 G        L10027  027370          L10120  041552          PHF   = 000400 G
IXE   = 004000 G        L$EF    002052 G        L10030  027252          L10121  074772          PKB     012224
IXU   = 000100 G        L$ENVI  002044 G        L10031  027336          L10123  075002          PKC     012226
I$AU  = 000041          L$ETP   002102 G        L10032  027604          MAINT = 000145 G        PKCS    012222
I$AUTO= 000041          L$EXP1  002046 G        L10033  027466          MARK    005122 G        PKV     012230
I$CLN = 000041          L$EXP4  002064 G        L10034  027552          MCPE  = 020000 G        PNT   = 001000 G
I$DU  = 000041          L$EXP5  002066 G        L10035  030034          MDPE  = 000400 G        POPQUE  025550
I$HRD = 000041          L$HARD  041200 G        L10036  027656          MESG1   041244          POSERR  004633 G
I$INIT= 000041          L$HIME  002120 G        L10037  027666          MESG2   041257          PRI   = 002000 G
I$MOD = 000041          L$HPCP  002016 G        L10040  027730          MESG3   041273          PRI00 = 000000 G
I$MSG = 000041          L$HPTP  002022 G        L10041  027740          MESG4   041304          PRI01 = 000040 G
I$PROT= 000040          L$HW    002172 G        L10042  030002          MSGABV  017434          PRI02 = 000100 G
I$PTAB= 000041          L$ICP   002104 G        L10043  030012          MSGAVG  017336          PRI03 = 000140 G
I$PWR = 000041          L$INIT  025632 G        L10044  030142          MSGBEL  017362          PRI04 = 000200 G
I$RPT = 000041          L$LADP  002026 G        L10045  030110          MSGLMT  005221 G        PRI05 = 000240 G
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PRIO6 = 000300 G        RPLA    002710 G        STALMG  042501          TST13   034550          T$$SW = 010001
PRIO7 = 000340 G        RPMR1   002714 G        STALRD  002232          TST14A  034736          T$$TES= 010113
PSTACK  011666          RPOF    002722 G        STALRM  042566          TST15   036312          T1      026762 G
QCNT    025056          RPSN    002720 G        STLTIM  042405          TST18A  037616          T1.1    027006
QDRV0   025150          RPSTU0  020200          STO     024200          TST18B  037724          T10     033130 G
QDRV1   025170          RPSTU1  020210          STOFLG  002233          TST18C  041132          T10.1   033250
QDRV2   025210          RPSTU2  020220          STOMSG  042353          TWOMS   012552          T10.1$  033252
QDRV3   025230          RPSTU3  020230          STOPCK  012364          TYPTIM  016504          T10.2   033416
QDRV4   025250          RPSTU4  020240          STRTMR  015742          TYTIME  002242 G        T10.2$  033404
QDRV5   025270          RPSTU5  020250          ST.CLK  012000          T$ARGC= 000001          T10.3$  033572
QDRV6   025310          RPSTU6  020260          ST.LCL  012320          T$CODE= 013130          T10.4$  033550
QDRV7   025330          RPSTU7  020270          ST.PCL  012246          T$ERRN= 000024          T10.7$  033614
QINPT   025066          RPTMR   024104          SVCGBL= 000000          T$EXCP= 000000          T10.8$  033720
QOUTPT  025106          RPVEC   002654 G        SVCINS= 000000          T$FLAG= 000040          T11     034004 G
QSTART  025126          RPWC    002672 G        SVCSUB= 000000          T$FREE= 075002          T11.1   034100
QSTOP   025130          RPO7    021122          SVCTAG= 000000          T$GMAN= 000000          T11.2$  034102
QTERP = 025350          RTC   = 000117 G        SVCTST= 000000          T$HILI= 177777          T11.5$  034156
RANADR  017716          RWU1  = 002000 G        SVRHXX  024644          T$LAST= 000001          T12     034210 G
RAND    011712          RWU2  = 004000 G        SVSTAT  002264 G        T$LOLI= 000000          T12.1   034300
RANPAT  002234          RWU3  = 010000 G        S$LSYM= 010000          T$LSYM= 010000          T12.2   034354
RDDAT = 000171 G        SAVREG  010750          TD      023116          T$LTNO= 000022          T13     034436 G
RDHD  = 000173 G        SC      023304          TEMP0   002240 G        T$NEST= 177777          T13.1   034514
RDHDMG  042261          SCTRWC= 177400 G        TEST1   026770          T$NS0 = 000000          T13.1$  034616
RDTD  = 000175 G        SC11    023612          TEST10  033160          T$NS1 = 000005          T13.2   034556
RDY   = 000200 G        SC12    023702          TEST13  034450          T$NS2 = 000003          T14     034626 G
RD.RP   024426          SC13    023766          TEST14  034710          T$PCNT= 000000          T14.1   034714
READIN= 000121 G        SC3     023354          TEST15  036162          T$PTAB= 010122          T14.1$  035044
RECAL = 000107 G        SC4     023360          TEST16  036510          T$PTHV= 000001          T14.2   035126
REDHDR  002226          SC5     023372          TEST17  037164          T$PTNU= 000001          T14.3   035534
REG     002754 G        SC6     023534          TEST18  037470          T$SAVL= 177777          T14.7$  035754
RELSE = 000113 G        SC8     023562          TEST3   027162          T$SEGL= 177777          T14.8$  036060
RESREG  011002          SDF   = 000020 G        TEST4   027414          T$SEKO= 010000          T1410$  035126
REV     005204 G        SEABAD  004550 G        TEST5   027636          T$SIZE= 000006          T1411$  035536
RHEXT   002660 G        SEAERR  004511 G        TEST6   030066          T$SUBN= 000003          T1412$  035712
RHTYPE  002662 G        SEARCH= 000131 G        TEST7   030176          T$TAGL= 177777          T1418   002502 G
RMR   = 000004 G        SEC.DS  002306 G        TEST8   031252          T$TAGN= 010124          T15     036144 G
ROTATE  004674 G        SEC.RD  002302 G        TEST9   032242          T$TEMP= 000000          T15.1   036272
RPADR   002652 G        SEEK  = 000105 G        TICKMS  012214          T$TEST= 000022          T15.2   036310
RPAS    002706 G        SETFOR= 000147 G        TICKUS  012216          T$TSTM= 177777          T15.3   036370
RPATMG  042202          SET.IE  025004          TIMER   020356          T$TSTS= 000001          T16     036422 G
RPBA    002674 G        SFPTBL  002204 G        TIMMSG  042331          T$$AU = 010021          T16.1   036542
RPBAE   002740 G        SIZE70  011034          TIMSTL  002230          T$$AUT= 010016          T16.2   036560
RPCC    002726 G        SKI   = 040000 G        TIMTYP  002227          T$$CLE= 010017          T16.3   036666
RPCS1   002670 G        SNDIGT  004427 G        TIMT10  002452 G        T$$DAT= 010123          T16.4   036704
RPCS2   002700 G        SPTYP   016354          TIMT11  002462 G        T$$DU = 010020          T17     037010 G
RPCS3   002742 G        SP10    002520 G        TIMT12  002472 G        T$$HAR= 010117          T17.1   037162
RPDA    002676 G        SP11    002526 G        TIM.DN  002330 G        T$$HW = 010000          T18     037332 G
RPDB    002712 G        SP12    002534 G        TIM.PT  002346 G        T$$INI= 010015          T18END  041112
RPDC    002724 G        SP1418  002542 G        TIM.UP  002312 G        T$$MSG= 010005          T18OFL  041006
RPDS    002702 G        SP7     002512 G        TRE   = 040000 G        T$$PC = 000001          T18.1   037554
RPDT    002716 G        SRCHWT  020352          TRGSEC  002254 G        T$$PRO= 010014          T18.2   040062
RPEC1   002734 G        SRCH00  015612          TRKWC   002354 G        T$$PTA= 010122          T18.3   040472
RPEC2   002736 G        SRHSEC  002252 G        TRK.DS  002310 G        T$$RPT= 010013          T1811$  040474
RPER1   002704 G        STALL   015410          TRK.RD  002300 G        T$$SEG= 010000          T1812$  040650
RPER2   002730 G        STALLF  002231          TRNSWT  020350          T$$SOF= 010120          T2      027032 G
RPER3   002732 G        STALL1  002356 G        TST12   034330          T$$SRV= 010012          T2.1    027054
RPINIT  020400          STALL2  002360 G        TST12A  034404          T$$SUB= 010116          T2.11   027054
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T2.2    027110       T6      030036 G     T8.10$  031762       T9.8$   033042       WRTDAT= 000161 G
T2.21   027110       T6.1    030102       T8.2    031412       UAM   = 000200 G     WRTENM  004432 G
T3      027140 G     T6.11   030104       T8.2$   031546       UNIT    002650 G     WRTTD = 000165 G
T3.1    027244       T6.2    030112       T8.3    031604       UNS   = 040000 G     WRT.RP  024520
T3.11   027246       T7      030144 G     T8.3$   031560       UNSMSG  005237 G     WRYUNS= 000400 G
T3.2    027254       T7A     002442 G     T8.4$   031570       UPE   = 020000 G     XIT14   036114
T4      027372 G     T7.1    030312       T8.5$   031310       VERIFY  015470       XIT18   041146
T4.1    027460       T7.1$   030314       T8.6$   031774       WCE   = 040000 G     XTIMES  002250 G
T4.2    027470       T7.10$  030440       T8.7$   032022       WCEFLG  002350 G     X$ALWA= 000000
T5      027606 G     T7.2    030616       T8.8$   032126       WCF   = 000040 G     X$FALS= 000040
T5.1    027650       T7.2$   030620       T8.9$   031740       WCKD  = 000151 G     X$OFFS= 000400
T5.11   027652       T7.20$  030554       T9      032212 G     WCKHD = 000153 G     X$TRUE= 000020
T5.2    027660       T7.3$   031016       T9.1    032354       WLE   = 004000 G     $DIV    011176
T5.3    027722       T7.44$  030504       T9.1$   032336       WOR   = 001000 G     $MULT   011420
T5.31   027724       T7.7$   031032       T9.2    032510       WRITMG  042000       $PATCH  042616 G
T5.4    027732       T7.8$   031136       T9.2$   032476       WRPAT   036544       $RNCON  011772
T5.5    027774       T8      031222 G     T9.3$   032666       WRPATN  036670       $RP1    011774
T5.51   027776       T8.1    031300       T9.4$   032644       WRSAFM  042047       $RP2    011776
T5.6    030004       T8.1$   031376       T9.7$   032710       WRTALL  002235       $$FLG   017714

. ABS.  075002      000
        000000      001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  30464 WORDS  ( 119 PAGES)
DYNAMIC MEMORY AVAILABLE FOR  71 PAGES
.CZRJLB/C=[20,0]SVC34R.MLB,[20,12]CZRJLB.DOC,CZRJLB.HIS,CZRJLB
```

CROSS REFERENCE TABLE (CREF V04.00)

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BYPASS  13-17#  30-37   44-11*  44-135*  44 139*
C$AU     7-278#  48-34
C$AUTO   7-278#  45-17
C$BRK    7 278#
C$BSEG   7-278#  67-203
C$BSUB   7-278#  50-62   51-18   51-25   52-46   52 49   53-41   53-44   54-27   54-30   54-42   54 45   54-57   54-60
        55-15    55-18   56-44   56-76   57-25   57-41   57-69   58-34   58-52   59-29   59-49   60-32   61-20   61-31
        62-19    62-28   63-30   63-71   63 124  64 37   64-42   64-56   65-38   65-42   65-63   65-67   66-52   67-70
        67-127   67-180
C$CEFG   7-278#
C$CLCK   7-278#  26-16   26-35
C$CLEA   7-278#  46-26
C$CLOS   7-278#
C$CLP1   7-278#
C$CVEC   7-278#  44-98   44-100  44-101  46-18   46-21   46-23
C$DCLN   7-278#  30-45   44-102  64-34
C$DODU   7-278#
C$DRPT   7-278#
C$DU     7-278#  47-33
C$EDIT   7-278#   7-323
C$ERDF   7-278#  30-19   30-23   30-27   30-31   30-35   63-148  64-33   67-209
C$ERHR   7-278#  27-27   27-35   27-42   27-47   27-52   27-61   27-66   27-71   27-76   27-87   27-92   27-95   27-98
        27-103   27-108  27-113  27-118  27-123  27-128  27-135  27-140  27-147  27-150  27-155  27-160  27-165  27-170
        27-203   31-22   56-112  57-102  58-84   59-79   61-24   61-35   62-24   62-33   63-157  67-221
C$ERRO   7-278#
C$ERSF   7-278#
C$ERSO   7-278#
C$ESCA   7-278#
C$ESEG   7-278#  67-205
C$ESUB   7-278#  50-67   51-20   51-27   52-48   52-64   53-43   53-60   54-29   54-32   54-44   54-47   54-59   54-62
        55-17    55-20   56-57   56-89   57-27   57-55   57-83   58-46   58-66   59-43   59-63   60-44   61-25   61-36
        62-25    62-34   63-32   63-96   63-138  64-39   64-45   64-58   65-41   65-47   65-66   65-72   66-60   67-75
        67-152   67-194
C$ETST   7-278#  50-68   51-31   52-71   53-67   54-67   55-25   56-120  57-110  58-92   59-87   60-52   61-45   62-38
        63-165   64-63   65-85   66-83   67-247
C$EXIT   7-278#  44-91   44-103  44-165  46-24   56-26   57-15   57-18   58-18   58-21   59-17   59-20   62-35   63-35
        66-33    67-37   67-78
C$GETB   7-278#
C$GETW   7-278#
C$GMAN   7-278#
C$GPHR   7-278#  44-39
C$GPLO   7-278#
C$GPRI   7-278#  36-18   36-145  36-209
C$INIT   7-278#  44-180
C$INLP   7-278#
C$MANI   7-278#
C$MEM    7-278#
C$MSG    7-278#  19-25   19-34   19-43   19-49
C$OPEN   7-278#
C$PNTB   7-278#  19-4    19-8    19-24   19-28   19-29   19-33   19-39   19-40   19-42   19-46   19-48
C$PNTF   7-278#  32-165  32-168  32-171  32-173  33-40   33-43   33-45   33-50   33-51   33-56   33-57   33-66   33-73
        33-75    33-77   44-29   44-71   44-73   44-75   44-77   44-85   44-114  44-127  44-132  56-60   56-61   56-73
        56-74    57-86   58-69   59-66   63-99   63-100  63-121  63-122  63-141  66-31   67-35   67-155  67-156  67-177
        67-178   67-197
C$PNTS   7-278#
C$PNTX   7-278#  19-10   19-11   19-13   19-14   19-16   19-17   19-21   19-22   19-30   19-31
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M13

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        54 45    54-45#   54-47    54-47#   54-47#   54-57    54 57#   54-59    54-59#   54-59#   54-60    54-60#   54-62    54-62#
        54 62#   55 8     55-15    55-15#   55 17    55 17#   55-17#   55 18    55-18#   55-20    55-20#   55 20#   56 23    56-44
        56-44#   56-57    56-57#   56-57#   56-76    56-76#   56 89    56-89#   56-89#   57-12    57-25    57 25#   57-27    57-27#
        57 27#   57-41    57-41#   57-55    57 55#   57 55#   57 69    57 69#   57-83    57 83#   57-83#   58-15    58-34    58-34#
        58-46    58-46#   58-46#   58-52    58 52#   58 66    58-66#   58-66#   59-14    59-29    59-29#   59-43    59 43#   59-43#
        59-49    59-49#   59-63    59-63#   59-63#   60-20    60-32    60-32#   60-44    60-44#   60 44#   61 9     61-20    61-20#
        61-25    61-25#   61-25#   61-31    61-31#   61-36    61-36#   61-36#   62-10    62-19    62-19#   62-25    62-25#   62-25#
        62-28    62-28#   62-34    62-34#   62-34#   63-17    63-30    63-30#   63-32    63-32#   63-32#   63-71    63-71#   63-96
        63-96#   63-96#   63-124   63-124#  63-138   63-138#  63-138#  64 19    64-37    64-37#   64 39    64-39#   64-39#   64-42
        64-42#   64-45    64-45#   64-45#   64-56    64-56#   64-58    64-58#   64-58#   65-18    65-38    65-38#   65-41    65-41#
        65-41#   65-42    65-42#   65-47    65-47#   65-47#   65-63    65-63#   65-66    65-66#   65-66#   65-67    65-67#   65-72
        65-72#   65-72#   66-25    66-52    66-52#   66-60    66-60#   66-60#   67-29    67-70    67-70#   67-75    67-75#   67-75#
        67-127   67-127#  67-152   67-152#  67-152#  67-180   67-180#  67-194   67-194#  67-194#
I$TST     7 278#   50-57    50-57#   50-62    50-68    50-68#   50-68#   51-14    51-14#   51-18    51-25    51-31    51-31#   51-31#
        52-23    52-23#   52-46    52-49    52-71    52-71#   52-71#   53-22    53-22#   53-41    53-44    53-67    53-67#   53-67#
        54-17    54-17#   54-27    54-30    54-42    54 45    54-57    54-60    54-67    54 67#   54-67#   55-8     55-8#    55-15
        55-18    55-25    55-25#   55-25#   56-23    56 23#   56-26    56-44    56-76    56-120   56-120#  56-120#  57-12    57-12#
        57-15    57-18    57-25    57-41    57-69    57-110   57-110#  57-110#  58-15    58-15#   58-18    58-21    58-34    58-52
        58 92    58-92#   58-92#   59-14    59-14#   59-17    59-20    59-29    59-49    59-87    59-87#   59-87#   60-20    60-20#
        60-32    60-52    60-52#   60-52#   61-9     61-9#    61-20    61-31    61-45    61-45#   61-45#   62-10    62-10#   62-19
        62-28    62-35    62-38    62-38#   62-38#   63-17    63-17#   63 30    63-35    63-71    63 124   63-165   63-165#  63-165#
        64-19    64-19#   64-37    64-42    64-56    64-63    64-63#   64-63#   65-18    65-18#   65-38    65-42    65-63    65-67
        65-85    65-85#   65-85#   66-25    66-25#   66-33    66-52    66-83    66-83#   66 83#   67-29    67-29#   67-37    67-70
        67-78    67-127   67 180   67 247   67-247#  67-247#
IAE     12-89#   27-111
IBE     11-57#
IC      10-11#   51-21    51-28
ICMSG   69-22    69-79#
IDU     11-57#
IE      12-5#
IER     11-57#
ILF     12-79#   27-106
ILLCMD  12-209#
ILR     12-80#   27-106
ILV     12-64#   63-56    67-112
INCCYL  58-30*   58-31*   58-32    58-94#
ISR     11-57#
ISRCNT  13-11#   38-6*    44-14*
ISRV    36-36    38-5#    44-89    56-119   57-109   58-83    58-91    59-86    63-164   67-201   67-229
IT      10-14#   60-46    65-80    66-70
ITCNT   13-10#   44-13*   50-58*   50-65*   52-24*   52-69*   53-23*   53 65*   62-12*   62-36*   63-18*   63-33*   64-22*   64 59*
        67-40*   67-76*
ITMSG   69-28    69-82#
IXE     11 57#
IXU     12-160#  27-163
J$JMP     7-278#   42-61    47-18    48-19
KWSRV   26-84    26-94    26-113#
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L$APT     7-323#
L$AU    48-9#
L$AUT     7-323#
L$AUTO    7-323    45-10#
L$CCP     7-323#
L$CLEA    7-323    46-8#
L$CO      7-323#
L$DEPO    7-323#
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L$DEVP    7-323#
L$DISP    7 323     8 8#
L$DLY     7-323#
L$DTP     7-323#
L$DTYP    7-323#
L$DU     47-8#
L$DUT     7-323#
L$DVTY    7-323    18-17#
L$EF      7-323#
L$ENVI    7-323#
L$ETP     7-323#
L$EXP1    7-323#
L$EXP4    7-323#
L$EXP5    7-323#
L$HARD    7-323    68-53     68-53#
L$HIME    7-323#
L$HPCP    7-323#
L$HPTP    7-323#
L$HW      7-323     9-9       9-9#
L$ICP     7-323#
L$INIT    7-323    44-8#
L$LADP    7-323#
L$LAST    7-323    69-122#   70-22
L$LOAD    7-323#
L$LUN     7-323#
L$MREV    7-323#
L$NAME    7-323#
L$PRIO    7-323#
L$PROT    7-323    43-8#
L$PRT     7-323#
L$REPP    7-323#
L$REV     7-323#
L$RPT    42-47#
L$SOFT    7-323    69-12     69-12#
L$SPC     7-323#
L$SPCP    7-323#
L$SPTP    7-323#
L$STA     7-323#
L$SW      7-323    10-8      10-8#
L$TEST    7-323#   32-138    33-67     33-69     33-71     33-113    66-31     67-35
L$TIML    7-323#
L$UNIT    7-323#   44-34
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L10020  47 18    47-33#
L10021  48 19    48 34#
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L10102  64-45#
L10103  64-58#
L10104  65-85#
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NOCLK    18 61#   44-85
NOOP     12-199#
NOTMSG   18-82#   44-71
NS1      13-24#   28-8     52-56    53-51    61-16
NT1      13-23#   28-11    61-17    64-48
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O$AU      7-278#   7-323
O$BGNR    7-278#   7-323
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O$ERRT    7-278#   7-323
O$GNSW    7-278#   7-310#   7-323
O$POIN    7-278#   7-310    7-310#   7-310#   7-310#   7-323
O$SETU    7-278#   7-310#   7-323    69-122
OCTHEX   19-7     24-4#
OFFSET   12-204#  37-96    62-18
OFLMSG   18-81#   44-73
OM       12-62#   62-22    62-31
ONECYL   14-13    18-71#
ONEFIL    2-4#     2-8      4-905    5-1      7-263#   7-299    10-41    11-1     11-8#    11-13    41-2     42-1     42-8#    42-13
         48-36    49-1     49-9#    50-3     67-256   68-1     68-9#    68-15
OPI      12-92#   27-116
OPT      36-168   36-208#  38-40    38-145   38-194
PARMSG   69-14    69-76#
PAT      10-17#   65-32    65-56    66-44    67-47
PATMSG   69-34    69-85#
PCLKTB   26-22*   26-64#
PGE      12-151#  27-59
PHF      12-162#  27-168
PKB      26-24*   26-25*   26-67#   26-85*   26-127*  26-136*  26-156*  26-162*  26-171*  56-45*   56-51*   56-77*   56-83*   57-42*
         57-49*   57-70*   57-77*   58-33*   58-40*   58-53*   58-60*   59-30*   59-37*   59-50*   59-57*   63-80*   63-90*   63-104*
         63-114*  63-126*  63-132*  67-136*  67-146*  67-160*  67-170*  67-182*  67-188*
PKC      26-26*   26-27*   26-68#   32-76    32-91    32-93    32-95    32-96    32-99    32-101   32-102   32-121   32-123   32-124
         32-128   32-130   32-131   32-135   32-146   56-49    56-81    57-47    57-75    58-38    58-58    59-35    59-55    63-88
         63-112   63-130   67-144   67-168   67-186
PKCS     26-23*   26-66#   26-86*   26-105*  26-123*  26-128*  26-131*  26-152*  26-163*  26-166*  56-46*   56-50*   56-79*   56-82*
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PKV      26-29*   26-69#   26-84    26-124   26-126   26-135   26-153   26-155   26-170   44-98    46-18    56-37    57-32    58-27
         59-26    63-44    67-86
PNT      11-57#
POPQUE   36-221   37-12    37-149   38-137   38-183   40-83#
POSERR   18-68#   57-86    58-69    59-66    63-141   67-197
PRI      11-57#
PRI00    11-57#   56-39    56-110   57-34    57-100   58-29    58-80    59-28    59-77    63-46    63-155   67-88    67-219
PRI01    11-57#
PRI02    11-57#
PRI03    11-57#
PRI04    11-57#
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PRI06    11-57#   26-84    26-94    26-126   26-135   26-155   26-170   56-37    57-32    58-27    59-26    63-44    67-86
PRI07    11-57#   46-10
PSTACK   19-8     19-8     19-8     19-8     24-6     24-21    24-40#
QCNT     39-3#    40-8     40-32*   40-47    40-49*   40-69    40-83*
QDRV0    39-14    39-25    39-34    39-46#
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SFPTBL	10 8#													
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SKI	12-165#	27-121												
SNDIGT	18-63#	44-127												
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SP11	15-18#	58-89												
SP12	15-22#	59-84												
SP1418	15-26#	63-162	67-227											
SP7	15-8#	56-117												
SPTYP	32-161#	56-116	57-106	58-88	59-83	63-161	67-226							
SRCH00	32-10#	56-27	57-16	58-19	59-18	63-37	67-80							
SRCHWT	35-98#	36-210*	37-74*	38-134	38-141*									
SRHSEC	13-13#	19-40	63-72*	67-128*										
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ST.LCL	26-47	26-90#												
ST.PCL	26-32	26-80#												
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STALL1	13-50#	28-86	28-126											
STALL2	13-51#	29-27												
STALLF	10-22#	28-83	28-123	29-24										
STALMG	69-57	69-97#												
STALRD	10-24#	30-57												
STALRM	69-60	69-98#												
STLTIM	69-55	69-96#												
STO	38-212	38-232#												
STOFLG	10-25#	26-81	26-91											
STOMSG	69-53	69-95#												
STOPCK	26-102#	44-93	46-13	56-35	57-30	58-25	59-24	60-22	61-11	63-22	64-21	65-28	66-50	67-55
STRTMR	32-43#	56-34	57-29	58-24	59-23	63-41	67-83							
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F 15


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CROSS REFERENCE TABLE (CREF V04.00)

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          69-47#   69-49    69-49    69-49    69-49#   69-49#   69-49#   69-51    69-51    69 51    69-51#   69-51#   69-51#   69-53
          69-53    69-53    69-53#   69-53#   69-53#   69-55    69-55    69-55    69-55#   69-55#   69-55#   69-57    69-57    69-57
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T$TEST     7-278#  50-57    50-57    50-57#   50-62    51-14    51-14    51-14#   51-18    51-25    52-23    52-23    52-23#   52-46
          52-49    53-22    53-22    53-22#   53-41    53-44    54-17    54-17    54-17#   54-27    54-30    54-42    54-45    54-57
          54-60    55-8     55-8     55-8#    55-15    55-18    56-23    56-23    56-23#   56-44    56-76    57-12    57-12    57-12#
          57-25    57-41    57-69    58-15    58-15    58-15#   58-34    58-52    59-14    59-14    59-14#   59-29    59-49    60-20
          60-20    60-20#   60-32    61-9     61-9     61-9#    61-20    61-31    62-10    62-10    62-10#   62-19    62-28    63-17
          63-17    63-17#   63-30    63-71    63-124   64-19    64-19    64-19#   64-37    64-42    64-56    65-18    65-18    65-18#
          65-38    65-42    65-63    65-67    66-25    66-25    66-25#   66-52    67-29    67-29    67-29#   67-70    67-127   67-180
          69-122
T$TSTM     7-278#  19-4     19-8     19-10    19-11    19-13    19-14    19-16    19-17    19-21    19-22    19-24    19-25    19-28
          19-29    19-30    19-31    19-33    19-34    19-39    19-40    19-42    19-43    19-46    19-48    19-49    26-16    26-35
          26-84    26-94    26-126   26-135   26-155   26-170   27-27    27-35    27-42    27-47    27-52    27-61    27-66    27-71
          27-76    27-87    27-92    27-95    27-98    27-103   27-108   27-113   27-118   27-123   27-128   27-135   27-140   27-147
          27-150   27-155   27-160   27-165   27-170   27-203   30-19    30-23    30-27    30-31    30-35    30-45    31-22    32-165
          32-168   32-171   32-173   33-40    33-43    33-45    33-50    33-51    33-56    33-57    33-66    33-73    33-75    33-77
          36-18    36-20    36-36    36-45    36-145   36-147   36-199   36-209   36-254   42-76    44-10    44-16    44-20    44-25
          44-29    44-39    44-71    44-73    44-75    44-77    44-85    44-89    44-91    44-98    44-100   44-101   44-102   44-103
          44-114   44-127   44-132   44-165   44-180   45-17    46-10    46-18    46-21    46-23    46-24    46-26    47-33    48-34
          50-62    50-67    50-68    51-18    51-20    51-25    51-27    51-31    52-46    52-48    52-49    52-64    52-71    53-41
          53-43    53-44    53-60    53-67    54-27    54-29    54-30    54-32    54-42    54-44    54-45    54-47    54-57    54-59
          54-60    54-62    54-67    55-15    55-17    55-18    55-20    55-25    56-26    56-37    56-39    56-44    56-57    56-60
          56-61    56-73    56-74    56-76    56-89    56-110   56-112   56-119   56-120   57-15    57-18    57-25    57-27    57-32
          57-34    57-41    57-55    57-69    57-83    57-86    57-100   57-102   57-109   57-110   58-18    58-21    58-27    58-29
          58-34    58-46    58-52    58-66    58-69    58-80    58-83    58-84    58-91    58-92    59-17    59-20    59-26    59-28
          59-29    59-43    59-49    59-63    59-66    59-77    59-79    59-86    59-87    60-32    60-44    60-52    61-20    61-24
          61-25    61-31    61-35    61-36    61-45    62-19    62-24    62-25    62-28    62-33    62-34    62-35    62-38    63-30
          63-32    63-35    63-44    63-46    63-71    63-96    63-99    63-100   63-121   63-122   63-124   63-138   63-141   63-148
          63-155   63-157   63-164   63-165   64-33    64-34    64-37    64-39    64-42    64-45    64-56    64-58    64-63    65-38
          65-41    65-42    65-47    65-63    65-66    65-67    65-72    65-85    66-31    66-33    66-52    66-60    66-83    67-35
          67 37    67-70    67-75    67-78    67-86    67-88    67-127   67-152   67-155   67-156   67-177   67-178   67-180   67-194
          67-197   67-201   67-203   67-205   67-209   67-214   67 219   67-221   67-229   67-247
T$TSTS     7-278#  50-57#   51-14#   52-23#   53-22#   54-17#   55-8#    56-23#   57-12#   58-15#   59-14#   60-20#   61-9#    62-10#
          63-17#   64-19#   65-18#   66-25#   67-29#
T1         8-8     50-57#
T1.1      50-62#
T10        8-8     59-14#
T10.1     59-29#
T10.1$    59-30#   59-72
T10.2     59-49#
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T10.2$  59 39    59-46#
T10.3$  59 59    59-65    59-68#
T10.4$  59-45    59-66#
T10.7$  59 26    59-75#
T10.8$  59-67    59-73    59 80#
T11      8-8     60-20#
T11.1   60-32#
T11.2$  60-33#   60-39    60-50
T11.5$  60-45#
T12      8-8     61-9#
T12.1   61-20#
T12.2   61-31#
T13      8 8     62-10#
T13.1   62-19#
T13.1$  62-32    62-36#
T13.2   62-28#
T14      8-8     63-17#
T14.1   63-30#
T14.1$  63-53#   63-151
T14.2   63-71#
T14.3   63-124#
T14.7$  63-44    63-153#
T14.8$  63-101   63-123   63-142   63-150   63-158#
T1410$  63-71#
T1411$  63-92    63-116   63-125#
T1412$  63-134   63-140   63-144#
T1418   14-28#   63-79    63-160   67-135   67-225
T15      8-8     64-19#
T15.1   64-37#
T15.2   64-42#
T15.3   64-56#
T16      8-8     65-18#
T16.1   65-38#
T16.2   65-42#
T16.3   65-63#
T16.4   65-67#
T17      8-8     66-25#
T17.1   66-52#
T18      8-8     67-29#
T18.1   67-70#
T18.2   67-127#
T18.3   67-180#
T1811$  67-148   67-172   67-181#
T1812$  67-190   67-196   67-200#
T18END  67-157   67-179   67-198   67-212   67-222#
T180FL  67-86    67-217#
T2       8-8     51-14#
T2.1    51-18#
T2.11   51-18#   51-23
T2.2    51-25#
T2.21   51-25#   51-30
T3       8-8     52-23#
T3.1    52-46#
T3.11   52-29    52-47#
T3.2    52-49#
T4       8-8     53-22#
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T4.1     53 41#
T4.2     53 44#
T5        8-8      54-17#
T5.1     54 27#
T5.11    54 28#    54-36
T5.2     54-30#
T5.3     54-42#
T5.31    54-43#    54-51
T5.4     54-45#
T5.5     54 57#
T5.51    54-58#    54 66
T5.6     54-60#
T6        8 8      55-8#
T6.1     55-15#
T6.11    55 16#    55-24
T6.2     55-18#
T7        8-8      56-23#
T7.1     56-44#
T7.1$    56 45#    56 106
T7.10$   56-60#    56-91
T7.2     56-76#
T7.2$    56-53     56-68     56-77#
T7.20$   56 73#    56-101
T7.3$    56-85     56-96     56-103#
T7.44$   56 59     56-64#
T7.7$    56-37     56-108#
T7.8$    56-62     56-75     56-105    56-113#
T7A      14-6#     56-32     56-115
T8        8-8      57-12#
T8.1     57-25#
T8.1$    57-38#    57-60     57-96
T8.10$   57-79     57-85     57-88#
T8.2     57-41#
T8.2$    57-51     57-58#
T8.3     57-69#
T8.3$    57-40     57-61#
T8.4$    57-66#    57-90
T8.5$    57-23     57-28#
T8.6$    57-68     57-91#
T8.7$    57-32     57-96#
T8.8$    57-87     57-93     57-103#
T8.9$    57-57     57-86#
T9        8-8      58-15#
T9.1     58-34#
T9.1$    58-31#    58-75
T9.2     58-52#
T9.2$    58-42     58-49#
T9.3$    58-62     58-68     58-71#
T9.4$    58-48     58-69#
T9.7$    58-27     58-78#
T9.8$    58-70     58-76     58-85#
TD       38-10     38-19#
TEMP0    13-8#     63-48*    63-145    63-147*   67-90*    67-206    67-208*
TEST1    50-59#    50-66
TEST10   59-22#
TEST13   62-13#    62-37
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TEST14   63-29#   63 34
TEST15   64-23#   64-60
TEST16   65-30#   65-83
TEST17   66-53#   66-65    66-74    66 81
TEST18   67-55#   67-77
TEST3    52-27#   52-67    52-70
TEST4    53-26#   53-63    53-66
TEST5    54-25#
TEST6    55-13#
TEST7    56-33#
TEST8    57-20#
TEST9    58-23#
TICKMS   26-51*   26-55*   26-59#   26-113
TICKUS   26-52*   26-56*   26-60#
TIM.DN   13-40#   32-51*   32-74    32-120
TIM.PT   13-46#   32-45    32-91*   32-92*   32-143   32-146*  32-147*
TIM.UP   13-33#   32-44    32-50*   32-71    32-117   33-23    63-145   67-206   67-211
TIMER    35-116#  36-23    36-65*   36-128*  36-246*  37-155*  37-210*  38-22*   38-118*  38-143*  38-208   38-210*  38-243*  38-258*
         38-264*
TIMMSG   69-51    69-94#
TIMSTL   10-21#   26-157
TIMT10   14-13#   57-19    57-105
TIMT11   14-18#   58-22    58-87
TIMT12   14-23#   59-21    59-82
TIMTYP   10-20#   33-27
TRE      12-11#
TRGSEC   13-14#   19-40    63-55*   67-111*
TRK.DS   13-31#   19-29    19-31    19-38*   19-40    28-32*   28-61*   28-101*  29-18*   31-19*   32-21*
TRK.RD   13-27#   19-4     19-31    27-21*   28-9     28-11*   28-16*   30-15*   31-16*   56-111*  57-101*  58-81*   59-78*   63-156*
         67-220*
TRKWC    13-49#   60-25    65-21    66-37
TRNSWT   35-90#   37-13*   37-185   37-187*  37-198   37-216*  37-222*  38-24    38-25*   38-236   38-253*
TST12    61-23    61-26#
TST12A   61-34    61-37#
TST13    62-23    62-27#
TST14A   63-20    63-37#
TST15    64-43#   64-51
TST18A   67-52    67-80#
TST18B   67-92#   67-215
TST18C   67-225#
TWOMS    26-152#  57-59    57-89    58-51    58-73    59-48    59-70
TYPTIM   33-17#   56-115   57-105   58-87    59-82    63-160   67-225
TYTIME   13-9#    32-162   33-26*   33-37*
UAM      11-57#
UNIT     17-3#    44-30*   44-33*   44-34    44-39
UNS      12-93#
UNSMSG   18-79#   44-77
UPE      12-38#   27-30
VERIFY   28-79    28-120   31-8#
WCE      12-39#   27-45
WCEFLG   13-47#   29-9*    56-64*   56-71*   56-92*   56-99*   63-103*  63-119*  67-159*  67-175*
WCF      12-84#   27-69
WCKD     12-210#  65-45    65-70    66-58    67-73    67-202
WCKHD    12-211#
WLE      12-90#   27-74
WOR      12-147#  27-153
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WRITMG   69-38    69-87#
WRPAT    65 39#   65-52
WRPATN   65-64#   65-77
WRSAFM   69-44    69-88#
WRT.RP   36-101   36-105   37-21    37-31    37-35    37 42    37-46    37 55    37 59    37-66    37-71    37-83    37 91    37-102
         37-117   37-140   37-146   37-164   37-168   37-179   38 105   38-315#
WRTALL   10-27#   66-28    67-32
WRTDAT   12-212#  65-43    65-68    66-56    67-71    67-183
WRTENM   18-64#   66-31    67-35
WRTTD    12-214#
WRYUNS   12-146#  27-153
X$ALWA    7-278#
X$FALS    7-278#  69-16    69-40    69-59
X$OFFS    7-278#  69-16    69-40    69-59
X$TRUE    7-278#
XIT14    63-39    63-163#
XIT18    67-82    67-228#
XTIMES   13-12#   63-18    63-149   67-40    67-211
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CROSS REFERENCE TABLE (CREF V04.00)

SEQ 0196

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                19-30#      19-31       19-31       19-31       19 31       19-31       19-31       19 31#      19-33       19 33#      19-39       19 39#      19-40       19-40
                19-40       19-40       19-40       19-40#      19-42       19-42#      19-46       19-46#      19-48       19-48#      32-165      32 165#     32-168      32-168#
                32 171      32-171#     32-173      32-173#     33 40       33 40#      33 43       33-43#      33 45       33 45#      33 50       33 50       33-50#      33 51
                33-51#      33-56       33-56       33-56#      33-57       33 57#      33-66       33 66#      33 73       33-73#      33 75       33-75#      33 77       33-77#
                44-29       44-29#      44-71       44-71#      44-73       44-73#      44-75       44-75#      44-77       44-77#      44-85       44 85#      44-114      44 114#
                44-127      44-127#     44-132      44-132#     56-60       56 60#      56-61       56-61#      56 73       56-73#      56-74       56-74#      57 86       57-86#
                58-69       58-69#      59-66       59-66#      63-99       63-99#      63-100      63-100#     63-121      63-121#     63 122      63-122#     63-141      63-141#
                66-31       66-31#      67 35       67-35#      67 155      67-155#     67-156      67-156#     67 177      67-177#     67 178      67-178#     67 197      67-197#
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                 7-323       7-323       7-323       7-323       7-323       7-323       7-323       7-323       7-323       7-323       7-323       7 323       7-323       7-323
                 7-323       7-323       7-323       7-323       7-323       7-323       7-323       7-323       7-323       7-323       7-323       7-323#      7 323#      18-17
                18-17#      18-27       18-27#
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                19-49       19-49#      26-115      26-115#     26-133      26-133#     26-168      26-168#     32-36       32-36#      38 15       38-15#      41-1        41 1#
                42-76       42-76#      43-12       43-12#      44-180      44-180#     45-17       45-17#      46-26       46 26#      47-33       47-33#      48-34       48 34#
                48-35       48-35#      50-67       50-67#      50-68       50-68#      51-20       51-20#      51-27       51-27#      51-31       51-31#      52-48       52 48#
                52-64       52-64#      52-71       52-71#      53-43       53-43#      53-60       53-60#      53-67       53-67#      54-29       54-29#      54-32       54-32#
                54-44       54-44#      54-47       54-47#      54-59       54-59#      54-62       54-62#      54-67       54-67#      55 17       55-17#      55-20       55-20#
                55-25       55-25#      56-57       56-57#      56-89       56-89#      56-120      56-120#     57-27       57-27#      57-55       57 55#      57-83       57 83#
                57-110      57-110#     58-46       58-46#      58-66       58-66#      58-92       58-92#      59-43       59-43#      59-63       59 63#      59-87       59-87#
                60-44       60-44#      60-52       60-52#      61-25       61-25#      61-36       61-36#      61 45       61-45#      62-25       62-25#      62-34       62-34#
                62-38       62-38#      63-32       63-32#      63-96       63-96#      63-138      63-138#     63-165      63-165#     64-39       64-39#      64-45       64-45#
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                69-20       69-20#      69-22       69-22#      69-24       69-24#      69 26       69-26#      69-28       69-28#      69-30       69-30#      69-32       69-32#
                69-34       69-34#      69-38       69-38#      69-44       69-44#      69-47       69-47#      69-49       69-49#      69-51       69-51#      69 53       69-53#
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                52-64#      52-71#      53-43#      53-60#      53-67#      54-29#      54-32#      54-44#      54-47#      54-59#      54-62#      54-67#      55-17#      55-20#
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                64-58#      64-63#      65-41#      65-47#      65-66#      65-72#      65-85#      66-60#      66-83#      67-75#      67-152#     67-194#     67-205#     67-247#
                67-254#     68-62#      69-71#      69-123#
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                27-140      27-140#     27-147      27-147#     27-150      27-150#     27-155      27-155#     27-160      27-160#     27-165      27-165#     27-170      27-170#
                27-203      27-203#     30-19       30-19#      30-23       30-23#      30-27       30-27#      30-31       30-31#      30-35       30-35#      31-22       31 22#
                56-112      56-112#     57-102      57-102#     58-84       58-84#      59-79       59-79#      61-24       61-24#      61-35       61-35#      62-24       62-24#
                62-33       62-33#      63-148      63-148#     63-157      63-157#     64-33       64-33#      67-209      67-209#     67-221      67-221#
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M$ESCS           1-D10#      7-278#
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36-147	36-147	36-147#	36-147#	36-199	36-199	36-199#	36-199#	36-209	36-209	36-209#	36-209#	36-254	36-254
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	67-127	67-127#	67-180	67-180#										
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	67-180#	67-194	67-194#	67-197	67-197#	67-201	67-201#	67-203	67-203#	67-205	67-205#	67-209	67-209#	67-209#
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MEMORY   1-;66#   7-278#
OPEN     1-;71#   7-278#
POINTE   1-;76#   7-278#   7-310
POP      7-246#  27-205    33-82
PRINTB   1-<39#   7-278#   19-4     19-8     19-24    19-28    19-29    19-33    19-39    19-40    19-42    19-46    19-48
PRINTF   1-<79#   7-278#   32-165   32-168   32-171   32-173   33-40    33-43    33-45    33-50    33-51    33-56    33-57    33-66
        33-73    33-75    33-77    44-29    44-71    44-73    44-75    44-77    44-85    44-114   44-127   44-132   56-60    56-61
        56-73    56-74    57-86    58-69    59-66    63-99    63-100   63-121   63-122   63-141   66-31    67-35    67-155   67-156
        67-177   67-178   67-197
PRINTS   1-*19#   7-278#
PRINTX   1-*59#   7-278#   19-10    19-11    19-13    19 14    19-16    19-17    19-21    19-22    19-30    19-31
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READBU   1-*99#   7-278#
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RFLAGS   1->08#   7-278#
SAV.RH   7-48#   56-54    56-86    56-111   57-52    57-80    57-101   58-43    58-63    58-81    59-40    59-60    59-78    63-93
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SAVREG   7-22#   38-348   56-54    56-86    56-111   57-52    57-80    57-101   58-43    58-63    58-81    59-40    59-60    59-78
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SETVEC   1->18#   7-278#   26-84    26-94    26-126   26-135   26-155   26-170   36-36    44-89    56-37    56-39    56-119   57-32
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        67-201   67-214   67-229
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STARS    1->38#   7-167#   7-278#   50-39    50-43    51-3     51-12    52-3     52-21    53-3     53-20    54-3     54-15    55-3
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XFERT    1-@20#   7-278#
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