RK06

DISK DRIVE DIAG. PART 2

MD-11-DZR6I-C

EP-DZR6I-C-DL-B

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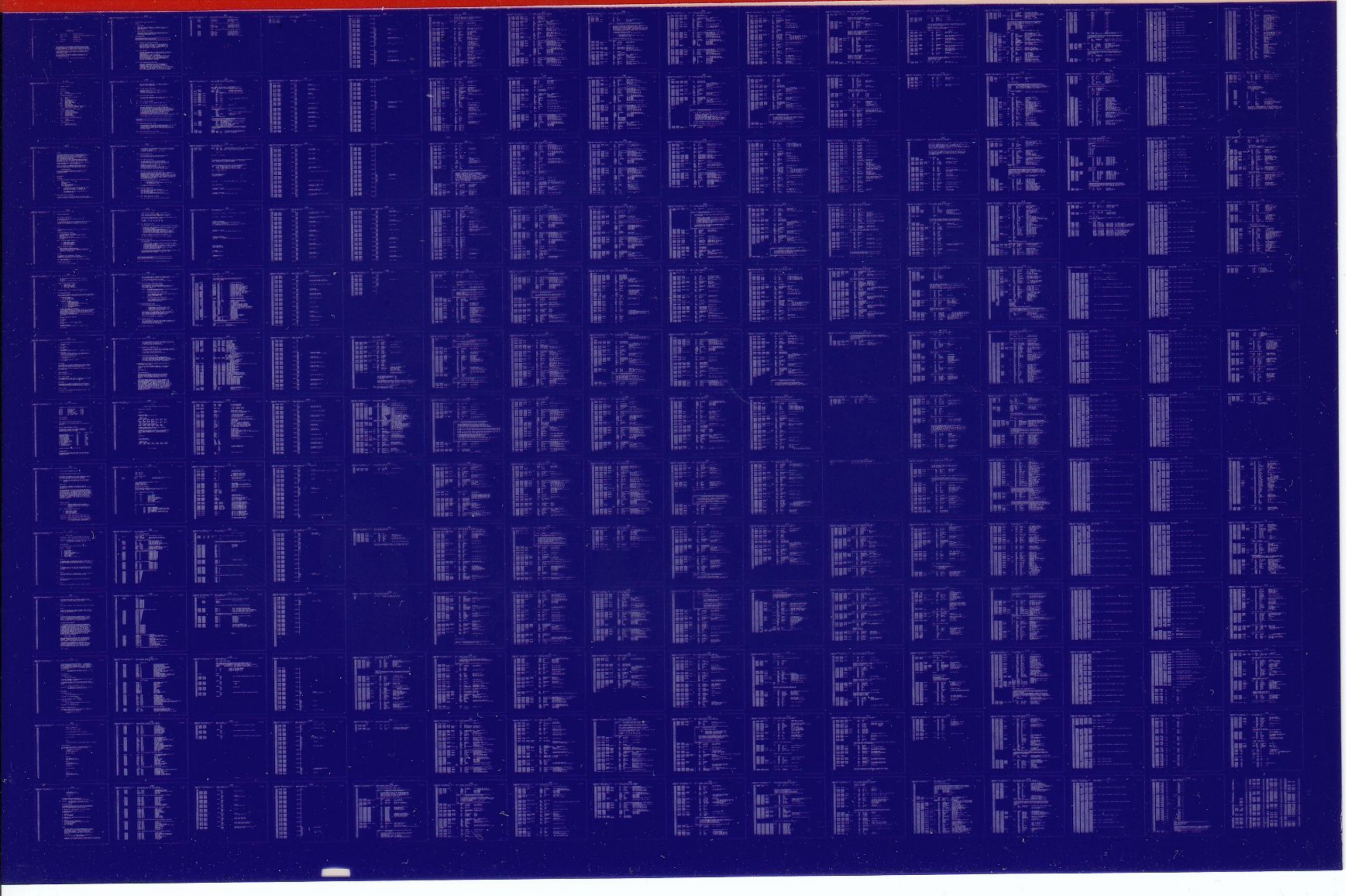

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IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZR6I-C-D
PRODUCT NAME:	UNIBUS RK06 DISK DRIVE DIAGNOSTIC: PART 2
DATE:	DECEMBER 1976
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	GARY PAPAZIAN

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1.0 ABSTRACT

THIS PROGRAM PERFORMS PART 2 OF THE DRIVE DIAGNOSTICS TO INSURE THAT THE DISK IS CAPABLE OF PERFORMING READ AND WRITE DATA OPERATIONS IN BOTH 20 AND 22 SECTOR FORMATS.
WORST CASE PATTERNS, SPIRAL WRITING AND READING, AND ALL OFFSET OPERATIONS ARE PERFORMED.
ALSO, UNLOADING AND LOADING TIMES ARE REPORTED ALONG WITH ROTATIONAL MIN, MAX, 137 CYLINDER & MAX VELOCITY TIMES.
ERROR DETECTION LOGIC IS CHECKED BY SOFTWARE ERROR FORCING.

AFTER A SUCCESSFUL RUN (WITH NO ERRORS) OF PART 2, THE DRIVE IS READY FOR PART 3 OF THE DRIVE DIAGNOSTICS.

TESTING IS BASED ON A HIERARCHY APPROACH STARTING WITH BASIC LOGIC TESTS AND PROCEEDING THRU DYNAMIC TESTING. THE TESTS WILL BE KEPT SMALL TO FACILITATE SCOPING LOOPS.

*****CAUTION*****

HALTING THIS PROGRAM ANYWHERE BUT AT THE END OF A PASS, MAY LEAVE THE HEADERS IN THE DISK CARTRIDGE IN AN UNDETERMINED STATE.

2.0 REQUIREMENTS

2.1 HARDWARE

THE FOLLOWING HARDWARE IS REQUIRED TO RUN THE DISK DIAGNOSTIC:

PDP-11
CONSOLE TELETYPE
16K MEMORY
KW11-L OR KW11-P CLOCK
RK06 UNIBUS CONTROLLER (RK611)
1 TO 8 RK06 DRIVES

NOTES:
1. IF NEITHER KW11-L OR P CLOCK IS USED, ALL TIMING TESTS WILL BE BYPASSED. A MESSAGE AT THE BEGINNING OF THE TESTS WILL CONFIRM THIS.

2. THE PROGRAM CAN WORK OFF EITHER FORMATTED OR NON-FORMATTED PACKS.

2.2 PRELIMINARY TESTING & PROGRAMS

THE RK611 DISKLESS CONTROLLER DIAGNOSTICS (ALL PARTS) SHOULD FIRST RUN SUCCESSFULLY FOLLOWED BY THE RK06 DRIVE DIAGNOSTIC- PART 1.

3.0 PROGRAM CONSIDERATIONS

3.1 PDP-11 FAMILY COMPATIBILITY

THIS PROGRAM CAN BE USED BY THE PDP-11/04,05,10,20, 34,35,40,45,50, & 70.

IT IS COMPATABLE WITH THE LSI-11 INSTRUCTION SET AND CAN TEST THE RK06 ONLY IF THE DRIVE CONTROLLER FOR THE LSI-11 IS DESIGNED TO BE DIAGNOSTICALLY COMPATABLE WITH THE RK611.

3.2 XXDP

THIS PROGRAM CAN BE CHAINED BY XXDP & WILL NOT OVERLAY THE LOADER.

CHAIN MODE OPERATION (MONITOR)

1. THE INPUT DIALOGUE IS BYPASSED.
2. THE BUSS ADDRESS & CONTROLLER INTERRUPT VECTOR IS DEFAULTED.
3. DRIVE 0 WILL NOT BE TESTED.
4. ALL OTHER DRIVES IN THE 'DRIVE PRESENT' CONDITION WILL BE TESTED.

NOTE: THE DRIVE PRESENT CONDITION IS:

A. HEADS MANUALLY LOADED
B. CORRECT PORT SELECTED
C. WRITE LOCK DISABLED
D. DRIVE READY INDICATOR ON

DUMP MODE OPERATION (MANUAL)

1. INPUT DIALOGUE IF STARTED FROM 220.
2. DRIVE 0 CAN BE TESTED, BUT THE OPERATOR IS FIRST GIVEN A MESSAGE TO REPLACE THE PACK IN DR0 WITH A SCRATCH PACK & TYPE <CR> WHEN DONE.

3.3 ACT/APT

THIS PROGRAM IS ACT COMPATIBLE. IT IS APT COMPATABLE TO THE EXTENT THAT APT HOOKS WILL BE IN THE PROGRAM & WILL WORK THRU THE 'UPTON INTERFACE'.

FOR OTHER INTERFACES, APT MAY ONLY LOAD & START THE PROGRAM. I.E. LOAD & DUMP MODE.

AUTOMATIC MODE (MONITOR)

1. THE INPUT DIALOGUE IS BYPASSED.

2. THE BUSS ADDRESS & CONTROLLER INTERRUPT VECTOR IS DEFAULTED.
3. ALL DRIVES IN THE 'DRIVE PRESENT' CONDITION WILL BE TESTED.

NOTE: THE DRIVE PRESENT CONDITION IS:

A. HEADS MANUALLY LOADED
B. CORRECT PORT SELECTED
C. WRITE LOCK DISABLED
D. DRIVE READY INDICATOR ON

DUMP MODE (MANUAL): INPUT DIALOGUE IF STARTED FROM 220.

3.3.1 APT ETABLE DEFINITIONS

THE FOLLOWING DEFINITIONS ARE VALID FOR SPECIFYING APT ENVIPONMENTAL TABLE (ETABLE) ENTRIES. VIA RUNNING THE APT UTILITY PROGRAM "TSP":

1. SOFTWARE ENVIRONMENT:
   =1 IF APT SCRIPT MODE
   =0 IF STANDALONE MODE

2. ENVIRONMENT MODE:BYTE
   BIT 7 = 1 ETABLE DOES SIZING
   = 0 PROGRAM DOES SIZING
   BIT 6 = 1 SPOOL MESSAGES TO APT IF SCRIPT MODE
   = 0 DON'T SPOOL TO APT
   BIT 5 = 1 SUPPRESS CONSOLE OUTPUT
   = 0 ALLOW CONSOLE OUTPUT
   BITS 4-0 NOT USED

3. SWITCH 1 (SOFTWARE SWITCH REGISTER)
   IF ENVIRONMENT MODE BIT 7 (SIZING BIT) IS SET TO 1, THE SOFTWARE SWITCH REGISTER WILL BE USED, INSTEAD OF THE HARDWARE CONSOLE SWITCH REGISTER. REGARDLESS OF WHICH ONE IS USED, ALL BITS DEFINED IN SECTIONS 4.3 & 4.4 (SWITCH REGISTER OPTIONS) MAY USED WHEN RUNNING IN STANDALONE MODE.
   IN APT SCRIPT MODE, HOWEVER, BIT 14 (LOOP ON TEST) MUST ALWAYS BE SET TO 0.

4. SWITCH 2 (USER SWITCH REGISTER)
   NOT USED

5. CPU OPTIONS:
   NOT USED

6. MEMORY TYPES 1-4 AND MAX MEMORY ADDRESSES
   NOT USED

7. INTERRUPT VECTOR 1:
   USED WHEN ENVIRONMENT MODE BIT 7=1. DEFAULT = 210

8. BUS PRIORITY 1:

USED WHEN ENVIRONMENT MODE BIT 7=1. DEFAULT = 5

9. INTERRUPT VECTOR 2:
NOT USED

10. BUS PRIORITY 2:
NOT USED

11. BASE ADDRESS:
USED WHEN ENVIRONMENT MODE BIT 7 = 1. DEFAULT = 177440

12. DEVICE MAP:
USED WHEN ENVIRONMENT MODE BIT 7 = 1. EACH BIT SET TO 1 IN BITS 0-7 WILL SELECT THE CORRESPONDING DRIVE TO BE TESTED. BITS 8-15 ARE NOT USED.

13. CONTROLLER DESCRIPTOR WORDS:
NOT USED

14. DEVICE DESCRIPTOR CODES (IN WORDS):
NOT USED

3.4 DUAL ACCESS

THIS PROGRAM WILL NOT TEST OR SUPPORT DUAL-ACCESS. A DRIVE EQUIPED WITH DUAL ACCESS MUST BE SWITCHED TO THE PORT UNDER TEST TO PREVENT CONTENTION WITH THE OTHER PORT.

DUAL ACCESS TESTS WILL BE INCORPORATED IN A SEPARATE PROGRAM AT A LATER DATE.

3.5 MEMORY MANAGEMENT

MEMORY MANAGEMENT NOT USED

3.6 PARITY CHECK ENABLED

IF THE MEMORY PARITY CHECK OPTION IS AVAILABLE ON THE SYSTEM, THE PROGRAM WILL RUN WITH MEMORY CHECK ENABLED.

3.7 BAD SECTOR

THE PROGRAM WILL COMPARE DATA ERRORS WITH THE BAD SECTOR INFORMATION CONTAINED ON CYLINDER 410, HEAD 2. PRINTOUTS OF DATA ERRORS DUE TO BAD SECTORS/TRACKS WILL BE MASKED OUT.

3.8 EXECUTION TIME

THE EXECUTION TIMES SHOWN BELOW ARE BASED ON THE PDP 11/50.

TOTAL TIME: 2 MIN, 40 SEC

A BREAKDOWN OF THE MORE LENGTHY TESTS ARE SHOWN BELOW:

TEST 20	DRIVE OFF TRACK	45 SEC
TEST 21	UNLOAD HEADS	10 SEC
TEST 22	LOAD HEADS	20 SEC
TEST 23	ROTATIONAL TIMING	15 SEC
TEST 24	MAX SEEK TIMES	15 SEC
TEST 26	137 CYL SEEK TIMES	10 SEC
TEST 27	MAX VELOCITY TIMES	15 SEC

3.9 FAULT ISOLATION

TO BE DETERMINED.

3.10 ERROR CORRECTION AND FAILURE RATE ANALYSIS

THIS PROGRAM WILL NOT DO ERROR CORRECTION OR FAILURE RATE ANALYSIS.

3.11 DEFAULT UNIBUS ADDRESSES & VECTORS

THE FOLLOWING IS A LIST OF ALL DEFAULT ADDRESSES & VECTORS OF ALL HARDWARE TO BE USED & THEIR MEMORY ADDRESSES WHERE THEY CAN BE CHANGED.

	LOCATION	DEFAULT CONTENTS
RK06 BUSS ADDRESS	1264	177440
CONTROLLER INTERRUPT VECTOR	1314	210
CONTROLLER PRIORITY	1316	240
P-CLOCK STATUS REG	1320	172540
P-CLOCK SET BUFFER	1322	172542
P-CLOCK READ BUFFER	1324	172544
L-CLOCK STATUS REG	1326	177546
L-CLOCK INTERRUPT VECTOR	1330	100
P-CLOCK INTERRUPT VECTOR	1332	104
TTY KB STATUS REG	1144	177560
TTY KB BUFFER	1146	177562
TTY PRINTER STATUS REG	1150	177564
TTY PRINTER BUFFER	1152	177566

4.0 OPERATING PROCEDURE & CONTROL FUNCTIONS

4.1 PROGRAM LOADING

THE PROGRAM CAN BE LOADED FROM PAPER TAPE USING STANDARD PROCEDURE FOR ABSOLUTE LOADER TAPES; OR FROM ANY MEDIA SUPPORTED BY XXDP.

4.1.1 LOAD THE STARTING ADDRESS (SEE SEC 4.2).

4.1.2 SET SWITCH REGISTERS AS DESIRED (SEE SEC 4.3).

4.1.3 SET DRIVES TO BE TESTED IN THE 'LOAD' CONDITION & WITH THE APPROPRIATE PORT SELECTED & WRITE LOCK DISABLED. DRIVES NOT TO BE TESTED MUST HAVE BOTH PORTS DESELECTED.

NOTE: THE DRIVE WILL NOT RESPOND TO THE 'START SPINDLE' COMMAND IF THE RUN/STOP SWITCH IS IN THE 'STOP' POSITION.

4.1.4 PRESS 'START'

THE PROGRAM WILL IDENTIFY ITSELF AND WILL BEGIN A DIALOGUE WITH THE OPERATOR TO DETERMINE DRIVES TO BE TESTED (SEE SEC 4.5).

THE PROGRAM BEGINS TESTING ONLY THOSE DRIVES SPECIFIED BY THE INPUT DIALOGUE. IF A SPECIFIED DRIVE CANNOT BE FOUND BY THE PROGRAM IT WILL BE FLAGGED AS AN ERROR THAT THE DRIVE WAS NOT AVAILABLE. THEN BEGINNING WITH THE LOWEST NUMERICAL DRIVE AND PROCEEDING IN SEQUENTIAL ORDER, ALL VALID DRIVES WILL BE TESTED. ONE PASS THROUGH THE TEST SEQUENCE WILL BE PERFORMED ON EACH DRIVE BEFORE MOVING TO THE NEXT DRIVE IN SEQUENCE. THE DRIVE TO BE TESTED WILL BE TYPED AT THE BEGINNING OF EACH PASS. "END OF PASS" WILL BE TYPED AFTER TESTING ALL DRIVES.

4.2 STARTING LOCATIONS

LOCATION 200 - STARTING ADDRESS TO DEFAULT THE BUSS ADDRESS & THE CONTROLLER INTERRUPT VECTOR & TEST ALL DRIVES IN THE 'DRIVE PRESENT' CONDITION.

NOTE: THE DRIVE PRESENT CONDITION IS:

A. HEADS MANUALLY LOADED
B. CORRECT PORT SELECTED
C. WRITE LOCK DISABLED
D. DRIVE READY INDICATOR ON

LOCATION 204 - SAME AS 200 START BUT BYPASS WRITE TESTS.

LOCATION 214 - SAME AS 200 START BUT BYPASS TIMING TESTS.

LOCATION 220 - STARTING ADDRESS TO INPUT TESTING PARAMETERS VIA THE INPUT DIALOGUE. BUSS ADDRESS & CONT. INTERRUPT VECTOR INPUTTED ONLY ON

1ST PASS.

LOCATION 224 - SAME AS 220 START BUT BYPASS WRITE TESTS.

LOCATION 230 - SAME AS 220 START BUT BYPASS TIMING TESTS.

IMPORTANT: FOR VARIATIONS OF THE ABOVE, SEE XXDP, ACT/APT CONSIDERATIONS IN SECTIONS 3.2 & 3.3.

4.3 SWITCH REGISTER

THE SWITCHES ARE USED TO PROVIDE CONTROL FUNCTIONS.

SWITCH	FUNCTION
15	HALT ON ERROR
14	LOOP ON TEST
13	INHIBIT ERROR TYPEOUT
12	BYPASS DRIVE AFTER 20 ERRORS
11	INHIBIT ITERATION
10	BELL ON ERROR
9	LOOP ON ERROR
8	LOOP ON TEST IN SW<07:00>

4.3.1 SW<15>

THE PROGRAM HALTS ON ENCOUNTERING AN ERROR, AFTER TYPING OUT THE ERROR MESSAGE AND PERTINENT INFORMATION, IF SW13=0. PRESSING "CONTINUE" RESTORES NORMAL OPERATION OF THE PROGRAM.

4.3.2 SW<14>

THE PROGRAM LOOPS ON THE TEST THAT IS BEING EXECUTED WHEN THE SWITCH IS PUT ON. THIS SWITCH IS NORMALLY USED ALONG WITH SW15.

4.3.3 SW<13>

THIS SWITCH INHIBITS ALL ERROR MESSAGES. NORMALLY USED WHEN LOOPING ON TEST (SW14) OR LOOPING ON ERROR (SW9).

4.3.4 SW<12>

THIS SWITCH BYPASSES A GIVEN DRIVE AFTER 20 ERRORS HAVE BEEN DETECTED.

4.3.5 SW<11>

EACH TEST WILL BE EXECUTED ONLY ONCE. NORMALLY AFTER THE

FIRST PASS, EACH SUBTEST IS ITERATED A NUMBER OF TIMES
(USUALLY 50, 5 IN SOME CASES). SETTING THIS SWITCH INHIBITS
ITERATIONS, SO THAT QUICK PASSES CAN BE MADE.

4.3.6 SW<10>

RINGS A BELL ON ERROR. USEFUL WHEN ERROR TYPEOUT IS INHIBITED.

4.3.7 SW<09>

THIS SWITCH PROVIDES THE TIGHTEST POSSIBLE SCOPE LOOP FOR
ERRORS. IF THE PROGRAM DETECTS AN ERROR, IT WILL LOOP BACK
TO THE BEGINNING OF TEST.

4.3.8 SW<08>

THIS SWITCH IS USED TO SELECT A PARTICULAR TEST (AS PER
SW<00-7>) FOR EXECUTION AND SUBSEQUENT LOOPING. THUS IF
TEST 15 IS TO BE SELECTED THE SWITCH SETTING WOULD BE
000415. IT SHOULD BE NOTED THAT BEFORE SELECTING TEST 15,
ALL THE PREVIOUS TESTS (1-14) WILL BE EXECUTED.

4.4 'SOFTWARE' SWITCH REGISTER

IF THE PROGRAM IS BEING RUN ON A SWITCHLESS PROCESSOR
(I.E. AN 11/04 OR 11/34) THE PROGRAM WILL DETERMINE THAT
THE HARDWARE SWITCH REGISTER IS NOT PRESENT AND WILL USE
A 'SOFTWARE' SWITCH REGISTER. THE 'SOFTWARE' SWITCH
REGISTER IS LOCATED AT LOCATION 176 (8). THE SETTINGS
OF THE 'SOFTWARE' SWITCHES ARE CONTROLLED THROUGH A
KEYBOARD ROUTINE WHICH IS CALLED BY TYPING A 'CONTROL G'.
THE PROGRAM WILL RECOGNIZE THE 'CONTROL G' AT ANY TIME
EXCEPT WHEN THE PROGRAM IS AT A HIGHER PRIORITY PROCESSING
AN RK06 INTERRUPT. THE 'SOFTWARE' SWITCH VALUES ARE
ENTERED AS AN OCTAL NUMBER IN RESPONSE TO THE PROMPT
FROM THE SWITCH ENTRY ROUTINE:

SWR = NNNNNN NEW =

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

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

4.5 INPUT DIALOGUE

THE DIALOGUE WILL BE DONE INTERACTIVELY. THE PROGRAM WILL REQUEST A PARAMETER BY CONSOLE TYPEOUT. THE PARAMETER MAY THEN BE ENTERED AS SPECIFIED BELOW OR ALLOWED TO DEFAULT BY A CARRIAGE RETURN. UNRECOGNIZED OR ILLEGAL RESPONSES WILL BE ECHOED BACK FOLLOWED BY "?". THE PROPER RESPONSE MAY THEN BE ENTERED.

IMPORTANT: FOR VARIATIONS OF THE ABOVE, SEE XXDP, ACT/APT CONSIDERATIONS IN SECTIONS 3.2 & 3.4.

4.5.1 DRIVE SELECTION

THE REQUEST WILL BE:

DRIVES TO BE TESTED:

THE DEFAULT RESPONSE IS CARRIAGE RETURN TO TEST ALL DRIVES IN THE 'DRIVE PRESENT' CONDITION.

THE OPERATOR CAN ALSO TYPE IN THE SPECIFIC DRIVE NUMBERS TO BE TESTED, SEPARATED BY COMMAS & TERMINATED BY A CARRIAGE RETURN.

E.G. DRIVES TO BE TESTED: 1,2,4,6

IMPORTANT: FOR VARIATIONS OF THE ABOVE, SEE XXDP, ACT/APT CONSIDERATIONS IN SECTIONS 3.2 & 3.3.

4.5.2 BUS ADDRESS

THE REQUEST WILL BE:

TYPE IN BUSS ADDRESS IF NOT 177440

THE DEFAULT IS A CARRIAGE RETURN

4.5.3 CONTROLLER INTERRUPT VECTOR

THE REQUEST WILL BE:

TYPE IN CONTROLLER INTERRUPT VECTOR IF NOT 210

THE DEFAULT IS A CARRIAGE RETURN.

4.5.4 EXAMPLE OF PROGRAM DIALOGUE

THE EXAMPLE SHOWN IS FOR A PROGRAM STARTED AT ADDRESS 220. ALL OPERATOR RESPONSES ARE UNDERLINED.

UNIBUS RK06 DRIVE DIAGNOSTIC
PART 2

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                                MAINDEC-11-DZR6I-C-PB

                                DRIVES TO BE TESTED: 1,3<CR>
                                                     -------

                                TYPE IN BUSS ADDRESS IF NOT 177440 <CR>
                                                            ----

                                TYPE IN CONTROLLER INTERRUPT VECTOR IF NOT 210 <CR>
                                                                       ----

                                WILL TEST DRIVES:
                                1
                                3

                                DRIVE 1

                                (THE REST IS IDENTICAL TO THE EXAMPLE SHOWN IN 4.6 BELOW)


                        4.6     PROGRAM EXAMPLE

                                THE FOLLOWING IS AN EXAMPLE OF A PROGRAM STARTED AT THE
                                DEFAULT ADDRESS (200) & WITH 2 DRIVES ON THE LINE.

                                        UNIBUS RK06 DRIVE DIAGNOSTIC
                                           PART 2
                                        MAINDEC-11-DZR6I-C-PB

                                        WILL TEST DRIVES:
                                        0
                                        1

                                        DRIVE 0

                                        DRIVE SERIAL NO. AAA
                                        CARTRIDGE SERIAL NO. BBB

                                        DRIVE 1

                                        DRIVE SERIAL NO. CCC
                                        CARTRIDGE SERIAL NO. DDD

                                        END PASS #1


                                        WILL TEST DRIVES:
                                        0
                                        1

                                        DRIVE 0

                                        DRIVE SERIAL NO. AAA
                                        CARTRIDGE SERIAL NO. BBB

                                        DRIVE 1
```

```
                                    DRIVE SERIAL NO. CCC
                                    CARTRIDGE SERIAL NO. DDD

                                    END PASS # 2

                                       (ETC)

                                THE ABOVE ASSUMES NO ERRORS DETECTED.
                                THE NUMBER OF PASSES IS DETERMINED BY ACT/APT/XXDP

                                IMPORTANT:  FOR VARIATIONS OF THE ABOVE, SEE XXDP, ACT/APT
                                            CONSIDERATIONS IN SECTIONS 3.2 & 3.3.

                            4.7 HALTING THE PROGRAM

                                THE PROGRAM PROVIDES A METHOD OF HALTING ITSELF SUCH THAT
                                THE CARTRIDGE AND/OR DRIVE IS NOT LEFT IN ON UNDETERMINED
                                STATE; IE: HEADS UNLOADED OR INVALID FORMAT.

                                TO PROPERLY HALT, TYPE CONTROL-C (↑C) ON THE CONSOLE.

                                IF HEADS ARE LOADED & FORMATTING IS VALID,
                                THE PROGRAM WILL:

                                1.  ECHO ↑C
                                2.  TYPE "CPU HALTED"
                                3.  HALT THE PROGRAM

                                IF HEADS ARE NOT LOADED AND/OR FORMATTING IS INVALID,
                                THE PROGRAM WILL:

                                1.  ECHO ↑C
                                2.  TYPE 'HALT PENDING, PLEASE WAIT'
                                3.  DO THE TEST(S) THAT LOADS HEADS AND/OR FORMATS
                                    THE INVALID CYLINDERS
                                4.  TYPE 'CPU HALTED'
                                5.  HALT THE PROGRAM


                                NOTES:

                                1.  THE ABOVE EXAMPLE IS FOR THE PROGRAM RUNNING IN DUMP
                                    MODE (MANUAL).  IF THE PROGRAM IS RUNNING IN CHAIN/AUTO
                                    MODE VIA XXDP,ACT,APT;  IT WILL FIRST LOAD HEADS
                                    AND/OR FORMAT CORRECTLY,  IF REQ'D, THEN IT WILL
                                    JUMP ON TO THE MONITOR WHERE THE NEXT PROGRAM CAN BE
                                    CALLED IN.

                                    THE TYPEOUTS WILL BE "ABORT PENDING - PLEASE WAIT"
                                                      &  "PROGRAM ABORTING"

                                2.  OPERATING THE 'CONTINUE' SWITCH ON THE CPU CONSOLE WILL RETURN THE
                                    PROGRAM TO TEST 1 WHERE TESTING WILL BEGIN WITH THE 1'ST DRIVE AGAIN.
```

```
                        5.0     DRIVE DIAGNOSTIC FUNCTIONAL DESCRIPTION

                        5.1     GENERAL

                                A.  WRITE TESTS

                                    THESE TESTS CHECK THE ABILITY OF THE DRIVE TO WRITE & READ
                                    WORSE CASE PATTERNS;  PERFORM ALL OFFSETS & PERFORM ALL
                                    SPIRAL WRITING.

                                B.  SERVO & SPINDLE TIMING TESTS

                                    THESE TESTS CHECK & TYPE HEAD LOAD, UNLOAD & INDEX TIMING,
                                    ALSO MIN, MAX, AND AVERAGE SEEK TIMES, AND MAX VELOCITY
                                    OF THE HEADS ARE MEASURED & TYPED.

                        5.2     TEST DESCRIPTIONS

                                ;*******************************************************************
                                ;BASIC CONTROLLER TESTS, SIZING & SETUP
                                ;*******************************************************************

                                TEST 1  REFERENCE ALL CONTROLLER REGISTERS

                                    THIS TEST VERIFIES THAT ALL THE CONTROLLER REGISTERS
                                    CAN BE ACCESSED.  THE INABILITY  TO BE ACCESSED WILL
                                    RESULT IN A TIMEOUT TRAP WITH  AN ERROR MESSAGE.  ANY
                                    ERROR IN THIS TEST WILL RESULT IN ABORTING ALL OTHER
                                    TESTS AND JUMPING TO  'END OF PASS'


                                TEST 2  SIZE THE BUSS

                                    THIS TEST IS ENTERED ONLY IF 'DRIVE SELECTION' IS DEFAULTED
                                    EITHER BY RUNNING IN THE AUTO MODE OR A 200 START IN THE
                                    MANUAL MODE.
                                    EVERY DRIVE FROM 0 THRU 7 IS ADDRESSED.
                                    CONTROLLER ERROR (CERR) IS EXAMINED AND IF NOT SET, THE
                                    DRIVE WILL BE TESTED.  IF SET, THE PROGRAM WILL BYPASS
                                    TESTING THAT DRIVE ONLY IF THE ERROR WAS A RESULT OF
                                    MDS, UFE OR NED BEING SET; OR BOTH NED & DRA RESET IN-
                                    DICATING THE OTHER PORT IS ACCESSED.


                                TEST 3  VERIFY OPERATOR DRIVE SELECTIONS

                                    THIS TEST IS ENTERED ONLY IF DRIVE SELECTION IS NOT
                                    DEFAULTED.  EVERY DRIVE FROM 0 TO 7 IS ADDRESSED &
                                    CONTROLLER ERROR (CERR) IS EXAMINED. IF NOT SET, THE
                                    PROGRAM WILL ASSUME THE DRIVE IS PRESENT.  IT WILL THEN CHECK
                                    TO SEE THAT THE DRIVE WAS INPUTTED FOR TESTING.  IF NOT, IT WILL
                                    BE AN ERROR.  IF CERR WAS SET, THAT DRIVE WILL BE BYPASSED
                                    ONLY IF THE ERROR WAS A RESULT OF MDS OR UFE SET OR BOTH
```

```
                        NED & DRA RESET (WRONG PORT).  IF CERR IS  A RESULT OF
                        NED ONLY, IT IS CHECKED AGAINT THE INPUTTED INFOR TO
                        VERIFY IT WAS NOT SPECIFIED.


                TEST 4  FIND NEXT DRIVE TO BE TESTED

                        THIS TEST FINDS THE NEXT DRIVE PRESENT & PUTS THAT
                        ADDRESS IN 'DRVAD'.
                        THROUGHOUT THE FOLLOWING TESTS, THE DRIVE TESTED IS
                        THE DRIVE WHOSE ADDRESS IS IN 'DRVAD'.


                TEST 5  PRINT DRIVE SERIAL NUMBER

                        THIS TEST READS & PRINTS THE DRIVE SERIAL # FROM MSG A, WORD 11
                        IN DECIMAL & IS PERFORMED ON THE 1ST PASS ONLY


                TEST 6  SET VV WITH PACK COMMAND

                        IF VV IS RESET, THE PACK COMMAND IS USED TO SET IT.


                TEST 7  READ & SAVE BAD SECTOR INFO & TYPE PACK SERIAL #

                        THIS TEST VERIFIES THAT CYL 410, TRACK 2 CAN BE READ.
                        THIS AREA CONTAINS BAD SECTOR INFO WHICH IS WRITTEN BY THE
                        FACTORY DURING MANF.  ALL BAD SECTOR INFO (BSE) WILL BE STORED
                        AT THIS TIME TO MASK FUTURE READ HEADER OR DATA ERROR PRINTOUTS.
                        IF BSE INFO CANNOT BE READ, OR IF AFTER READING THE BSE INFO
                        IT IS DETERMINED THAT AN ALIGNMENT CARTRIDGE IS USED,
                        A MESSAGE WILL BE TYPED INDICATING THAT ALL
                        FUTURE FORMAT AND READ-WRITE TESTS WILL BE BYPASSED.
                        THIS IS DONE SO AS NOT TO DESTROY BSE INFO OR AN ALIGNMENT PACK BY WRITI

                        THE PACK SERIAL # IS TYPED IN OCTAL & FOR THE FIRST PASS ONLY.


                ;*******************************************************************
                ;WRITE TESTS
                ;*******************************************************************


                TEST 10 BASIC WRITE DATA TEST; 1 WORD

                        THIS TEST VERIFIES THE ABILITY OF THE DRIVE TO WRITE JUST ONE WORD,
                        ALL SECTORS ON CYL 0 ARE GIVEN IDENTICAL HEADERS &
                        A WRITE COMMAND IS ISSUED. READ & WRITE CHECK COMMANDS ARE NOT
                        PERFORMED. THIS TEST PROVIDES THE TIGHTEST POSSIBLE SCOPE LOOP
                        FOR A WRITE ERROR.


                TEST 11 BASIC WRITE DATA TEST; FULL SECTOR

                        THIS TEST VERIFIES THE ABILITY OF THE DRIVE TO WRITE
```

```
                        A FULL SECTOR.  ALL ZEROS ARE WRITTEN BY THE WRITE DATA COMMAND
                        & CHECKED BY A RD DATA COMMAND.  A FURTHER CHECK IS PERFORMED
                        BY THE WRT CHK COMMAND.
                        THE ABOVE IS REPEATED FOR AN ALL ONES PATTERN.


TEST 12 20 SECTOR FORMAT TEST

                        DATA IS WRITTEN ON A FULL TRACK IN 20 SECTOR FORMAT.
                        MSG B0,B1 ARE CHECKED FOR ANY ERROR CONDITION


TEST 13 TEST OFFSET & RTC LOGIC

                        THE HEADS ARE FIRST OFFSET BY OFFSET COMMANDS.
                        THIS TEST CHECKS THE RTC LOGIC BY VERIFYING THAT THE
                        'OFFSET ON' BIT (MSG A,00) RESETS AND THE OFFSET REG

                        BECOMES THE CYL DIFF INFO WHEN A SEEK CMD TO A
                        DIFFERENT CYLINDER IS ISSUED
                        IT ALSO TESTS THAT DRIVE CLEAR & SEEK TO SELF WILL NOT
                        CLEAR THE 'OFFSET ON' BIT OR THE OFFSET REG.
                        ALL OFFSET POSITIONS IN BOTH DIRECTIONS ARE CHECKED


TEST 14 TEST READ DATA AT ALL HEAD OFFSET POSITIONS

                        THIS TEST VERIFIES THAT THE HEAD OFFSET LOGIC IS OPERATIONAL BY
                        WRITING ALL 1'S PATTERNS ON CYLINDER 0, HEAD 0. THEN
                        PERFORMING READ DATA FROM CENTERLINE AND MOVING OUT + AND - OFFSET
                        POSITIONS UNTIL A FAILURE OCCURES.  THE FAILING OFFSET POSITIONS
                        ARE PRINTED OUT IF LESS THAN THE OFFSET TOLERANCE TO BE SPECIFIED.
                        OFFSET CODES ARE ALSO VERIFIED BY READING MSG A, STATUS 00 & 10.
                        ALL HEADS ARE TESTED AT CYL 0.

                        IF THERE ARE NO FAILURES AT ALL, THIS INDICATES THAT

                                A. HEADS DID NOT MOVE AT ALL
                        OR      B. THE COMBINATION OF DISC SURFACE, HEADS, R/W AMP
                                   ARE EXCEPTIONALLY GOOD.

                        AN APPROPRIATE MESSAGE WILL BE TYPED.


TEST 15 WRITE WITH HEADS OFFSET

                        THIS TEST VERIFIES THAT WHEN ATTEMPTING TO
                        WRITE WITH HEADS OFFSET THAT THE OFFSET WILL CLEAR
                        & THE DRIVE WILL WRITE
                        SINCE THE WRITE COMMAND HAS AN IMPLIED RTC.
                        THIS TEST IS PERFORMED FOR MAX POS & NEG OFFSETS ONLY


TEST 16 TEST CURRENT CROSS-OVER CYLINDERS

                        THIS TEST VERIFIES THAT THE DRIVE CAN WRITE & READ OFF
```

```
                        CURRENT CHANGE CYLINDERS X & Y IN THE FOLLOWING WAY:

                        SPIRAL WRITING IS PERFORMED FROM CYLINDER X TO CYLINDER Y
                        WITH A DATA PATTERN FILLING THE ENTIRE 2 CYLINDERS.

                        A WRITE CHECK IS THEN PREFORMED TO VERIFY DATA WAS PROPERLY WRITTEN.
                        THIS TEST IS PERFORMED FOR ALL 3 HEADS.

                        CYLINDER X:  63  127  191  255  319  383
                        CYLINDER Y:  64  128  192  256  320  384


                TEST 17 TEST HEAD SWITCHING TIME

                        TESTS THE ABILITY TO SWITCH HEADS IN LESS THEN 10MS WHEN HEADS SPIRAL.

                        1. SECTOR 17 IS FIRST LOCATED AND A WRITE DATA COMMAND OF 512 WORDS
                           TO SECTOR 21 IS ISSUED.
                        2. THE PROGRAM NOW KNOWS THAT THE DRIVE WILL NOT HAVE TO TRAVEL
                           A FULL REVOLUTION BEFORE FINDING SECTOR 21.
                        3. SINCE EACH SECTOR TAKES APPROX. 1.2MS, THE TIME BETWEEN
                           THE START OF THE WRITE COMMAND (FROM SECTOR 21, HEAD 0; TO
                           SECTOR 0, HEAD 1) AND CONTROLLER READY SHOULD BE APPROX 6MS

                        THE ABOVE IS REPEATED FOR HEAD SWITCHING BETWEEN 1 TO 2

                        THIS TEST IS BYPASSED IF NEITHER L OR P CLOCK IS PRESENT


                TEST 20 DRIVE OFF TRACK TEST

                        THIS TEST CHECKS FOR SERVO OSCILLATIONS DURING SETTLING TIME BEYOND
                        THE ALLOTED 3MS.

                        1.  INITIALLY, EVERY CYLINDER IS FORMATTED WITH IDENTICAL HEADERS
                            (UNIQUE TO EACH CYLINDER)
                        2.  A FULL SECTOR WRITE COMMAND IS ISSUED BY A SINGLE CYL SEEK FROM 0 TO
                            AS HEADERS ARE IDENTICAL, THE NEXT SECTOR TO COME UNDER THE
                            HEADS WILL IMMEDIATELY BE WRITTEN.
                        3.  IF THERE IS OSCILLATION SENSED BY READING THE TRIBITS,
                            DRIVE OFF TRACK ERROR WILL SET.

                        IN THIS MANNER OSCILLATING SEEKS ARE PERFORMED BETWEEN ALL MAJOR CYLINDE
                        100 OSCILLATIONS ARE PERFORMED AT EACH MAJOR CYLINDER
                        BEFORE DOING THE NEXT CYLINDER



                ;*******************************************************************
                ; SERVO & SPINDLE TIMING TESTS.
                ;*******************************************************************


                TEST 21 TIME BETWEEN OUTER LIMIT TO HEADS HOME DURING UNLOAD
```

```
                        TIME IS MEASURED FROM ATTN ASSERTING (APPROXIMATES REV & OUTER LIMIT)
                        TO HEADS HOME ASSERTING. EXPECTED TIME APPROX 500MS

                        ALL TIMING TESTS ARE BYPASSED IF NEITHER
                        L OR P CLOCK IS PRESENT & WILL BE INDICATED BY A MESSAGE


TEST 22 TEST LOW VELOCITY TIMES DURING LOADING

                        THIS TEST ISSUES A START SPINDLE COMMAND
                        AFTER 'HEADS HOME' HAS BEEN DETECTED FROM THE PREVIOUS TEST.
                        THE FOLLOWING "LOW VELOCITY" TIMES ARE CHECKED AGAINST
                        LIMITS TO BE DEFINED:

                        TIME 1:  TIME BETWEEN HEADS HOME NEGATING & SERVO SIG PRES ASSERTING
                                   EXPECTED TIME APPROX 500 MS

                        TIME 2:  TIME BETWEEN OUTER LIMIT & INNER LIMIT

                                   TIME IS MEASURED FROM SERVO SIG PRES (APPROX OUTER LIMIT)
                                   TO REV (APPROX INNER LIMIT)
                                   EXPECTED TIME APPROX 2 SEC

                        TIME 3:  TIME BETWEEN INNER LIMIT & OUTER LIMIT

                                   TIME IS MEASURED FROM REV ASSERTING (FROM ABOVE)
                                   TO REV NEGATING (APPROX OUTER LIMIT)
                                   EXPECTED TIME APPROX 2 SEC


TEST 23 MEASURE ROTATIONAL SPEED

                        THIS TEST MEASURES INDEX TIMING BY:

                              A.  CHANGE FORMAT TO 20 SECTOR & READ HEADER.
                                  CONTROLLER RDY STARTS THE TIMER
                              B.  CHANGE FORMAT TO 22 SECTOR & READ HEADER.
                                  CONTROLLER RDY ENDS THE TIMER.

                        INDEX TIMING IS THE TIME BETWEEN THE 2 CONT. RDY TIMES.
                        THIS IS BECAUSE A CHANGE OF FORMAT INHIBITS SECTOR PULSES
                        UNTIL THE NEXT INDEX APPEARS-THUS KEEPING A GIVEN
                        FORMAT COMPLETE THROUGHOUT AN ENTIRE CYLINDER

                        THE TIME IS THE AVERAGE OF 100 READINGS.


TEST 24 MEASURE MAX SEEK TIME

                        THIS TEST MEASURES THE MAX SEEK TIME BETWEEN CYLINDERS 0 & 410
                        THE AVERAGE TIME OF 100 SEEKS IN BOTH DIRECTIONS ARE PRINTED
                        IF NOT WITHIN LIMITS TO BE SUPPLIED.
                        MAX SEEK TIME SHOULD BE LESS THAN 70MS.


TEST 25 MEASURE MIN SEEK TIME
```

```
                        THIS TEST MEASURES THE MIN SEEK TIME BETWEEN CYLINDER 0 & 1
                        THE AVERAGE TIME OF 100 SEEKS IN BOTH DIRECTIONS ARE PRINTED
                        IF NOT WITHIN LIMITS TO BE SUPPLIED.
                        MIN SEEK TIME SHOULD BE LESS THAN 10MS.


                    TEST 26 MEASURE 137 CYLINDER SEEK TIME

                        THIS TEST MEASURES THE AVERAGE SEEK TIME BETWEEN CYLINDERS 0 & 137
                        THE AVERAGE TIME OF 100 SEEKS IN BOTH DIRECTIONS ARE PRINTED

                        IF NOT WITHIN LIMITS TO BE SUPPLIED.
                        AVERAGE SEEK TIME SHOULD BE LESS THAN 40MS


                    TEST 27 MEASURE MAX VELOCITY OF HEADS

                        THIS TESTS MAX VELOCITY BY DOING SEEKS BETWEEN
                        CYL 0 & 383 AND MEASURING THE TIME BETWEEN CYLINDERS
                        128 & 256.  SINCE THE DISTANCE BETWEEN CYL 128 & 256 IS KNOWN,
                        THE AVERAGE VELOCITY OF 100 SEEKS IS CALCULATED & TYPED
                        IF NOT WITHIN THE SPECIFIED LIMITS TO BE SUPPLIED.


                    THE PROGRAM DOES NOT REQUIRE FORMATTED PACKS AS FORMATTING
                    IS PERFORMED IN ANY CASE.

                    ANY TEST THAT MODIFIES STANDARD FORMATTING IS FOLLOWED BY A
                    'CLEAN UP' TEST TO PUT THOSE CYLINDERS BACK TO STANDARD
                    FORMAT.


            6.0     ERROR REPORTING


            6.1     ERROR INTERPRETATION

                    WHENEVER AN ERROR MESSAGE IS PRINTED OUT, ALL REGISTERS
                    AND OTHER DATA PERTAINING TO THE ERROR ARE ALSO GIVEN.
                    MSG A(00), MSG B(01), RKER, RKBA...ETC, INDICATE THE
                    CONTENTS OF THE CORRESPONDING REGISTERS AT THE TIME OF
                    ERROR.

                    EVERY ERROR MESSAGE CONTAINS A PC.  THIS PC INDICATES THE
                    POSITION IN PROGRAM WHERE THE ERROR CALL IS LOCATED.  THE
                    ERROR MESSAGE, BECAUSE OF PRACTICAL CONSIDERATIONS IS MADE
                    SHORT AND MEANINGFUL.  THE USER IS ADVISED TO LOOK UP THE
                    PC IN THE PROGRAM LISTING, WHERE HE WILL FIND MORE INFORMATION
                    ABOUT THE ERROR.  IN MANY INSTANCES, A SINGLE FAULT WILL
                    GIVE RISE TO MORE THAN ONE ERROR REPORT.  A LITTLE DELIBERATION
                    AND CAREFUL EXAMINATION OF THE DATA GIVEN WILL BE CERTAINLY
                    VERY HELPFUL IN PINPOINTING THE FAULT.  A BRIEF EXPLANATION
                    OF WHAT IS BEING CHECKED IN THE TEST IS GIVEN AT THE
                    BEGINNING OF EVERY TEST.  ALL THE NUMBERS GIVEN WITH ERROR
                    MESSAGES ARE IN OCTAL.
```

NOTE

NO ERROR LOGGING OR OPERATION HISTORY IS PROVIDED.

6.2 ERROR PRINTOUT EXAMPLES:

EXAMPLE #1

MESSAGE A0 ERROR
AFTER START SPINDLE CMD & FWD SET

TEST NO.	PC
000014	016530

EXPECT A0	EXPECT B0	EXPECT A1	EXPECT B1	EXPECT A2	EXPECT B2	EXPECT B3
030144	100000	013704	000001			
ACTUAL A0	ACTUAL B0	ACTUAL A1	ACTUAL B1	ACTUAL A2	ACTUAL B2	ACTUAL B3
140144	100000	101744	000001			

RKCS1	RKCS2	RKASOF	RKER	RKDS	RKDC
040200	000100	010000	000000	000000	000000

THE ABOVE EXAMPLE SHOWS EXPECTED & ACTUAL DATA FOR
MESSAGE REGISTERS A0, B0, A1 & B1.

MESSAGES A2, B2 & B3 WILL BE TYPED OUT ONLY AS REQUIRED IF
THE CYLINDER DIFFERENCE/OFFSET, CYLINDER ADDRESS &
HEAD & SECTOR INFORMATION IS A VARIABLE PARAMETER OF THE
TEST.

EXAMPLE #2:

NO ATTN IN RKASOF
AFTER UNLOAD COMMAND

TEST NO.	PC
000003	014330

RKMR2	RKMR3	RKER	RKDS	RKCS1	RKCS2	RKASOF
000144	100000	000000	100101	000206	000104	000000

[END OF DOCUMENT]

%

```
                        .NLIST  CND,MC,MD
                        .LIST   ME
                        .ENABL  ABS,AMA

                        ;DEFINE SYSMAC MACROS

167400                  $SWR=   167400          ;DEFINE SWITCHES 15,14,13,11,10,9,8
000001                  $TN=    1               ;SET FIRST TEST NO. TO 1


                        .TITLE  UNIBUS RK06 DRIVE DIAGNOSTIC  PART 2
                        ;*COPYRIGHT (C) 1976
                        ;*DIGITAL EQUIPMENT CORP.
                        ;*MAYNARD, MASS. 01754
                        ;*
                        ;*PROGRAM BY GARY PAPAZIAN
                        ;*
                        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        ;*PACKAGE (MAINDEC-11-DZQAC-C2), SEPT 14, 1976.
                        ;*

                        .SBTTL  OPERATIONAL SWITCH SETTINGS
                        ;*
                        ;*      SWITCH                  USE
                        ;*      ------          --------------------
                        ;*        15            HALT ON ERROR
                        ;*        14            LOOP ON TEST
                        ;*        13            INHIBIT ERROR TYPEOUTS
                        ;*        12            ABORT DRIVE AFTER 20 ERRORS
                        ;*        11            INHIBIT ITERATIONS
                        ;*        10            BELL ON ERROR
                        ;*         9            LOOP ON ERROR
                        ;*         8            LOOP ON TEST IN SWR<7:0>


                        .SBTTL  SUMMARY OF STARTING LOCATIONS
                        ;*
                        ;*
                        ;*              200     DEFAULT PARAMETERS
                        ;*              204     DEFAULT PARAMETERS & BYPASS WRITE TESTS
                        ;*              214     DEFAULT PARAMETERS & BYPASS TIMING TESTS
                        ;*              220     INPUT PARAMETERS
                        ;*              224     INPUT PARAMETERS & BYPASS WRITE TESTS
                        ;*              230     INPUT PARAMETERS & BYPASS TIMING TESTS
                        ;*              240     ODT11
                        ;*
```

```
                        .SBTTL  BASIC DEFINITIONS

                        ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100                  STACK=  1100
                        .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
                        .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL

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

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

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

                        ;*"SWITCH REGISTER" SWITCH DEFINITIONS
100000                  SW15=   100000
040000                  SW14=   40000
020000                  SW13=   20000
010000                  SW12=   10000
004000                  SW11=   4000
002000                  SW10=   2000
001000                  SW09=   1000
000400                  SW08=   400
000200                  SW07=   200
000100                  SW06=   100
000040                  SW05=   40
000020                  SW04=   20
000010                  SW03=   10
000004                  SW02=   4
```

```
                        SW01=   2
                        SW00=   1
                        .EQUIV  SW09,SW9
                        .EQUIV  SW08,SW8
                        .EQUIV  SW07,SW7
                        .EQUIV  SW06,SW6
                        .EQUIV  SW05,SW5
                        .EQUIV  SW04,SW4
                        .EQUIV  SW03,SW3
                        .EQUIV  SW02,SW2
                        .EQUIV  SW01,SW1
                        .EQUIV  SW00,SW0

                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                  BIT15=  100000
040000                  BIT14=  40000
020000                  BIT13=  20000
010000                  BIT12=  10000
004000                  BIT11=  4000
002000                  BIT10=  2000
001000                  BIT09=  1000
000400                  BIT08=  400
000200                  BIT07=  200
000100                  BIT06=  100
000040                  BIT05=  40
000020                  BIT04=  20
000010                  BIT03=  10
000004                  BIT02=  4
000002                  BIT01=  2
000001                  BIT00=  1
                        .EQUIV  BIT09,BIT9
                        .EQUIV  BIT08,BIT8
                        .EQUIV  BIT07,BIT7
                        .EQUIV  BIT06,BIT6
                        .EQUIV  BIT05,BIT5
                        .EQUIV  BIT04,BIT4
                        .EQUIV  BIT03,BIT3
                        .EQUIV  BIT02,BIT2
                        .EQUIV  BIT01,BIT1
                        .EQUIV  BIT00,BIT0

                        ;*BASIC "CPU" TRAP VECTOR ADDRESSES
000004                  ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
000010                  RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
000014                  TBITVEC=14              ;;"T" BIT
000014                  TRTVEC= 14              ;;TRACE TRAP
000014                  BPTVEC= 14              ;;BREAKPOINT TRAP (BPT)
000020                  IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
000024                  PWRVEC= 24              ;;POWER FAIL
000030                  EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
000034                  TRAPVEC=34              ;;"TRAP" TRAP
000060                  TKVEC=  60              ;;TTY KEYBOARD VECTOR
000064                  TPVEC=  64              ;;TTY PRINTER VECTOR
000240                  PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR

                        .SBTTL  RK06 CONTROLLER REGISTER DEFINITION
```

```
1252
1253                            ;       $BASE=177440
1254
1255    000000                  RKCS1=  0               ;CONTROL AND STATUS REGISTER 1
1256    000002                  RKWC=   2               ;WORD COUNT REGISTER
1257    000004                  RKBA=   4               ;BUS ADDRESS REGISTER
1258    000006                  RKDA=   6               ;DESIRED TRACK SECTOR REGISTER
1259    000010                  RKCS2=  10              ;CONTROL AND STATUS REGISTER 2
1260    000012                  RKDS=   12              ;DRIVE STATUS REGISTER
1261    000014                  RKER=   14              ;ERROR REGISTER
1262    000016                  RKASOF= 16              ;ATTENTION SUMMARY AND OFFSET REGISTER
1263    000020                  RKDC=   20              ;DESIRED CYLINDER REGISTER
1264    000024                  RKDB=   24              ;DATA BUFFER
1265    000026                  RKMR1=  26              ;MAINTENANCE REGISTER 1
1266    000034                  RKMR2=  34              ;MAINTENANCE REGISTER 2 (MESSAGE LINE A)
1267    000036                  RKMR3=  36              ;MAINTENANCE REGISTER 3 (MESSAGE LINE B)
1268    000030                  RKECPS= 30              ;ECC POSITION INFORMATION
1269    000032                  RKECPT= 32              ;ECC PATTERN INFORMATION
1270
1271                            .SBTTL  CONTROL AND STATUS REGISTER 1 BITS (RKCS1:0)
1272
1273                            ;       DRIVE COMMANDS
1274
1275    000001                  SELDRV= 1               ;SELECT DRIVE (GET STATUS)
1276    000003                  PACK=   3               ;PACK ACKNOWLEDGE
1277    000005                  CLEAR=  5               ;DRIVE CLEAR
1278    000007                  UNLOAD= 7               ;UNLOAD
1279    000011                  SRTSPL= 11              ;START SPINDLE
1280    000013                  RECAL=  13              ;RECALIBRATE
1281    000015                  OFFSET= 15              ;OFFSET
1282    000017                  SEEK=   17              ;SEEK
1283    000021                  RDDATA= 21              ;READ DATA
1284    000023                  WRDATA= 23              ;WRITE DATA
1285    000025                  RDHEAD= 25              ;READ HEADER
1286    000027                  WRHEAD= 27              ;WRITE HEADER AND DATA
1287    000031                  WRTCHK= 31              ;WRITE CHECK
1288
1289    000001                  GO=     BIT0            ;GO BIT
1290    000100                  IE=     BIT6            ;INTERRUPT ENABLE
1291    000200                  RDY=    BIT7            ;CONTROLLER READY
1292    000400                  BA16=   BIT8            ;BUS ADDRESS BIT 16
1293    001000                  BA17=   BIT9            ;BUS ADDRESS BIT 17
1294    002000                  CDT=    BIT10           ;CONTROLLER DRIVE TYPE (0=RK06)
1295    004000                  CTO=    BIT11           ;CONTROLLER TIMEOUT
1296    010000                  CFMT=   BIT12           ;CONTROLLER DRIVE FORMAT (0=22 SECTOR, 1=20 SECTOR)
1297    020000                  DCPAR=  BIT13           ;SERCON PARITY ERROR DETECTED BY CONTROLLER
1298    040000                  DI=     BIT14           ;DRIVE INTERRUPT
1299    100000                  CERR=   BIT15           ;CONTROLLER ERROR
1300    100000                  CCLR=   BIT15           ;CONTROLLER CLEAR
1301
1302                            .SBTTL  CONTROL AND STATUS REGISTER 2 BITS (RKCS2:10)
1303
1304    000007                  DRVMSK= 7               ;MASK FOR DRIVE SELECTION CODE
1305    000010                  RLS=    BIT3            ;DESELECT OR RELEASE DRIVE IN BITS 0-2
1306    000020                  BAI=    BIT4            ;BUS ADDRESS INCREMENT INHIBIT
1307    000040                  SCLR=   BIT5            ;SUBSYSTEM CLEAR CONTROLLER AND ALL DRIVES
```

```
1308            000100          IR=     BIT6                    ;INPUT READY
1309            000200          OR=     BIT7                    ;OUTPUT READY
1310            000400          UFE=    BIT8                    ;UNIT FIELD ERROR
1311            001000          MDS=    BIT9                    ;MULTIPLE DRIVE SELECT
1312            002000          PGE=    BIT10                   ;PROGRAMMING ERROR
1313            004000          NEM=    BIT11                   ;NON-EXISTENT MEMORY
1314            010000          NED=    BIT12                   ;NON-EXISTENT DRIVE
1315            020000          UPE=    BIT13                   ;UNIBUS PARITY ERROR
1316            040000          WCE=    BIT14                   ;WRITE CHECK ERROR
1317            100000          DLT=    BIT15                   ;DATA LATE ERROR
1318
1319                            .SBTTL  ERROR REGISTER BIT DEFINITION (RKER:14)
1320
1321            000001          ILF=    BIT0                    ;ILLEGAL FUNCTION CODE
1322            000002          SKI=    BIT1                    ;SEEK INCOMPLETE
1323            000004          NXF=    BIT2                    ;NON-EXECUTABLE FUNCTION
1324            000010          DRPAR=  BIT3                    ;DRIVE DETECTED SERCON PARITY ERROR
1325            000020          FMTE=   BIT4                    ;FORMAT ERROR
1326            000040          DTYE=   BIT5                    ;DRIVE TYPE ERROR
1327            000100          ECH=    BIT6                    ;ECC HARD
1328            000200          BSE=    BIT7                    ;BAD SECTOR ERROR
1329            000400          HVRC=   BIT8                    ;HEADER VRC ERROR
1330            001000          COE=    BIT9                    ;CYLINDER ADDRESS OVERFLOW ERROR
1331            002000          IDAE=   BIT10                   ;INVALID DISK ADDRESS ERROR: HEAD/CYL
1332            004000          WLE=    BIT11                   ;WRITE LOCK ERROR
1333            010000          DTE=    BIT12                   ;DRIVE TIMING ERROR
1334            020000          OPI=    BIT13                   ;OPERATION (SEARCH) INCOMPLETE
1335            040000          UNS=    BIT14                   ;DRIVE UNSAFE
1336            100000          DCK=    BIT15                   ;DATA CHECK
1337
1338                            .SBTTL  STATUS REGISTER BIT DEFINITION (RKDS:12)
1339
1340            000001          DRA=    BIT0                    ;DRIVE AVAILABLE (CONTROLLER IS SET IF
1341                                                            ;    THIS BIT IS RESET)
1342            000004          OFST=   BIT2                    ;DRIVE OFFSET
1343            000010          ACLO=   BIT3                    ;AC LOW
1344            000020          DCLO=   BIT4                    ;DC LOW
1345            000040          DROT=   BIT5                    ;DRIVE OFF TRACK
1346            000100          VV=     BIT6                    ;VOLUME VALID
1347            000200          DRDY=   BIT7                    ;DRIVE READY
1348            000400          DDT=    BIT8                    ;DRIVE TYPE (0=RK06)
1349            004000          WRL=    BIT11                   ;WRITE LOCK
1350            020000          PIP=    BIT13                   ;POSITIONING IN PROGRESS
1351            040000          DSC=    BIT14                   ;DRIVE STATUS CHANGE
1352            100000          SVAL=   BIT15                   ;STATUS VALID
1353
1354                            .SBTTL  MAINTENANCE REGISTER 1 BIT DEFINITION (RKMR1:22)
1355
1356            000017          MESMSK= 17                      ;MESSAGE MASK
1357            000020          PAT=    BIT4                    ;FORCE EVEN PARITY ON SERCON MESSAGE LINES
1358            000040          DMD=    BIT5                    ;DIAGNOSTIC MODE
1359            000100          MSP=    BIT6                    ;MAINTENANCE SECTOR PULSE
1360            000200          MIND=   BIT7                    ;MAINTENANCE INDEX
1361            000400          MCLK=   BIT8                    ;MAINTENANCE CLOCK
1362            001000          MERD=   BIT9                    ;MAINTENANCE ENCODED READ DATA
1363            002000          MEWD=   BIT10                   ;MAINTENANCE ENCODED WRITE DATA
```

```
1364            004000          PCA=    BIT11                   ;PRECOMPENSATION ADVANCE
1365            010000          PCD=    BIT12                   ;PRECOMPENSATION DELAY
1366            020000          ECCW=   BIT13                   ;ECC WORD IS BEING READ OR WRITTEN
1367            040000          WRTGAT= BIT14                   ;WRITE GATE
1368            100000          RDGATE= BIT15                   ;READ GATE
1369
1370                            .SBTTL  DEFINITION OF DRIVE STATUS BYTE 00 MESSAGE A (RKMR2:34)
1371
1372            000040          D.DRA=  BIT5                    ;DRIVE AVAILABLE
1373            000100          D.VV=   BIT6                    ;VOLUME VALID
1374            000200          D.DRDY= BIT7                    ;DRIVE READY
1375            000400          D.DDT=  BIT8                    ;DRIVE TYPE (0=RK06)
1376            001000          D.FORM= BIT9                    ;DRIVE FORMAT
1377            002000          D.OFF=  BIT10                   ;OFFSET ON
1378            004000          D.WRL=  BIT11                   ;WRITE LOCK
1379            010000          D.SPIN= BIT12                   ;SPINDLE ON
1380            020000          D.PIP=  BIT13                   ;POSITIONING IN PROGRESS
1381            040000          D.DSC=  BIT14                   ;DRIVE STATUS CHANGE
1382
1383                            .SBTTL  DEFINITION OF DRIVE STATUS BYTE 01 MESSAGE A (RKMR2:34)
1384
1385            000020          D.SSP=  BIT4                    ;SERVO SIG PRES
1386            000040          D.HDHM= BIT5                    ;HEADS HOME
1387            000100          D.BRHM= BIT6                    ;BRUSHES HOME
1388            000200          D.DOOR= BIT7                    ;DOOR INTERLOCKED
1389            000400          D.CART= BIT8                    ;CARTRAGE INTERLOCK
1390            001000          D.SPOK= BIT9                    ;SPEED OK
1391            002000          D.FWD=  BIT10                   ;FORWARD
1392            004000          D.REV=  BIT11                   ;REVERSE
1393            010000          D.LOAD= BIT12                   ;HEADS LOADING
1394            020000          D.RTZ=  BIT13                   ;RETURN TO ZERO
1395            040000          D.UNLD= BIT14                   ;HEADS UNLOADING
1396
1397                            .SBTTL  DEFINITION OF DRIVE STATUS BYTE 00 MESSAGE B (RKMR3:36)
1398
1399            000040          D.IDAE= BIT5                    ;INVALID DISK ADDRESS ERROR:HEAD/CYL
1400            000100          D.ACLO= BIT6                    ;AC LOW
1401            000200          D.FLT=  BIT7                    ;DRIVE FAULT
1402            000400          D.ILF=  BIT8                    ;ILLEGAL FUNCTION CODE
1403            001000          D.PAR=  BIT9                    ;DRIVE DETECTED SERCON PARITY ERROR
1404            002000          D.SKI=  BIT10                   ;SEEK INCOMPLETE
1405            004000          D.WLE=  BIT11                   ;WRITE LOCK ERROR
1406            010000          D.SPLS= BIT12                   ;SPEED LOSS
1407            020000          D.DROT= BIT13                   ;DRIVE OFF TRACK
1408            040000          D.UNS=  BIT14                   ;R/W UNSAFE
1409
1410                            .SBTTL  DEFINITION OF DRIVE STATUS BYTE 01 MESSAGE B (RKMR3:36)
1411
1412            000020          D.SECT= BIT4                    ;SECTOR ERROR
1413            000040          D.WCUR= BIT5                    ;WRITE CURRENT AND NO WRITE GATE
1414            000100          D.WGAT= BIT6                    ;WRITE GATE AND NO TRANSISTIONS
1415            000200          D.HDFL= BIT7                    ;HEAD FAULT
1416            000400          D.MHD=  BIT8                    ;MULTIPLE HEAD SELECT
1417            001000          D.XERR= BIT9                    ;INDEX ERROR
1418            002000          D.TIB=  BIT10                   ;TRIBIT ERROR
1419            004000          D.PLO=  BIT11                   ;PLO ERROR
```

```
1420            010000          D.NMOV= BIT12                   ;SEEK AND NO MOTION
1421            020000          D.LIMD= BIT13                   ;LIMIT DETECT ON SEEK
1422            040000          D.SUNS= BIT14                   ;SERVO UNSAFE
1423
1424                            .SBTTL  COMMON MASKS AND OTHER BITS: MESSAGE A (RKMR2:34)
1425
1426            000007          M.DRV=  7                       ;DRIVE CODE, ALL BYTES
1427            017760          M.CDIF= 17760                   ;CYLINDER DIFF, BYTE 10
1428            017760          M.OFST= 17760                   ;OFFSET VALUE, BYTE 10
1429            077770          M.SER=  77770                   ;DRIVE SERIAL #, BYTE 11
1430
1431                            .SBTTL  COMMON MASKS AND OTHER BITS: MESSAGE B (RKMR3:36)
1432
1433            000003          M.ID=   3                       ;BYTE ID, ALL BYTES
1434            017760          M.CADD= 17760                   ;CYLINDER ADDRESS, BYTE 10
1435            040000          M.ALGN= BIT14                   ;ALIGN SIGN, BYTE 10
1436            000760          M.SECT= 760                     ;SECTOR COUNT, BYTE 11
1437            007000          M.HEAD= 7000                    ;HEAD DECODE, BYTE 11
1438            100000          M.PAR=  BIT15                   ;PARITY, MESS A/B, ALL BYTES
```

```
                                .SBTTL  TRAP CATCHER

                        000000          .=0
                                ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
                                ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
                        000174          .=174
000174  000000          DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
000176  000000          SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER
                                .SBTTL  STARTING ADDRESS(ES)
000200  000137  012726          JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM
                        000204          .=204
000204  000137  012622          JMP     BYWRT
                        000214          .=214
000214  000137  012642          JMP     BYTIM
                        000220          .=220
000220  000137  012602          JMP     PARSRT          ;INPUT ALL PARAMETERS & START TESTING
                        000224          .=224
000224  000137  012662          JMP     BYWRTA
                        000230          .=230
000230  000137  012704          JMP     BYTIMA

                        000240          .=240
000240  000137  065250          JMP     0.ODT           ;ENTER ODT11

                                .SBTTL  ACT11 HOOKS

                                ;;******************************************************************
                                ;HOOKS REQUIRED BY ACT11
                        000244          $SVPC=.                 ;SAVE PC
                        000046          .=46
000046  036150                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                        000052          .=52
000052  100000          .WORD   100000                  ;;2)SET LOC.52 TO 100000
                        000244          .=$SVPC                 ;; RESTORE PC
                        001000          .=1000
                                .SBTTL  APT PARAMETER BLOCK

                                ;;******************************************************************
                                ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                ;;******************************************************************
                        001000          .$X=.   ;;SAVE CURRENT LOCATION
                        000024          .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
000024  000200                  200     ;;FOR APT START UP
                        000044          .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
000044  001000                  $APTHDR ;;POINT TO APT HEADER BLOCK
                        001000          .=.$X   ;;RESET LOCATION COUNTER
                                ;;******************************************************************
                                ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                ;INTERFACE SPEC.

001000                  $APTHD:
001000  000000          $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001002  001210          $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001004  000430          $TSTM:  .WORD   280.    ;;RUN TIM OF LONGEST TEST
```

```
001006  001130  $PASTM: .WORD   600.    ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001010  001130  $UNITM: .WORD   600.    ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
001012  000042          .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)


                .LIST   MD

;
;USE LOOP X TO OMIT SUBCLR
;


;
;THIS MACRO FILLS EXPECTED MSG A0, B0, A1, B1, A2, B2 & B3 WITH STANDARD BITS
;A=D.DSC AFTER ATTN OR 0 AFTER DRIVE CLEAR OR ANY IMPLIED SEEKS
;NOTE: A CAN BE ANY BIT COMBINATION DESIRED.
;

;
;THIS MACRO ASSUMES DRIVE MSG A0, B0, A1, B1 WILL ALWAYS BE TESTED
;USE     A,C,D,E FOR MSG A0, B0, A1, B1 ERROR NUMBERS RESP.
;USE     G=T.A2  TO READ MSG A2 & PUT INFO INTO 'CYLDIF'
;       H=T.B2  TO READ MSG B2 & PUT INFO INTO 'CYLADD'
;       I=T.B3  TO READ MSG B3 & PUT INFO INTO 'SECTOR' & 'HEADA'
;
;USE    F=<ERROR DESCRIPTION>
;

;
;A=CYL DIFF/OFFSET ERROR #
;B=CYL ADDR ERROR #
;C=<ERROR DESCRIPTION>
;


;
;USE CALIB       X   TO OMIT CHECKING MSGS A0, B0, A1, B1, A2 & B2
;

;
;QUICK START SPINDLE
;

;
; A=WRHEAD/<CFMT!WRHEAD>
; USE WRHDR     <A>,X   TO OMIT CHECKING A0, B0, A1 & B1
;

;
; A=RDHEAD/<CFMT!RDHEAD>
;USE RDHDR <A>,X TO OMIT CHECKING A0, B0, A1, B1
;
```

```
1551                                    ;
1552                                    ; A=TOCYL/FRCYL , B=HEAD#, C = 0 FOR 22 SECTOR, 1 FOR 20 SECTOR
1553                                    ;
1554
1555                                    ;
1556                                    ;QUICK SEEK.    ENTER WITH CYL# IN RKDC
1557                                    ;
1558
1559
1560                                    ;
1561                                    ;A=WRDATA/<CFMT!WRDATA>
1562                                    ;C=ADDR TO JMP TO ATTEMPT TO WRITE ON ANOTHER SECTOR
1563                                    ;D=ADDR TO JMP TO BYPASS TEST
1564                                    ;E: IF BLANK WILL CHECK A0, B0, A1 & B1 AT THE END OF WRITING
1565                                    ;E: IF NON BLANK WILL OMIT CHECKING A0 THRU B1
1566                                    ;
1567
1568
1569
1570                                    ;
1571                                    ;A=RDDATA/<CFMT!RDDATA>
1572                                    ;USE RDATA      <A>,X TO OMIT CHECKING A0, B0, A1 & B1
1573                                    ;
1574
1575
1576
1577                                    ;
1578                                    ;A=WRTCHK/<CFMT!WRTCHK>
1579                                    ;C=EXPECTED DATA FOR TYPEOUT
1580                                    ;USE WRCHK      <A>,DATA0,X TO OMIT CHECKING A0, B0, A1 & B1
1581                                    ;
1582
1583
1584
1585
1586
1587                                    ;
1588                                    ;A=CYL # TO GO TO
1589                                    ;B=FWD DIRECTION MSG
1590                                    ;C=REV DIRECTION MSG
1591                                    ;
1592
1593                                    ;
1594                                    ;A= ERROR #
1595                                    ;B = ERROR CONDITION
1596                                    ;
1597
1598                                    ;
1599                                    ;A&B=ERROR # & CYL #
1600                                    ;C&D=ERROR # & CYL #
1601                                    ;
1602
1603                                            .NLIST  MD
1604
```

```
                                .SBTTL  COMMON TAGS

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

001100                                  .=1100
001100                          $CMTAG:                         ;;START OF COMMON TAGS
001100  000000                          .WORD   0
001102  000                     $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
001103  000                     $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
001104  000000                  $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000                  $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
001110  000000                  $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000                  $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
001114  000                     $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
001115  001                     $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
001116  000000                  $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120  000000                  $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
001122  000000                  $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
001124  000000                  $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
001126  000000                  $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
001130  000000                          .WORD   0               ;;RESERVED--NOT TO BE USED
001132  000000                          .WORD   0
001134  000                     $AUTOB: .BYTE   0               ;;AUTOMATIC MODE INDICATOR
001135  000                     $INTAG: .BYTE   0               ;;INTERRUPT MODE INDICATOR
001136  000000                          .WORD   0
001140  177570                  SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
001142  177570                  DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
001144  177560                  $TKS:   177560                  ;;TTY KBD STATUS
001146  177562                  $TKB:   177562                  ;;TTY KBD BUFFER
001150  177564                  $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
001152  177566                  $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
001154  000                     $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001155  002                     $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001156  012                     $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001157  000                     $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001160  000000                  $TMP0:  .WORD   0               ;;USER DEFINED
001162  000000                  $TMP1:  .WORD   0               ;;USER DEFINED
001164  000000                  $TMP2:  .WORD   0               ;;USER DEFINED
001166  000000                  $TMP3:  .WORD   0               ;;USER DEFINED
001170  000000                  $TMP4:  .WORD   0               ;;USER DEFINED
001172  000000                  $TMP5:  .WORD   0               ;;USER DEFINED
001174  000000                  $TIMES: 0                       ;;MAX. NUMBER OF ITERATIONS
001176  000000                  $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
001200  177607  000377          $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
001204  077                     $QUES:  .ASCII  /?/             ;;QUESTION MARK
001205  015                     $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001206  000012                  $LF:    .ASCIZ  <12>            ;;LINE FEED
                                ;;**********************************************************************
                                .SBTTL  APT MAILBOX-ETABLE

                                ;;**********************************************************************
                                .EVEN
001210                          $MAIL:                          ;;APT MAILBOX
001210  000000                  $MSGTY: .WORD   AMSGTY           ;;MESSAGE TYPE CODE
```

```
1661   001212  000000                  $FATAL: .WORD   AFATAL  ;;FATAL ERROR NUMBER
1662   001214  000000                  $TESTN: .WORD   ATESTN  ;;TEST NUMBER
1663   001216  000000                  $PASS:  .WORD   APASS   ;;PASS COUNT
1664   001220  000000                  $DEVCT: .WORD   ADEVCT  ;;DEVICE COUNT
1665   001222  000000                  $UNIT:  .WORD   AUNIT   ;;I/O UNIT NUMBER
1666   001224  000000                  $MSGAD: .WORD   AMSGAD  ;;MESSAGE ADDRESS
1667   001226  000000                  $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
1668   001230                          $ETABLE:                ;;APT ENVIRONMENT TABLE
1669   001230     000                  $ENV:   .BYTE   AENV    ;;ENVIRONMENT BYTE
1670   001231     000                  $ENVM:  .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
1671   001232  000000                  $SWREG: .WORD   ASWREG  ;;APT SWITCH REGISTER
1672   001234  000000                  $USWR:  .WORD   AUSWR   ;;USER SWITCHES
1673   001236  000000                  $CPUOP: .WORD   ACPUOP  ;;CPU TYPE,OPTIONS
1674                                   ;*                      BITS 15-11=CPU TYPE
1675                                   ;*                              11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
1676                                   ;*                              11/70=06,PDQ=07,Q=10
1677                                   ;*                      BIT 10=REAL TIME CLOCK
1678                                   ;*                      BIT  9=FLOATING POINT PROCESSOR
1679                                   ;*                      BIT  8=MEMORY MANAGEMENT
1680   001240     000                  $MAMS1: .BYTE   AMAMS1  ;;HIGH ADDRESS,M.S. BYTE
1681   001241     000                  $MTYP1: .BYTE   AMTYP1  ;;MEM. TYPE,BLK#1
1682                                   ;*                      MEM.TYPE BYTE   --  (HIGH BYTE)
1683                                   ;*                              900 NSEC CORE=001
1684                                   ;*                              300 NSEC BIPOLAR=002
1685                                   ;*                              500 NSEC MOS=003
1686   001242  000000                  $MADR1: .WORD   AMADR1  ;;HIGH ADDRESS,BLK#1
1687                                   ;*                        MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
1688   001244     000                  $MAMS2: .BYTE   AMAMS2  ;;HIGH ADDRESS,M.S. BYTE
1689   001245     000                  $MTYP2: .BYTE   AMTYP2  ;;MEM.TYPE,BLK#2
1690   001246  000000                  $MADR2: .WORD   AMADR2  ;;MEM.LAST ADDRESS,BLK#2
1691   001250     000                  $MAMS3: .BYTE   AMAMS3  ;;HIGH ADDRESS,M.S.BYTE
1692   001251     000                  $MTYP3: .BYTE   AMTYP3  ;;MEM.TYPE,BLK#3
1693   001252  000000                  $MADR3: .WORD   AMADR3  ;;MEM.LAST ADDRESS,BLK#3
1694   001254     000                  $MAMS4: .BYTE   AMAMS4  ;;HIGH ADDRESS,M.S.BYTE
1695   001255     000                  $MTYP4: .BYTE   AMTYP4  ;;MEM.TYPE,BLK#4
1696   001256  000000                  $MADR4: .WORD   AMADR4  ;;MEM.LAST ADDRESS,BLK#4
1697   001260  000000                  $VECT1: .WORD   AVECT1  ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
1698   001262  000000                  $VECT2: .WORD   AVECT2  ;;INTERRUPT VECTOR#2BUS PRIORITY#2
1699   001264  177440                  $BASE:  .WORD   ABASE   ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
1700   001266  000000                  $DEVM:  .WORD   ADEVM   ;;DEVICE MAP
1701   001270  000000                  $CDW1:  .WORD   ACDW1   ;;CONTROLLER DESCRIPTION WORD#1
1702   001272  000000                  $CDW2:  .WORD   ACDW2   ;;CONTROLLER DESCRIPTION WORD#2
1703   001274  000000                  $DDW0:  .WORD   ADDW0   ;;DEVICE DESCRIPTOR WORD#0
1704   001276  000000                  $DDW1:  .WORD   ADDW1   ;;DEVICE DESCRIPTOR WORD#1
1705   001300  000000                  $DDW2:  .WORD   ADDW2   ;;DEVICE DESCRIPTOR WORD#2
1706   001302  000000                  $DDW3:  .WORD   ADDW3   ;;DEVICE DESCRIPTOR WORD#3
1707   001304  000000                  $DDW4:  .WORD   ADDW4   ;;DEVICE DESCRIPTOR WORD#4
1708   001306  000000                  $DDW5:  .WORD   ADDW5   ;;DEVICE DESCRIPTOR WORD#5
1709   001310  000000                  $DDW6:  .WORD   ADDW6   ;;DEVICE DESCRIPTOR WORD#6
1710   001312  000000                  $DDW7:  .WORD   ADDW7   ;;DEVICE DESCRIPTOR WORD#7
1711   001314                          $ETEND:
1712                                   .MEXIT
1713           177440                  ABASE=  177440                  ;DEFAULT BUSS ADDRESS
1714   001314  000210                  RKVEC:  210                     ;DEFAULT CONTROLLER INTERRUPT VECTOR
1715   001316  000240                  RKPRI:  PR5                     ;PRIORITY
1716   001320  172540                  PKS:    172540                  ;P-CLOCK STATUS REG
```

```
1717  001322  172542          PKSB:   172542          ;P-CLOCK SET BUFFER
1718  001324  172544          PKRB:   172544          ;P-CLOCK READ BUFFER
1719  001326  177546          LKS:    177546          ;L-CLOCK STATUS REG.
1720
1721  001330  000100          LCVEC:  100             ;L-CLOCK INTERRUPT VECTOR
1722  001332  000104          PCVEC:  104             ;P-CLOCK INTERRUPT VECTOR.
1723
1724          000114          MEMVEC= 114             ;MEMORY PARITY VECTOR
1725          172100          MEMBAS= 172100          ;MEMORY PARITY OPTION CSR START ADDR
1726  001334  000000          TRAPPC: 0               ;PC FOR MEM CHECK ENABLE TRAP
1727
1728  001336  000000          PARAM:  0               ;1 FOR 220 START, NO DEFAULT
1729  001340  000000          BYPWRT: 0               ;1 FOR 204 OR 224 START
1730  001342  000000          BYPTIM: 0               ;1 FOR 210 OR 230 START
1731  001344  000000          FTITLE: 0               ;FLAG FOR PRINTING OUT 1ST PROGRAM TITLE
1732
1733  001346  000000          DRVPTR: 0               ;CONTAINS THE POINTER TO THE DRIVE FLAG
1734                                                  ;(DRIV0-DRIV7) OF THE DRIVE TO BE CHECKED NEXT.
1735  001350  000000          FRCYL:  0               ;FROM CYLINDER
1736  001352  000000          TOCYL:  0               ;TO CYLINDER
1737  001354  000000          CCYL:   0               ;CURRENT CYL, USED IN N SQUARE TEST
1738  001356  000000          PCYL:   0               ;PREV CYL., USED IN N SQUARE TEST
1739  001360  000000          CALDIF: 0               ;CALC CYL DIFF USED IN N SQUARE TEST
1740  001362  000000          CYLDIF: 0               ;CYL DIFF, RIGHT JUSTIFIED FROM RKMR3
1741  001364  000000          CYLADD: 0               ;CYL ADDR, RIGHT JUSTIFIED FROM RKMR3
1742  001366  000000          CALADD: 0               ;CYL ADDR USED IN FHDTAB ROUTINE
1743
1744  001370  000074          HZ:     60.             ;60 FOR 60 CPS
1745                                                  ;50 FOR 50 CPS
1746  001372  000000          COUNT:  0               ;LOADED TO 50 OR 60 TO COUNT TO 1 SEC
1747                                                  ;OR ANY OTHER NUMBER TO COUNT OFF FRACTIONAL SECOND
1748  001374  000000          SEC:    0               ;SECOND COUNTER
1749  001376  000000          TIMUP:  0               ;FLAG TO INDICATE TIME IS UP
1750  001400  000000          SECNT:  0               ;SECTOR COUNT
1751  001402  000000          PSEC:   0               ;PREVIOUS SECTOR
1752  001404  000000          ESEC:   0               ;EXPECTED SECTOR
1753  001406  000000          SECTOR: 0               ;SECTOR COUNT, RIGHT JUSTIFIED FROM RKMR3
1754
1755  001410  000001          T1:     1               ;TIMEOUT CONSTANTS
1756  001412  000012          T10:    10.
1757  001414  000062          T50:    50.
1758  001416  000764          T500:   500.
1759  001420  000144          T100:   100.
1760  001422  011610          T5000:  5000.
1761  001424  141520          T50000: 50000.
1762
1763  001426  000077          CYL:    63.             ;CYLINDER NUMBERS USED IN
1764  001430  000177                  127.            ;CURRENT CROSSOVER TEST
1765  001432  000277                  191.
1766  001434  000377                  255.
1767  001436  000477                  319.
1768  001440  000577                  383.
1769
1770  001442  000000          TIM1:   0               ;USED IN TIMING TESTS
1771  001444  000000          TIM2:   0
1772  001446  000000          TIM3:   0
```

```
1773  001450  000000                  TIM4:   0
1774
1775  001452  000000                  LPCNT:  0               ;LOOP CTR USED IN CALCLK
1776  001454  000000                  LPTIM:  0               ;LOOP TIME IN USEC
1777
1778  001456  000000                  SUM:    0               ;LO ORDER FOR TIMING TESTS
1779  001460  000000                          0               ;HI ORDER FOR TIMING TESTS
1780  001462  000000                  SUM1:   0               ;LO ORDER FOR TIMING TESTS
1781  001464  000000                          0               ;HI ORDER FOR TIMING TESTS
1782
1783  001466  000000                  WD1:    0               ;ACTUAL HEADER/DATA WORD
1784  001470  000000                  WD2:    0               ;EXPECTED DATA WORD
1785
1786  001472  000000                  OFFERR: 0               ;SET WHEN WRITE CHECK ERROR ON OFFSET
1787
1788
1789  001474  000000                  HEAD:   0               ;HEAD NUMBER
1790  001476  000000                  HEADA:  0               ;HEAD # FROM H.B3, RT. JUSTIFIED
1791  001500  000000                  HD1:    0               ;SHIFTED HEAD# FOR FORMATTER ROUTINE
1792  001502  000000                  FORMAT: 0               ;FORMAT TYPE
1793  001504  000000                  FMT1:   0               ;SHIFTED FORMAT FOR FORMATTER ROUTINE
1794  001506  000000                  WDCNT:  0               ;WORD COUNT
1795
1796  001510  000000                  DATA0:  0               ;ALL 0'S
1797  001512  052525                  DATA01: 52525           ;0101 PATT
1798  001514  177777                  DATA1:  177777          ;ALL 1'S
1799  001516  133467                  DPAT1:  133467
1800  001520  070627                  DPAT2:  70627
1801
1802  001522  000000                  WORD:   0               ;HEADER/DATA WORD
1803  001524  000000                  HDWD:   0               ;HEADER WORD FROM RKDB
1804
1805  001526  000000                  BSERR:  0               ;CANNOT READ BSE INFO WHEN SET
1806  001530  000000                  LIMERR: 0               ;LIMIT DETECT ERROR FLAG
1807  001532  000000                  BYPCERR:0               ;SET TO 1 TO BYPASS CKCERR IN 'GSTAT1'
1808  001534  000000                  CHKFLG: 0               ;WORDS TO BE TESTED
1809
1810  001536  000102                  HDTAB:  .BLKW 66.       ;CALCULATED HEADER WORD TABLE
1811  001742  000102                  RHTAB:  .BLKW 66.       ;FILLED AFTER READ HEADER CMD
1812  002146  000102                  SRTTAB: .BLKW 66.       ;ABOVE RHTAB SORTED STARTING FORM
1813                                                          ;SECTOR 0 BY SORT ROUTINE
1814  002352  000400                  BSE20H: .BLKW 256.      ;20 SECTOR HARDWARE BSE INFO
1815  003352  000400                  BSE22H: .BLKW 256.      ;22 SECTOR HARDWARE BSE INFO.
1816  004352  000400                  BSE20S: .BLKW   256.    ;20 SECTOR SOFTWARE BSE INFO.
1817  005352  000400                  BSE22S: .BLKW   256.    ;22 SECTOR SOFTWARE BSE INFO.
1818  006352  000400                  RDTAB:  .BLKW 256.      ;FILLED AFTER READ DATA CMD
1819
1820  007352  000000                  UNLD:   0               ;SET TO 0 IF HEADS ARE LOADED
1821                                                          ;SET TO 1 IF HEADS UNLOADED
1822  007354  000000                  BADHDR: 0               ;SET TO 0 IF FORMATTING OK
1823                                                          ;SET TO 1 IF FORMATTING ALTERED
1824  007356  000000                  HPEND:  0               ;SET TO 0 IF HALT NOT PENDING
1825                                                          ;SET TO 1 IF HALT PENDING
1826
1827                                                          ;THE ABOVE 3 FLAGS ARE USED
1828                                                          ;BY 'STOP' ROUTINE TO BRING
```

```
                                                        ;THE CPU TO A VALID HALT.


007360  001  002  004  ATTN:   .BYTE 1,2,4,10,20,40,100,200    ;ATN 0-7 RESP.
007363  010  020  040
007366  100  200
                              .EVEN

                        ;
                        ;THE FOLLOWING ARE HOLDING REGISTERS FOR THE RK611 REGISTERS
                        ;THEY ARE LOADED AFTER RDY IS REC'D FROM WRDY ROUTINE.
                        ;
007370  000000          HCS1:   0                       ;HOLD RKCS1
007372  000000          HCS2:   0                       ;HOLD RKCS2
007374  000000          HWC:    0                       ;HOLD RKWC
007376  000000          HBA:    0                       ;ETC.
007400  000000          HDA:    0
007402  000000          HDS:    0
007404  000000          HER:    0
007406  000000          HASOF:  0
007410  000000          HDC:    0
007412  000000          HDB:    0
007414  000000          HMR1:   0
007416  000000          HMR2:   0
007420  000000          HMR3:   0
007422  000000          HPOS:   0
007424  000000          HPAT:   0


007426  000000          TEMP1:  0                       ;TEMPORARY STORAGE.
007430  000000          TEMP2:  0
007432  000000          TEMP3:  0
007434  000000          TEMP4:  0
007436  000000          TEMP5:  0
                        ;
                        ;THE FOLLOWING ARE HOLDING REGISTERS FOR MSGA(0-3) & MSGB(0-3).
                        ;
007440  000000          H.A0:   0
007442  000000          H.B0:   0
007444  000000          H.A1:   0
007446  000000          H.B1:   0
007450  000000          H.A2:   0
007452  000000          H.B2:   0
007454  000000          H.A3:   0
007456  000000          H.B3:   0
                        ;
                        ;THE FOLLOWING ARE 'EXPECTED' REGISTER FOR THE ABOVE.
                        ;
007460  000000          E.A0:   0
007462  000000          E.B0:   0
007464  000000          E.A1:   0
007466  000000          E.B1:   0
007470  000000          E.A2:   0
007472  000000          E.B2:   0
007474  000000          E.A3:   0
```

```
1885  007476  000000                  E.B3:   0
1886                                  ;
1887                                  ;THE FOLLOWING ARE IDENTIFIERS FOR DRIVE MSG WORDS TO BE TESTED.
1888                                  ;
1889          000001                  T.A2=BIT0                       ;TEST MSG A2 IF SET
1890          000002                  T.B2=BIT1
1891          000004                  T.B3=BIT2
1892
1893                                  ;
1894                                  ;ALL THE FLAGS BELOW ARE CLEARED INITIALLY BY THE CLRFLG ROUTINE.
1895                                  ;
1896
1897  007500  000000                  DDUMP:  0                       ;FLAG - SET WHEN IN DDP DUMP MODE
1898  007502  000000                  DDPCH:  0                       ;FLAG - SET WHEN IN DDP CHAIN MODE
1899  007504  000000                  ACT11:  0                       ;FLAG - SET WHEN IN ACT11 MODE OF OPERATION
1900  007506  000000                  PPTP:   0                       ;FLAG - SET WHEN PROGRAM LOADED BY PAPER TAPE
1901  007510  000000                  DRIVS:  0                       ;CONTAINS THE NUMBER OF DRIVES PRESENT
1902
1903                                  ;THE FLAGS BELOW ARE SET TO 1 TO INDICATE THAT A PARTICULAR DRIVE
1904                                  ;IS PRESENT AND IS TO BE TESTED.
1905
1906  007512  000000                  DRIV0:  0                       ;FLAG SET TO 1 WHEN DRIVE 0 PRESENT
1907  007514  000000                  DRIV1:  0                       ;FOR DRIVE 1
1908  007516  000000                  DRIV2:  0                       ;FOR DRIVE 2
1909  007520  000000                  DRIV3:  0                       ;FOR DRIVE 3
1910  007522  000000                  DRIV4:  0                       ;FOR DRIVE 4
1911  007524  000000                  DRIV5:  0                       ;FOR DRIVE 5
1912  007526  000000                  DRIV6:  0                       ;FOR DRIVE 6
1913  007530  000000                  DRIV7:  0                       ;FOR DRIVE 7
1914
1915  007532  000000                  LCLKF:  0                       ;L-CLOCK FLAG PRESENT FLAG
1916  007534  000000                  PCLKF:  0                       ;P-CLOCK FLAG PRESENT FLAG
1917  007536  000000                  DOTIM:  0                       ;SET IF EITHER CLOCK PRESENT FOR TIMING TESTS.
1918  007540  000000                  SIZFLG: 0                       ;SET IF DEFAULT DO SIZING IN TEST 1
```

```
                                .SBTTL  ERROR POINTER TABLE

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

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

007542                          $ERRTB:

                                ;ERROR 1
007542  055115                          EM2                     ;DR # IN RKCS2 CANNOT BE READ BACK CORRECTLY IN RKMR2
007544  061123                          DH1
007546  064002                          DT1
007550  064374                          DF1

                                ;ERROR 2
007552  055334                          EM5                     ;DETECTED MDS
007554  061123                          DH1
007556  064002                          DT1
007560  064374                          DF1

                                ;ERROR 3
007562  055355                          EM6                     ;DETECTED UFE
007564  061123                          DH1
007566  064002                          DT1
007570  064374                          DF1

                                ;ERROR 4
007572  055376                          EM7                     ;DETECTED DRA & NED RESET (WRONG PORT SELECTED?)
007574  061123                          DH1
007576  064002                          DT1
007600  064374                          DF1
                                ;ERROR 5
```

```
1959  007602  055465                  EM8             ;DR PRESENT BUT NOT SPECIFIED BY OPERATOR
1960  007604  061123                  DH1
1961  007606  064002                  DT1
1962  007610  064374                  DF1
1963
1964                            ;ERROR 6
1965  007612  055541                  EM9             ;DR NOT PRESENT BUT SPECIFIED BY OPERATOR
1966  007614  061123                  DH1
1967  007616  064002                  DT1
1968  007620  064374                  DF1
1969
1970                            ;ERROR 7
1971  007622  055615                  EM10            ;ABORT TEST, COULD NOT REFERENCE CONTROLLER REGISTER
1972  007624  061123                  DH1
1973  007626  064002                  DT1
1974  007630  064374                  DF1
```

```
1975
1976
1977  007632  055700                ;ERROR 10
1978  007634  061123                        EM11            ;DRA & NED BOTH SET
1979  007636  064002                        DH1
1980  007640  064374                        DT1
1981                                  ;ERR 11
1982  007642  055744                        DF1
1983  007644  062322                        EM12            ;NO RDY
1984  007646  064002                        DH27            ;AFTER WRITE DATA CMD
1985  007650  064470                        DT1
1986                                  ;ERR 12
1987  007652  056340                        DF10
1988  007654  062322                        EM21            ;CERR SET
1989  007656  064002                        DH27
1990  007660  064470                        DT1
1991                                  ;ERR 13
1992  007662  055744                        DF10
1993  007664  062272                        EM12            ;NO RDY
1994  007666  064002                        DH26            ;AFTER READ DATA CMD
1995  007670  064470                        DT1
1996                                  ;ERR 14
1997  007672  056340                        DF10
1998  007674  062272                        EM21            ;CERR SET
1999  007676  064002                        DH26
2000  007700  064470                        DT1
2001                                  ;ERR 15
2002  007702  055744                        DF10
2003  007704  062574                        EM12            ;NO RDY
2004  007706  064002                        DH32            ;AFTER WRITE CHECK CMD
2005  007710  064470                        DT1
2006                                  ;ERR 16
2007  007712  057640                        DF10
2008  007714  062574                        EM80            ;WRITE CHECK ERROR SET
2009  007716  064072                        DH32            ;AFTER WRITE CHECK CMD
2010  007720  064410                        DT6
2011                                  ;ERR 17
2012  007722  057677                        DF3
2013  007724  063514                        EM81            ;WRITE CHECK CMD NOT FUNCTIONING
2014  007726  064002                        DH52            ;WITH INTENTIONAL MISCOMPARE
2015  007730  064470                        DT1
2016                                  ;ERR 20
2017  007732  057743                        DF10
2018  007734  062272                        EM82            ;READ DATA NOT COMPARE WITH WRITE DATA
2019  007736  064072                        DH26            ;AFTER READ DATA CMD
                                            DT6
```

```
 2020  007740  064410                    DF3
 2021                            ;ERR 21
 2022  007742  060015                    EM83                    ;DATA CHECK ERROR
 2023  007744  062272                    DH26
 2024  007746  064002                    DT1
```

```
2025  007750  064470                          DF10
2026
2027  007752  056340                  ;ERR 22
2028  007754  062574                          EM21                    ;CERR SET
2029  007756  064002                          DH32                    ;AFTER WRITE CHECK CMD
2030  007760  064470                          DT1
2031                                          DF10
2032  007762  056255                  ;ERR 23
2033  007764  062322                          EM18                    ;MSG B0 ERROR
2034  007766  064210                          DH27                    ;AFTER WRITE DATA CMD
2035  007770  064564                          DT13
2036                                          DF21
2037  007772  056340                  ;ERROR 24
2038  007774  062142                          EM21                    ;CERR SET
2039  007776  064002                          DH21                    ;AFTER SCLR
2040  010000  064470                          DT1
2041                                          DF10
2042  010002  056317                  ;ERR 25
2043  010004  062322                          EM20                    ;MSG B1 ERROR
2044  010006  064210                          DH27
2045  010010  064564                          DT13
2046                                          DF21
2047  010012  056255                  ;ERR 26
2048  010014  062272                          EM18
2049  010016  064210                          DH26                    ;AFTER READ DATA CMD
2050  010020  064564                          DT13
2051                                          DF21
2052
2053  010022  056567                  ;ERROR 27
2054  010024  062064                          EM24                    ;VOL VALID NOT SET
2055  010026  064002                          DH19                    ;AFTER PACK CMD
2056  010030  064470                          DT1
2057                                          DF10
2058  010032  056317                  ;ERR 30
2059  010034  062272                          EM20                    ;MSG B1 ERROR
2060  010036  064210                          DH26                    ;AFTER READ DATA CMD.
2061  010040  064564                          DT13
2062                                          DF21
2063  010042  056255                  ;ERR 31
2064  010044  062574                          EM18                    ;MSG B0 ERROR
2065  010046  064210                          DH32                    ;AFTER WRITE CHECK CMD
2066  010050  064564                          DT13
2067                                          DF21
2068  010052  056317                  ;ERR 32
2069  010054  062574                          EM20                    ;MSG B1 ERROR
2070  010056  064210                          DH32
2071  010060  064564                          DT13
2072                                          DF21
2073  010062  055744                  ;ERR 33
2074  010064  062222                          EM12                    ;CONTR NOT READY
2075  010066  064002                          DH24                    ;AFTER OFFSET CMD
2076  010070  064470                          DT1
2077                                          DF10
2078  010072  056002                  ;ERR 34
2079  010074  062222                          EM13                    ;NO ATTN
2080  010076  064002                          DH24
                                              DT1
```

```
2081  010100  064470                    DF10
2082
2083  010102  056234            ;ERR 35
2084  010104  063550                    EM17          ;MSG A0 ERROR
2085  010106  064210                    DH53          ;DURING OFFSET COMMAND
2086  010110  064564                    DT13
2087                                     DF21
2088  010112  056276            ;ERR 36
2089  010114  063550                    EM19          ;MSG A1 ERROR
2090  010116  064210                    DH53
2091  010120  064564                    DT13
2092                                     DF21
2093  010122  056276            ;ERR 37
2094  010124  062222                    EM19          ;MSG A1 ERROR
2095  010126  064210                    DH24          ;AFTER OFFSET CMD
2096  010130  064564                    DT13
2097                                     DF21
2098  010132  056317            ;ERR 40
2099  010134  062222                    EM20          ;MSG B1 ERROR
2100  010136  064210                    DH24
2101  010140  064564                    DT13
2102                                     DF21
2103  010142  056024            ;ERR 41
2104  010144  061411                    EM14          ;UNEXP MEM PCRITY TRAP
2105  010146  064024                    DH8           ;TEST #, TRAP PC
2106  010150  064404                    DT3
2107                                     DF2
2108  010152  057242            ;ERR 42
2109  010154  062222                    EM41          ;CYL ADDR IN B2 DID NOT REMAIN CLEARED
2110  010156  064250                    DH24
2111  010160  064620                    DT14
2112                                     DF22
2113  010162  060143            ;ERR 43
2114  010164  062170                    EM85
2115  010166  064002                    DH22
2116  010170  064470                    DT1
2117                                     DF10
2118  010172  056062            ;ERR 44
2119  010174  061123                    EM15          ;WCE AT CYL 411,TRK 2, SEC 21
2120  010176  064170                    DH1
2121  010200  064424                    DT10
2122                                     DF4
2123  010202  060143            ;ERR 45
2124  010204  063461                    EM85          ;OFFSET BIT IN RKMR2 CLEARED
2125  010206  064002                    DH51          ;AFTER SEEK TO SELF
2126  010210  064470                    DT1
2127                                     DF10
2128  010212  056622            ;ERR 46
2129  010214  062322                    EM25          ;DETECTED 10 BAD SECTORS
2130  010216  064002                    DH27          ;AFTER WRITE DATA CMD.
2131  010220  064470                    DT1
2132                                     DF10
2133  010222  057135            ;ERROR 47
2134  010224  062013                    EM39          ;CYL DIFF/OFFSET IN RKMR2 NOT CLEARED
2135  010226  064250                    DH17          ;AFTER RECAL CMD
2136  010230  064620                    DT14
                                         DF22
```

```
2137
2138  010232  057204                ;ERROR 50
2139  010234  062013                        EM40            ;CYL ADDR IN RKMR3 NOT CLEARED
2140  010236  064250                        DH17            ;AFTER RECAL COMD
2141  010240  064620                        DT14
2142                                        DF22
2143  010242  060463                ;ERR 51
2144  010244  062247                        EM93            ;WRONG CYL# IN HEADER WORD (MISPOSITION)
2145  010246  064152                        DH25            ;AFTER SEEK CMD
2146  010250  064550                        DT9
2147                                        DF20
2148  010252  056234                ;ERR 52
2149  010254  062322                        EM17            ;MSG A0 ERROR
2150  010256  064210                        DH27            ;AFTER WRITE DATA CMD
2151  010260  064564                        DT13
2152                                        DF21
2153  010262  056276                ;ERR 53
2154  010264  062322                        EM19            ;MSG A1 ERROR
2155  010266  064210                        DH27
2156  010270  064564                        DT13
2157                                        DF21
2158  010272  056234                ;ERR 54
2159  010274  062272                        EM17            ;MSG A0 ERROR
2160  010276  064210                        DH26            ;AFTER READ DATA CMD
2161  010300  064564                        DT13
2162                                        DF21
2163  010302  056002                ;ERROR 55
2164  010304  062013                        EM13            ;NO ATTN
2165  010306  064002                        DH17            ;AFTER RECAL CMD
2166  010310  064470                        DT1
2167                                        DF10
2168  010312  056276                ;ERR 56
2169  010314  062272                        EM19            ;MSG A1 ERROR
2170  010316  064210                        DH26
2171  010320  064564                        DT13
2172                                        DF21
2173  010322  056234                ;ERR 57
2174  010324  062574                        EM17            ;MSG A0 ERROR
2175  010326  064210                        DH32            ;AFTER WRITE CHECK CMD
2176  010330  064564                        DT13
2177                                        DF21
2178  010332  056276                ;ERR 60
2179  010334  062574                        EM19            ;MSG A1 ERROR
2180  010336  064210                        DH32
2181  010340  064564                        DT13
2182                                        DF21
2183  010342  056255                ;ERR 61
2184  010344  063550                        EM18            ;MSG B0 ERROR
2185  010346  064210                        DH53            ;DURING OFFSET CMD
2186  010350  064564                        DT13
2187                                        DF21
2188  010352  056317                ;ERR 62
2189  010354  063550                        EM20            ;MSG B1 ERROR
2190  010356  064210                        DH53
2191  010360  064564                        DT13
2192                                        DF21
                                    ;ERR 63
```

```
2193  010362  056674                    EM26                    ;BSE ERROR IN WRITE CMD NOT ON BSE TABLE
2194  010364  062322                    DH27                    ;AFTER WRITE DATA CMD
2195  010366  064002                    DT1
2196  010370  064470                    DF10
2197                          ;ERR 64
2198  010372  060244                    EM88                    ;DID NOT FIND SECTOR 0 FROM INDEX
2199  010374  063576                    DH54                    ;AFTER FORMAT CHANGE AND READY REC'D
2200  010376  064002                    DT1
2201  010400  064470                    DF10
2202                          ;ERR 65
2203  010402  056753                    EM27                    ;DETECTED BSE IN READ BUT NOT IN WRITE CMD.
2204  010404  061123                    DH1
2205  010406  064002                    DT1
2206  010410  064374                    DF1
2207                          ;ERR 66
2208  010412  057343                    EM60                    ;NO HEAD HOME
2209  010414  062037                    DH18                    ;AFTER UNLOAD CMD
2210  010416  064002                    DT1
2211  010420  064470                    DF10
2212                          ;ERR 67
2213  010422  060305                    EM89                    ;HDS HOME NOT CLEARED
2214  010424  061432                    DH9                     ;DURING START SPIN CMD
2215  010426  064002                    DT1
2216  010430  064470                    DF10
2217                          ;ERROR 70
2218  010432  060345                    EM90                    ;SERVO SIG PRES NOT SET
2219  010434  061432                    DH9
2220  010436  064002                    DT1
2221  010440  064470                    DF10
2222                          ;ERR 71
2223  010442  060405                    EM91                    ;REV NOT SET
2224  010444  061432                    DH9
2225  010446  064002                    DT1
2226  010450  064470                    DF10
2227                          ;ERROR 72
2228  010452  060432                    EM92                    ;REV NOT CLEARED
2229  010454  061432                    DH9
2230  010456  064002                    DT1
2231  010460  064470                    DF10
2232                          ;ERR 73
2233  010462  056002                    EM13                    ;NO ATTN
2234  010464  062037                    DH18                    ;AFTER UNLOAD CMD
2235  010466  064002                    DT1
2236  010470  064470                    DF10
2237                          ;ERR 74
2238  010472  056002                    EM13                    ;NO ATTN
2239  010474  061505                    DH10                    ;AT END OF HEAD LOADING
2240  010476  064002                    DT1
2241  010500  064470                    DF10
2242                          ;ERR 75
2243  010502  056362                    EM22                    ;NO DRIVS IN $DEVM
2244  010504  061123                    DH1
2245  010506  064002                    DT1
2246  010510  064374                    DF1
2247                          ;ERR 76
2248  010512  056467                    EM23                    ;NO DRIVS ON BUSS
```

```
2249  010514  061123                    DH1
2250  010516  064002                    DT1
2251  010520  064374                    DF1
2252                            ;ERR 77
2253  010522  000000                    0
2254  010524  000000                    0
2255  010526  000000                    0
2256  010530  000000                    0
2257                            ;ERR 100
2258  010532  000000                    0
2259  010534  000000                    0
2260  010536  000000                    0
2261  010540  000000                    0
2262                            ;ERROR 101
2263  010542  060544                    EM94        ;OFFSET NOT CLEARED
2264  010544  063334                    DH47        ;AFTER READ HEADER WITH MOVEMENT
2265  010546  064250                    DT14
2266  010550  064620                    DF22
2267                            ;ERROR 102
2268  010552  060600                    EM95        ;FORMAT NOT SET
2269  010554  062322                    DH27        ;AFTER WRITE DATA CMD
2270  010556  064002                    DT1
2271  010560  064470                    DF10
2272                            ;ERR 103
2273  010562  060600                    EM95
2274  010564  062574                    DH32        ;AFTER WRITE CHECK CMD
2275  010566  064002                    DT1
2276  010570  064470                    DF10
2277                            ;ERR 104
2278  010572  057135                    EM39        ;OFFSET NOT RESET
2279  010574  063715                    DH57        ;AFTER WRITE CMD WITH OFFSET
2280  010576  064250                    DT14
2281  010600  064620                    DF22
2282                            ;ERR 105
2283  010602  057204                    EM40        ;CYL ADDR NOT 0
2284  010604  063715                    DH57
2285  010606  064250                    DT14
2286  010610  064620                    DF22
2287                            ;ERR 106
2288  010612  060634                    EM96        ;CANNOT FIND SECTOR 23(8)
2289  010614  061123                    DH1
2290  010616  064002                    DT1
2291  010620  064374                    DF1
2292                            ;ERR 107
2293  010622  060665                    EM97        ;HEAD SWITCHING TOO LONG
2294  010624  062322                    DH27        ;AFTER WRITE DTA CMD
2295  010626  064050                    DT5
2296  010630  064514                    DF15
2297                            ;ERR 110
2298  010632  060752                    EM98        ;CANNOT FIND CYL 128
2299  010634  062247                    DH25        ;AFTER SEEK CMD
2300  010636  064002                    DT1
2301  010640  064470                    DF10
2302                            ;ERR 111
2303  010642  061003                    EM99        ;CANNOT FIND CYL 256
2304  010644  062247                    DH25
```

```
2305  010646  064002                    DT1
2306  010650  064470                    DF10
2307                            ;ERR 112
2308  010652  061034                    EM100           ;DRIVE OFF TRACK SET
2309  010654  062322                    DH27            ;AFTER WRITE DATA CMD
2310  010656  064030                    DT4
2311  010660  064454                    DF6
2312                            ;ERR 113
2313  010662  057072                    EM36            ;CYL ADDR IN RKMR3 INCORRECT
2314  010664  062322                    DH27
2315  010666  064030                    DT4
2316  010670  064454                    DF6
2317                            ;ERROR 114
2318  010672  060206                    EM86            ;OFFSET IN A2 NOT = RKASOF
2319  010674  062222                    DH24            ;AFTER OFFSET CMD
2320  010676  064250                    DT14
2321  010700  064620                    DF22
2322                            ;ERR 115
2323  010702  060206                    EM86
2324  010704  062170                    DH22            ;AFTER DRIVE CLEAR CMD
2325  010706  064250                    DT14
2326  010710  064620                    DF22
2327                            ;ERROR 116
2328  010712  055744                    EM12            ;CONT NOT RDY
2329  010714  062064                    DH19            ;AFTER PACK CMD
2330  010716  064002                    DT1
2331  010720  064470                    DF10
2332                            ;ERROR 117
2333  010722  055744                    EM12            ;CONT NOT RDY
2334  010724  062107                    DH20            ;AFTER SEL DR CMD
2335  010726  064002                    DT1
2336  010730  064470                    DF10
2337                            ;ERROR 120
2338  010732  055744                    EM12
2339  010734  062142                    DH21            ;AFTER SUBSYS CLEAR
2340  010736  064002                    DT1
2341  010740  064470                    DF10
2342                            ;ERROR 121
2343  010742  055744                    EM12
2344  010744  061432                    DH9             ;AFTER START SPINDLE CMD
2345  010746  064002                    DT1
2346  010750  064470                    DF10
2347                            ;ERROR 122
2348  010752  061071                    EM101           ;DID NOT GO TO CYL 10
2349  010754  062515                    DH30            ;AFTER READ HEADER CMD
2350  010756  064250                    DT14
2351  010760  064620                    DF22
2352                            ;ERROR 123
2353  010762  060206                    EM86            ;A2 OFFSET NOT = RKASOF
2354  010764  063461                    DH51            ;AFTER SEEK TO SELF
2355  010766  064250                    DT14
2356  010770  064620                    DF22
2357                            ;ERROR 124
2358  010772  055744                    EM12
2359  010774  062013                    DH17            ;AFTER RECAL CMD
2360  010776  064002                    DT1
```

```
2361  011000  064470                        DF10
2362                                  ;ERR 125
2363  011002  057551                        EM73          ;CTO SET
2364  011004  060052                        EM84          ;WHILE WAITING FOR OR REC'D CONTR RDY. MSG A&B BAD
2365  011006  064002                        DT1
2366  011010  064434                        DF5
2367                                  ;ERR 126
2368  011012  057617                        EM79          ;NED SET
2369  011014  060052                        EM84
2370  011016  064002                        DT1
2371  011020  064050                        DT5
2372                                  ;ERR 127
2373  011022  055334                        EM5           ;MDS SET
2374  011024  060052                        EM84
2375  011026  064002                        DT1
2376  011030  064434                        DF5
2377                                  ;ERROR 130
2378  011032  000000                        0
2379  011034  000000                        0
2380  011036  000000                        0
2381  011040  000000                        0
2382                                  ;ERROR 131
2383  011042  055744                        EM12          ;NO RDY
2384  011044  062247                        DH25          ;AFTER SEEK CMD
2385  011046  064002                        DT1
2386  011050  064470                        DF10
2387                                  ;ERROR 132
2388  011052  056002                        EM13          ;NO ATTN
2389  011054  062247                        DH25
2390  011056  064002                        DT1
2391  011060  064470                        DF10
2392                                  ;ERROR 133
2393  011062  000000                        0
2394  011064  000000                        0
2395  011066  000000                        0
2396  011070  000000                        0
2397                                  ;ERROR 134
2398  011072  000000                        0
2399  011074  000000                        0
2400  011076  000000                        0
2401  011100  000000                        0
2402                                  ;ERROR 135
2403  011102  000000                        0
2404  011104  000000                        0
2405  011106  000000                        0
2406  011110  000000                        0
2407                                  ;ERROR 136
2408  011112  000000                        0
2409  011114  000000                        0
2410  011116  000000                        0
2411  011120  000000                        0
2412                                  ;ERROR 137
2413  011122  057135                        EM39          ;CYL DIFF/OFFSET IN RKMR2 NOT CLEARED
2414  011124  062247                        DH25
2415  011126  064002                        DT1
2416  011130  064470                        DF10
```

```
2417
2418  011132  056234          ;ERR 140
2419  011134  063461                EM17                    ;MSG A0 ERROR
2420  011136  064210                DH51                    ;AFTER SEEK TO SELF
2421  011140  064564                DT13
2422                                 DF21
2423  011142  056255          ;ERR 141
2424  011144  063461                EM18
2425  011146  064210                DH51
2426  011150  064564                DT13
2427                                 DF21
2428  011152  056276          ;ERR 142
2429  011154  063461                EM19
2430  011156  064210                DH51
2431  011160  064564                DT13
2432                                 DF21
2433  011162  056317          ;ERR 143
2434  011164  063461                EM20
2435  011166  064210                DH51
2436  011170  064564                DT13
2437                                 DF21
2438  011172  000000          ;ERROR 144
2439  011174  000000                0
2440  011176  000000                0
2441  011200  000000                0
2442                                 0
2443  011202  000000          ;ERROR 145
2444  011204  000000                0
2445  011206  000000                0
2446  011210  000000                0
2447                                 0
2448  011212  000000          ;ERROR 146
2449  011214  000000                0
2450  011216  000000                0
2451  011220  000000                0
2452                                 0
2453  011222  000000          ;ERROR 147
2454  011224  000000                0
2455  011226  000000                0
2456  011230  000000                0
2457                                 0
2458  011232  000000          ;ERROR 150
2459  011234  000000                0
2460  011236  000000                0
2461  011240  000000                0
2462                                 0
2463  011242  055744          ;ERROR 151
2464  011244  062170                EM12                    ;NO RDY
2465  011246  064002                DH22                    ;AFTER CLEAR CMD
2466  011250  064470                DT1
2467                                 DF10
2468  011252  000000          ;ERROR 152
2469  011254  000000                0
2470  011256  000000                0
2471  011260  000000                0
2472                                 0
                               ;ERROR 153
```

```
2473  011262  000000                    0
2474  011264  000000                    0
2475  011266  000000                    0
2476  011270  000000                    0
2477                          ;ERROR 154
2478  011272  057310                    EM55          ;ATTN NOT CLEARED
2479  011274  062170                    DH22
2480  011276  064002                    DT1
2481  011300  064470                    DF10
2482                          ;ERROR 155
2483  011302  000000                    0
2484  011304  000000                    0
2485  011306  000000                    0
2486  011310  000000                    0
2487                          ;ERROR 156
2488  011312  000000                    0
2489  011314  000000                    0
2490  011316  000000                    0
2491  011320  000000                    0
2492                          ;ERROR 157
2493  011322  000000                    0
2494  011324  000000                    0
2495  011326  000000                    0
2496  011330  000000                    0
2497                          ;ERROR 160
2498  011332  000000                    0
2499  011334  000000                    0
2500  011336  000000                    0
2501  011340  000000                    0
2502                          ;ERROR 161
2503  011342  000000                    0
2504  011344  000000                    0
2505  011346  000000                    0
2506  011350  000000                    0
2507                          ;ERROR 162
2508  011352  000000                    0
2509  011354  000000                    0
2510  011356  000000                    0
2511  011360  000000                    0
2512                          ;ERROR 163
2513  011362  000000                    0
2514  011364  000000                    0
2515  011366  000000                    0
2516
2517
2518
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2528
```

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2529
2530
2531
2532
2533
2534
2535
2536
2537  011370  000000                    0
2538                          ;ERROR 164
2539  011372  000000                    0
2540  011374  000000                    0
2541  011376  000000                    0
2542  011400  000000                    0
2543                          ;ERROR 165
2544  011402  000000                    0
2545  011404  000000                    0
2546  011406  000000                    0
2547  011410  000000                    0
2548                          ;ERROR 166
2549  011412  000000                    0
2550  011414  000000                    0
2551  011416  000000                    0
2552  011420  000000                    0
2553                          ;ERROR 167
2554  011422  000000                    0
2555  011424  000000                    0
2556  011426  000000                    0
2557  011430  000000                    0
2558                          ;ERROR 170
2559  011432  000000                    0
2560  011434  000000                    0
2561  011436  000000                    0
2562  011440  000000                    0
2563                          ;ERROR 171
2564  011442  055744                    EM12        ;NO RDY
2565  011444  062515                    DH30        ;AFTER READ HEADER CMD
2566  011446  064002                    DT1
2567  011450  064470                    DF10
2568                          ;ERROR 172
2569  011452  000000                    0
2570  011454  000000                    0
2571  011456  000000                    0
2572  011460  000000                    0
2573                          ;ERROR 173
2574  011462  057421                    EM63        ;DLT SET
2575  011464  062515                    DH30
2576  011466  064050                    DT5
2577  011470  064514                    DF15
2578                          ;ERROR 174
2579  011472  056340                    EM21        ;CERR SET
2580  011474  062515                    DH30
2581  011476  064050                    DT5
2582  011500  064514                    DF15
2583                          ;ERROR 175
2584  011502  057135                    EM39        ;CYL DIFF NOT CLEARED
```

```
                        ERROR POINTER TABLE

2585  011504  061505                DH10            ;AT END OF HEAD LOADING
2586  011506  064002                DT1
2587  011510  064470                DF10
2588                          ;ERROR 176
2589  011512  057204                EM40            ;CYL ADDR NOT CLEARED.
2590  011514  061505                DH10
2591  011516  064002                DT1
2592  011520  064470                DF10
2593                          ;ERROR 177
2594  011522  000000                0
2595  011524  000000                0
2596  011526  000000                0
2597  011530  000000                0
2598                          ;ERROR 200
2599  011532  055744                EM12            ;NO RDY
2600  011534  062776                DH39            ;AFTER WRITE HEADER CMD
2601  011536  064050                DT5
2602  011540  064514                DF15
2603                          ;ERROR 201
2604  011542  056340                EM21            ;CERR SET
2605  011544  062776                DH39
2606  011546  064050                DT5
2607  011550  064514                DF15
2608                          ;ERROR 202
2609  011552  057442                EM65            ;READ HEADER ERROR
2610  011554  061123                DH1
2611  011556  064112                DT7
2612  011560  064504                DF14
2613                          ;ERROR 203
2614  011562  000000                0
2615  011564  000000                0
2616  011566  000000                0
2617  011570  000000                0
2618                          ;ERROR 204
2619  011572  000000                0
2620  011574  000000                0
2621  011576  000000                0
2622  011600  000000                0
2623                          ;ERROR 205
2624  011602  000000                0
2625  011604  000000                0
2626  011606  000000                0
2627  011610  000000                0
2628                          ;ERROR 206
2629  011612  000000                0
2630  011614  000000                0
2631  011616  000000                0
2632  011620  000000                0
2633                          ;ERROR 207
2634  011622  057072                EM36            ;CYL ADDR IN RKMR3 INCORRECT
2635  011624  062247                DH25            ;AFTER SEEK CMD
2636  011626  064030                DT4
2637  011630  064454                DF6
2638                          ;ERROR 210
2639  011632  056340                EM21            ;CERR SET
2640  011634  062247                DH25
```

```
2641  011636  064002                  DT1
2642  011640  064470                  DF10
2643                          ;ERROR 211
2644  011642  000000                  0
2645  011644  000000                  0
2646  011646  000000                  0
2647  011650  000000                  0
2648                          ;ERROR 212
2649  011652  000000                  0
2650  011654  000000                  0
2651  011656  000000                  0
2652  011660  000000                  0
2653                          ;ERROR 213
2654  011662  000000                  0
2655  011664  000000                  0
2656  011666  000000                  0
2657  011670  000000                  0
2658                          ;ERROR 214
2659  011672  000000                  0
2660  011674  000000                  0
2661  011676  000000                  0
2662  011700  000000                  0
2663                          ;ERROR 215
2664  011702  000000                  0
2665  011704  000000                  0
2666  011706  000000                  0
2667  011710  000000                  0
2668                          ;ERROR 216
2669  011712  000000                  0
2670  011714  000000                  0
2671  011716  000000                  0
2672  011720  000000                  0
2673                          ;ERROR 217
2674  011722  000000                  0
2675  011724  000000                  0
2676  011726  000000                  0
2677  011730  000000                  0
2678                          ;ERROR 220
2679  011732  000000                  0
2680  011734  000000                  0
2681  011736  000000                  0
2682  011740  000000                  0
2683                          ;ERROR 221
2684  011742  056234                  EM17          ;MSG A0 ERROR
2685  011744  062013                  DH17
2686  011746  064210                  DT13
2687  011750  064564                  DF21
2688                          ;ERROR 222
2689  011752  056276                  EM19          ;MSG A1 ERROR
2690  011754  062013                  DH17
2691  011756  064210                  DT13
2692  011760  064564                  DF21
2693                          ;ERROR 223
2694  011762  000000                  0
2695  011764  000000                  0
2696  011766  000000                  0
```

```
2697  011770  000000                    0
2698                              ;ERROR 224
2699  011772  000000                    0
2700  011774  000000                    0
2701  011776  000000                    0
2702  012000  000000                    0
2703                              ;ERROR 225
2704  012002  000000                    0
2705  012004  000000                    0
2706  012006  000000                    0
2707  012010  000000                    0
2708                              ;ERROR 226
2709  012012  055744                    EM12          ;NO RDY
2710  012014  062272                    DH26          ;AFTER READ DATA CMD
2711  012016  064002                    DT1
2712  012020  064470                    DF10
2713                              ;ERROR 227
2714  012022  056340                    EM21          ;CERR SET
2715  012024  062272                    DH26
2716  012026  064050                    DT5
2717  012030  064514                    DF15
2718                              ;ERROR 230
2719  012032  056171                    EM16          ;CANNOT READ BSE INFO
2720  012034  061643                    DH13          ;ON SEC 10, 12, 14, 16, 18, 20
2721  012036  064002                    DT1
2722  012040  064530                    DF17
2723                              ;ERROR 231
2724  012042  056171                    EM16
2725  012044  061727                    DH14          ;ON SEC 11, 13, 15, 17, 19, 21
2726  012046  064002                    DT1
2727  012050  064530                    DF17
2728                              ;ERROR 232
2729  012052  000000                    0
2730  012054  000000                    0
2731  012056  000000                    0
2732  012060  000000                    0
2733                              ;ERROR 233
2734  012062  056171                    EM16          ;CANNOT READ BSE INFO
2735  012064  063133                    DH42          ;ON SECT 0,2,4,6,8
2736  012066  064002                    DT1
2737  012070  064530                    DF17
2738                              ;ERROR 234
2739  012072  056171                    EM16
2740  012074  063204                    DH43          ;ON SECT 1,3,5,7,9
2741  012076  064002                    DT1
2742  012100  064530                    DF17
2743                              ;ERROR 235
2744  012102  057520                    EM69          ;ALIGN CARTRIDGE USED
2745  012104  063255                    DH44          ;WILL BYPASS FORMAT & ALL R/W TESTS
2746  012106  064002                    DT1
2747  012110  064470                    DF10
2748                              ;ERROR 236
2749  012112  000000                    0
2750  012114  000000                    0
2751  012116  000000                    0
2752  012120  000000                    0
```

```
2753                                    ;ERROR 237
2754  012122  000000                            0
2755  012124  000000                            0
2756  012126  000000                            0
2757  012130  000000                            0
2758                                    ;ERROR 240
2759  012132  000000                            0
2760  012134  000000                            0
2761  012136  000000                            0
2762  012140  000000                            0
2763                                    ;ERROR 241
2764  012142  000000                            0
2765  012144  000000                            0
2766  012146  000000                            0
2767  012150  000000                            0
2768                                    ;ERROR 242
2769  012152  000000                            0
2770  012154  000000                            0
2771  012156  000000                            0
2772  012160  000000                            0
2773
2774                                    ;ERROR 243
2775  012162  057072                            EM36            ;CYL ADDR IN RKMR3 INCORRECT
2776  012164  062247                            DH25            ;AFTER SEEK CMD
2777  012166  064132                            DT8
2778  012170  064454                            DF6
2779                                    ;ERR 244
2780  012172  057572                            EM74            ;RTZ NOT SET
2781  012174  063106                            DH41            ;DURING RECAL CMD
2782  012176  064002                            DT1
2783  012200  064470                            DF10
2784                                    ;ERR 245
2785  012202  000000                            0
2786  012204  000000                            0
2787  012206  000000                            0
2788  012210  000000                            0
2789                                    ;ERR 246
2790  012212  000000                            0
2791  012214  000000                            0
2792  012216  000000                            0
2793  012220  000000                            0
2794                                    ;ERR 247
2795  012222  000000                            0
2796  012224  000000                            0
2797  012226  000000                            0
2798  012230  000000                            0
2799                                    ;ERR 250
2800  012232  000000                            0
2801  012234  000000                            0
2802  012236  000000                            0
2803  012240  000000                            0
2804                                    ;ERR 251
2805  012242  000000                            0
2806  012244  000000                            0
2807  012246  000000                            0
2808  012250  000000                            0
```

```
2809                                    ;ERR 252
2810  012252  000000                            0
2811  012254  000000                            0
2812  012256  000000                            0
2813  012260  000000                            0
2814                                    ;ERR 253
2815  012262  000000                            0
2816  012264  000000                            0
2817  012266  000000                            0
2818  012270  000000                            0
2819                                    ;ERR 254
2820  012272  000000                            0
2821  012274  000000                            0
2822  012276  000000                            0
2823  012300  000000                            0
2824                                    ;ERR 255
2825  012302  000000                            0
2826  012304  000000                            0
2827  012306  000000                            0
2828  012310  000000                            0
2829                                    ;ERR 256
2830  012312  000000                            0
2831  012314  000000                            0
2832  012316  000000                            0
2833  012320  000000                            0
2834                                    ;ERR 257
2835  012322  000000                            0
2836  012324  000000                            0
2837  012326  000000                            0
2838  012330  000000                            0
2839                                    ;ERR 260
2840  012332  056234                        EM17        ;MSG AO ERROR
2841  012334  062222                        DH24        ;AFTER OFFSET CMD
2842  012336  064210                        DT13
2843  012340  064564                        DF21
2844                                    ;ERR 261
2845  012342  056255                        EM18        ;MSG BO ERROR
2846  012344  062222                        DH24
2847  012346  064210                        DT13
2848  012350  064564                        DF21
2849                                    ;ERR 262
2850  012352  000000                            0
2851  012354  000000                            0
2852  012356  000000                            0
2853  012360  000000                            0
2854                                    ;ERR 263
2855  012362  000000                            0
2856  012364  000000                            0
2857  012366  000000                            0
2858  012370  000000                            0
2859                                    ;ERR 264
2860  012372  000000                            0
2861  012374  000000                            0
2862  012376  000000                            0
2863  012400  000000                            0
2864                                    ;ERR 265
```

```
  2865  012402  056255                    EM18                    ;MSG BO ERROR
  2866  012404  062170                    DH22                    ;AFTER DRIVE CLEAR CMD
  2867  012406  064210                    DT13
  2868  012410  064564                    DF21
  2869                          ;ERR 266
  2870  012412  056317                    EM20                    ;MSG B1 ERROR
  2871  012414  062170                    DH22
  2872  012416  064210                    DT13
  2873  012420  064564                    DF21
  2874                          ;ERR 267
  2875  012422  056255                    EM18                    ;MSG BO ERROR
  2876  012424  062776                    DH39                    ;AFTER WRITE HEADER CMD
  2877  012426  064210                    DT13
  2878  012430  064564                    DF21
  2879                          ;ERR 270
  2880  012432  056317                    EM20                    ;MSG B1 ERROR
  2881  012434  062776                    DH39
  2882  012436  064210                    DT13
  2883  012440  064564                    DF21
  2884                          ;ERR 271
  2885  012442  056255                    EM18
  2886  012444  062515                    DH30                    ;AFTER RD. HDR. CMD.
  2887  012446  064210                    DT13
  2888  012450  064564                    DF21
  2889                          ;ERR 272
  2890  012452  056317                    EM20
  2891  012454  062515                    DH30
  2892  012456  064210                    DT13
  2893  012460  064564                    DF21
  2894                          ;ERR 273
  2895  012462  056234                    EM17                    ;MSG AO ERROR
  2896  012464  062170                    DH22                    ;AFTER DRV CLR CMD
  2897  012466  064210                    DT13
  2898  012470  064564                    DF21
  2899                          ;ERR 274
  2900  012472  056276                    EM19                    ;MSG A1 ERROR
  2901  012474  062170                    DH22
  2902  012476  064210                    DT13
  2903  012500  064564                    DF21
  2904                          ;ERR 275
  2905  012502  056255                    EM18                    ;MSG BO ERROR
  2906  012504  062013                    DH17                    ;AFTER RECAL CMD
  2907  012506  064210                    DT13
  2908  012510  064564                    DF21
  2909                          ;ERR 276
  2910  012512  056317                    EM20                    ;MSG B1 ERROR
  2911  012514  062013                    DH17
  2912  012516  064210                    DT13
  2913  012520  064564                    DF21
  2914                          ;ERR 277
  2915  012522  056234                    EM17                    ;MSG AO ERROR
  2916  012524  062776                    DH39                    ;AFTER WRITE HEADER CMD
  2917  012526  064210                    DT13
  2918  012530  064564                    DF21
  2919                          ;ERR 300
  2920  012532  056276                    EM19                    ;MSG A1 ERROR
```

```
2921   012534   062776                    DH39
2922   012536   064210                    DT13
2923   012540   064564                    DF21
2924                              ;ERR 301
2925   012542   056234                    EM17
2926   012544   062515                    DH30          ;AFT RD HDR. CMD
2927   012546   064210                    DT13
2928   012550   064564                    DF21
2929                              ;ERR 302
2930   012552   056276                    EM19
2931   012554   062515                    DH30
2932   012556   064210                    DT13
2933   012560   064564                    DF21
2934                              ;ERR 303
2935   012562   000000                    0
2936   012564   000000                    0
2937   012566   000000                    0
2938   012570   000000                    0
2939                              ;ERR 304
2940   012572   000000                    0
2941   012574   000000                    0
2942   012576   000000                    0
2943   012600   000000                    0
2944
```

```
                                        .SBTTL  PROGRAM SETUP
012602  012737  000001  001336  PARSRT: MOV     #1,PARAM        ;SET FLAG FOR 220 START
012610  005037  001340          BYPWRT: CLR     BYPWRT
012614  005037  001342          BYPTIM: CLR     BYPTIM
012620  000450                  PRGSRT: BR      PRGSRT          ;START PROGRAM

012622  105037  001336          BYWRT:  CLRB    PARAM
012626  012737  000001  001340          MOV     #1,BYPWRT       ;BYPASS WRITE TESTS
012634  105037  001342          BYTIM:  CLRB    BYPTIM
012640  000440                  BYTIMA: BR      PRGSRT

012642  105037  001336          BYWRTA: CLRB    PARAM
012646  105037  001340                  CLRB    BYPWRT
012652  012737  000001  001342          MOV     #1,BYPTIM       ;BYPASS TIMING TESTS
012660  000430                  BYTIMA: BR      PRGSRT

012662  012737  000001  001336          MOV     #1,PARAM
012670  012737  000001  001340          MOV     #1,BYPWRT
012676  105037  001342                  CLRB    BYPTIM
012702  000417                  BYTIMA: BR      PRGSRT

012704  012737  000001  001336          MOV     #1,PARAM
012712  105037  001340                  CLRB    BYPWRT
012716  012737  000001  001342          MOV     #1,BYPTIM
012724  000406                  BYTIMA: BR      PRGSRT

012726  105037  001336          START:  CLRB    PARAM           ;CLEAR FOR 200 START
012732  005037  001340                  CLR     BYPWRT
012736  005037  001342                  CLR     BYPTIM
012742  000005                  PRGSRT: RESET                   ;CLEAR ALL INT ENABLE & INIT
012744  012706  001100                  MOV     #STACK,SP       ;SETUP STACK POINTER
012750  012746  000000                  MOV     #PRO,-(SP)      ;PSW LOADED TO BE
012754  012746  012762                  MOV     #1$,-(SP)       ;LSI-11 COMPATABLE
012760  000002                          RTI                     ;ENABLE ALL INTERRUPTS

012762  004737  046322          1$:     JSR     PC,$TKINT       ;SETUP KB VECTOR ADDR, PRIORITY 4
                                                                ;& TURN ON KB INTERRUPT


                                ;*** CPU PRIORITY LEVEL NOW AT 0 ***
                                ;*** ANY DEVICE WHICH SETS ITS   ***
                                ;*** INTERRUPT ENABLE BIT WILL   ***
                                ;*** SERVICED.                   ***

                                ;CLOCK INTERRUPTS WILL CHANGE CPU PRIORITY TO LEVEL 6 (IN 'ST5')
                                ;RK06 CONTROLLER INTERRUPTS WILL CHANGE CPU PRIORITY TO LEVEL 5 IN 'SETINT')
                                ;KEYBOARD INTERRUPTS WILL CHANGE CPU PRIORITY TO LEVEL 4 (SEE ABOVE)

                                ;ALL 'SYSMAC' TRAPS WILL CHANGE CPU PRIORITY TO LEVEL 7 (SEE BELOW)

                                                        ;SYSMAC 'SETUP'
                                .SBTTL  INITIALIZE THE COMMON TAGS
                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
012766  012706  001100                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
```

```
3001  012772  005026                        CLR     (R6)+                   ;;CLEAR MEMORY LOCATION
3002  012774  022706  001140                CMP     #SWR,R6 ;;DONE?
3003  013000  001374                        BNE     .-6                     ;;LOOP BACK IF NO
3004  013002  012706  001100                MOV     #STACK,SP               ;;SETUP THE STACK POINTER
3005                                  ;;INITIALIZE A FEW VECTORS
3006  013006  012737  044430  000020        MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
3007  013014  012737  000340  000022        MOV     #340,@#IOTVEC+2 ;;LEVEL 7
3008  013022  012737  044710  000030        MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
3009  013030  012737  000340  000032        MOV     #340,@#EMTVEC+2 ;;LEVEL 7
3010  013036  012737  050540  000034        MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
3011  013044  012737  000340  000036        MOV     #340,@#TRAPVEC+2;LEVEL 7
3012  013052  012737  044164  000024        MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
3013  013060  012737  000340  000026        MOV     #340,@#PWRVEC+2 ;;LEVEL 7
3014  013066  013737  036116  036110        MOV     $ENDCT,$EOPCT           ;;SETUP END-OF-PROGRAM COUNTER
3015  013074  005037  001174                CLR     $TIMES                  ;;INITIALIZE NUMBER OF ITERATIONS
3016  013100  005037  001176                CLR     $ESCAPE                 ;;CLEAR THE ESCAPE ON ERROR ADDRESS
3017  013104  112737  000001  001115        MOVB    #1,$ERMAX               ;;ALLOW ONE ERROR PER TEST
3018  013112  012737  013112  001106        MOV     #.,$LPADR               ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
3019  013120  012737  013120  001110        MOV     #.,$LPERR               ;;SETUP THE ERROR LOOP ADDRESS
3020                                  ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
3021                                  ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
3022  013126  013746  000004                MOV     @#ERRVEC,-(SP)          ;;SAVE ERROR VECTOR
3023  013132  012737  013166  000004        MOV     #64$,@#ERRVEC           ;;SET UP ERROR VECTOR
3024  013140  012737  177570  001140        MOV     #DSWR,SWR               ;;SETUP FOR A HARDWARE SWICH REGISTER
3025  013146  012737  177570  001142        MOV     #DDISP,DISPLAY          ;;AND A HARDWARE DISPLAY REGISTER
3026  013154  022777  177777  165756        CMP     #-1,@SWR                ;;TRY TO REFERENCE HARDWARE SWR
3027  013162  001012                        BNE     66$                     ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
3028                                                                        ;;AND  THE HARDWARE SWR IS NOT = -1
3029  013164  000403                        BR      65$                     ;;BRANCH IF NO TIMEOUT
3030  013166  012716  013174        64$:    MOV     #65$,(SP)               ;;SET UP FOR TRAP RETURN
3031  013172  000002                        RTI
3032  013174  012737  000176  001140 65$:    MOV     #SWREG,SWR              ;;POINT TO SOFTWARE SWR
3033  013202  012737  000174  001142        MOV     #DISPREG,DISPLAY
3034  013210  012637  000004        66$:    MOV     (SP)+,@#ERRVEC          ;;RESTORE ERROR VECTOR
3035
3036  013214  005037  001216                CLR     $PASS                   ;;CLEAR PASS COUNT
3037  013220  132737  000200  001231        BITB    #APTSIZE,$ENVM          ;;TEST USER SIZE UNDER APT
3038  013226  001403                        BEQ     67$                     ;;YES,USE NON-APT SWITCH
3039  013230  012737  001232  001140        MOV     #$SWREG,SWR             ;;NO,USE APT SWITCH REGISTER
3040  013236                        67$:
3041  013236  012737  013302  000004 MEMPAR: MOV     #1$,ERRVEC              ;SETUP TIMEOUT VECTOR
3042  013244  012737  000340  000006        MOV     #PR7,ERRVEC+2
3043
3044  013252  012701  172100                MOV     #MEMBAS,R1              ;ADDR OF MEM CSR
3045  013256  005011                3$:     CLR     (R1)                    ;SEE IF CAN REFERENCE
3046  013260  012711  000001                MOV     #1,(R1)                 ;SET ENABLE BIT IF YES
3047  013264  012737  044066  000114        MOV     #MEMERR,MEMVEC          ;LOAD VECTOR IF NO TIMEOUT
3048  013272  012737  000340  000116        MOV     #PR7,MEMVEC+2
3049  013300  000401                        BR      2$
3050
3051  013302  022626                1$:     CMP     (SP)+,(SP)+             ;ADJ STACK
3052  013304  062701  000002        2$:     ADD     #2,R1                   ;TRY NEXT CSR
3053  013310  020127  172140                CMP     R1,#MEMBAS+40           ;SEE IF TRIED ALL
3054  013314  001360                        BNE     3$                      ;BR IF NO
3055  013316  012737  000006  000004        MOV     #ERRVEC+2,ERRVEC                ;RESTORE TRAP CATCHER
3056  013324  005037  000006                CLR     ERRVEC+2
```

```
3057
3058  013330  004737  036204          JSR     PC,CLRFLG       ;CLEAR DDUMP THRU SIZFLG
3059  013334  005037  001220          CLR     $DEVCT
3060  013340  005037  001222          CLR     $UNIT
3061
3062                                  ;
3063                                  ;FIND OUT IF XXDP, ACT, APT; CHAIN OR DUMP MODE
```

```
3064                                            ;
3065
3066   013344  005737  000042          START1: TST     42
3067   013350  001014                          BNE     1$                      ;BR IF AUTO
3068   013352  004737  036224                  JSR     PC,TITLE                ;MANUAL, TYPE PROG ID
3069   013356  123727  000041  000013          CMPB    41,#13                  ;13=LOADED BY XXDP
3070   013364  001010                          BNE     2$
3071   013366  005237  007500                  INC     DDUMP                   ;SET RK06 DUMP MODE FLAG
3072   013372  104401  051531                  TYPE    ,MSG2                   ;REPLACE DRO PACK W/SCRATCH & DO<CR>
3073   013376  000137  013412                  JMP     ST2
3074   013402  000137  013456          1$:     JMP     ST3
3075   013406  005237  007506          2$:     INC     PPTP                    ;SET ACT/APT/PTP DUMP MODE FLAG
3076
3077                                            ;
3078                                            ;CHECK IF ALL PARAMETERS DEFAULTED.  IF NOT, BEGIN INPUT DIALOGUE
3079                                            ;WITH OPERATOR.  THE REPLY TO 'DRIVES TO BE TESTED' SHOULD BE
```

```
3080                            ;DRIVE NOS.  SEPERATED BY COMMAS & TERMINATED BY <CR>
3081                            ;       EX:     DRIVES TO BE TESTED:  1,2,4<CR>
3082                            ;
3083
```

```
3084  013412  005737  001336        ST2:    TST     PARAM
3085  013416  001002                BNE     1$              ;BR IF 220 START
3086  013420  000137  013510        JMP     ST4             ;200 START, DEFAULT & SIZE THE BUSS
3087  013424  104401  051602        1$:     TYPE    ,MSG3           ;DRIVES TO BE TESTED
3088  013430  004737  036304                JSR     PC,GDRVS        ;GET DR NOS.
3089  013434  104401  051634                TYPE    ,MSG4           ;BUSS ADDR
3090  013440  004737  036444                JSR     PC,GBA          ;GET BA
3091  013444  104401  051701                TYPE    ,MSG5           ;CONT INT VECTOR
3092  013450  004737  036472                JSR     PC,GINT         ;GET INT VECTOR
3093  013454  000427                BR      ST5
3094
3095                                ;
3096                                ;AUTO MODE
3097                                ;CHECK IF LOADED BY XXDP OR OTHER.  SET FLAGS & NO INPUT DIALOGUE.
3098                                ;DEFAULT ALL PARAMETERS.  TEST ONLY THOSE DRIVES THAT ARE READY
3099                                ;ON THE BUSS
3100                                ;
3101
3102  013456  123727  000041  000013  ST3:    CMPB    41,#13          ;13=LOADED BY XXDP
3103  013464  001007                BNE     1$
3104  013466  005237  007502                INC     DDPCH           ;SET RK06 CHAIN MODE FLAG
3105  013472  004737  036224                JSR     PC,TITLE
3106  013476  104401  052016                TYPE    ,MSG7           ;DRO NOT TSTD
3107  013502  000402                BR      ST4
3108  013504  005237  007504        1$:     INC     ACT11           ;SET ACT AUTO FLAG.
3109
3110  013510  012737  177440  001264  ST4:    MOV     #177440,$BASE   ;DEFAULT VALUE
3111  013516  012737  000210  001314        MOV     #210,RKVEC      ;DEFAULT VALUE
3112  013524  004737  036524                JSR     PC,SETINT
3113  013530  005237  007540                INC     SIZFLG          ;DO "SIZE THE BUSS" TEST
3114
3115  013534  005037  007352        ST5:    CLR     UNLD            ;INITIALIZE FLAGS
3116  013540  005037  007354                CLR     BADHDR                  ;USED IN 'STOP ROUTINE
3117  013544  005037  007356                CLR     HPEND                   ;FOR VALID PROGRAM HALTS
3118  013550  012737  007512  001346        MOV     #DRIV0,DRVPTR   ;SETUP
3119  013556  005037  001220                CLR     $DEVCT          ;NO. OF DRVS DONE
3120  013562  005037  001222                CLR     $UNIT           ;CURRENT DRV UNDER TEST
3121  013566  012737  013634  000004        MOV     #1$,ERRVEC      ;SETUP TIMEOUT ERROR VECTOR
3122  013574  005777  165526                TST     @LKS            ;SEE IF L-CLOCK THERE
3123  013600  005237  007532                INC     LCLKF           ;PRESENT, SET FLAG.
3124  013604  013700  001330                MOV     LCVEC,R0        ;VECTOR ADDR
3125  013610  012737  013676  000004        MOV     #2$,ERRVEC
3126  013616  005777  165476                TST     @PKS            ;SEE IF P-CLOCK THERE
3127  013622  005237  007534                INC     PCLKF           ;PRESENT, SET FLAG
3128  013626  013700  001332                MOV     PCVEC,R0        ;VECTOR ADDR
3129  013632  000412                BR      3$
3130
3131  013634  022626                1$:     CMP     (SP)+,(SP)+     ;L-CLOCK NOT THERE, CLEAR STACK
3132  013636  012737  013702  000004        MOV     #4$,ERRVEC
3133  013644  005777  165450                TST     @PKS            ;SEE IF P-CLOCK THERE
3134  013650  005237  007534                INC     PCLKF           ;PRESENT, SET FLAG
3135  013654  013700  001332                MOV     PCVEC,R0        ;VECTOR ADDR
3136  013660  005237  007536        3$:     INC     DOTIM           ;INDICATES TIMING TESTS CAN BE DONE
3137  013664  012720  043276                MOV     #CLOCK,(R0)+    ;SERVICE ROUTINE FOR CLOCKS
3138  013670  012710  000300                MOV     #PR6,(R0)
3139  013674  000407                BR      TST1            ;;GO TO NEXT TEST
```

```
3140
3141  013676  022626                  2$:     CMP     (SP)+,(SP)+     ;P-CLOCK NOT THERE, CLEAR STACK
3142  013700  000767                          BR      3$
3143
3144  013702  022626                  4$:     CMP     (SP)+,(SP)+     ;NEITHER CLOCK THERE, CLEAR STACK
3145  013704  005037  007536                  CLR     DOTIM           ;TIMING TESTS CANNOT BE DONE.
3146  013710  104401  052212                  TYPE    ,MSG13          ;ALL TIMING TESTS BYPASSED
3147
3148
```

```
                                .SBTTL BASIC CONTROLLER TESTS, SIZING & SETUP

                                ;;*****************************************************************
                                ;*TEST 1         REFERENCE ALL CONTROLLER REGISTERS
                                ;*
                                ;*       THIS TEST VERIFIES THAT ALL THE CONTROLLER REGISTERS
                                ;*       CAN BE ACCESSED.  THE INABILITY  TO BE ACCESSED WILL
                                ;*       RESULT IN A TIMEOUT TRAP WITH  AN ERROR MESSAGE.  ANY
                                ;*       ERROR IN THIS TEST WILL RESULT IN ABORTING ALL OTHER
                                ;*       TESTS AND JUMPING TO  'END OF PASS'
                                ;*
                                ;;*****************************************************************
013714  000004                  TST1:   SCOPE
013716  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
013724  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
013730  012746  000000                  MOV     #PR0,-(SP)      ;RESET PSW TO PRIORITY 0
013734  012746  013742                  MOV     #5$,-(SP)       ;& MAKE IT LSI COMPATABLE
013740  000002                          RTI
013742                          5$:
013742  012737  014060  000004          MOV     #1$,ERRVEC      ;SETUP TIMOUT ERROR VECTOR
013750  013705  001264                  MOV     $BASE,R5        ;SETUP INDEX REG.
013754  005765  000000                  TST     RKCS1(R5)       ;REFERENCE ALL THE
013760  005765  000010                  TST     RKCS2(R5)       ;CONTROLLER REGISTERS
013764  005765  000002                  TST     RKWC(R5)
013770  005765  000004                  TST     RKBA(R5)
013774  005765  000006                  TST     RKDA(R5)
014000  005765  000012                  TST     RKDS(R5)        ;TIMEOUTS IN THIS SECTION
014004  005765  000014                  TST     RKER(R5)        ;INDICATE THAT THE CONTROLLER
014010  005765  000016                  TST     RKASOF(R5)      ;REGISTERS CANNOT BE READ.
014014  005765  000020                  TST     RKDC(R5)        ;TESTING SHOULD NOT PROCEED
014020  005765  000024                  TST     RKDB(R5)        ;UNTIL THIS IS REMEDIED.
014024  005765  000026                  TST     RKMR1(R5)
014030  005765  000034                  TST     RKMR2(R5)
014034  005765  000036                  TST     RKMR3(R5)
014040  005765  000030                  TST     RKECPS(R5)
014044  005765  000032                  TST     RKECPT(R5)
014050  012737  044000  000004          MOV     #BADTMO,ERRVEC  ;SETUP TIMEOUT HANDLER
014056  000404                          BR      TST2            ;;GO TO NEXT TEST
014060  022626                  1$:     CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
014062  104007                          ERROR   7               ;ABORT-COULD NOT REFERENCE CONTROLLER REGISTER
014064  000137  036062                  JMP     SETUP1

                                ;;*****************************************************************
                                ;*TEST 2         SIZE THE BUSS
                                ;*
                                ;*       THIS TEST IS ENTERED ONLY IF 'DRIVE SELECTION' IS DEFAULTED
                                ;*       EITHER BY RUNNING IN THE AUTO MODE OR A 200 START IN THE
                                ;*       MANUAL MODE.
                                ;*       EVERY DRIVE FROM 0 THRU 7 IS ADDRESSED.
                                ;*       CONTROLLER ERROR (CERR) IS EXAMINED AND IF NOT SET, THE
                                ;*       DRIVE WILL BE TESTED.  IF SET, THE PROGRAM WILL BYPASS
```

```
                                ;*      TESTING THAT DRIVE ONLY IF THE ERROR WAS A RESULT OF
                                ;*      MDS, UFE OR NED BEING SET; OR BOTH NED & DRA RESET IN-
                                ;*      DICATING THE OTHER PORT IS ACCESSED.
                                ;*
                                ;;*****************************************************************
014070  000004                TST2:   SCOPE
014072  012737  000001  001174        MOV     #1,$TIMES       ;;DO 1 ITERATION
014100  012706  001100                MOV     #STACK,SP       ;RESTORE STK PTR

014104  005237  001532                INC     BYPCERR         ;DO NOT TEST CERR IN 'FRDY'


014110  132737  000200  001231        BITB    #BIT7,$ENVM     ;SEE IF USE APT SELECTED DRIVES
014116  001002                        BNE     14$             ;BR IF YES
014120  000137  014234                JMP     12$             ;ELSE DO NORM SIZING OR VERIFY

014124  104401  052125        14$:    TYPE    ,MSG10          ;WILL TEST DRIVES
014130  005037  007510                CLR     DRIVS           ;# OF DRIVES PRESENT
014134  005000                        CLR     R0              ;DRV ADDR
014136  012701  007512                MOV     #DRIV0,R1       ;DRV FLAG
014142  013702  001266                MOV     $DEVM,R2        ;APT DEVICE MAP

014146  032702  000001        15$:    BIT     #BIT0,R2        ;SEE IF DRV IN DEVICE MAP
014152  001410                        BEQ     16$             ;BR IF NO
014154  005237  007510                INC     DRIVS           ;ELSE INCR DRIVE COUNT
014160  005211                        INC     (R1)            ;& SET DRIVE PRESENT FLAG
014162  104401  001205                TYPE    ,$CRLF
014166  010046                        MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
                                                                ;;TYPE DRIVE #
014170  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
014172     001                        .BYTE   1               ;;TYPE 1 DIGIT(S)
014173     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS

014174  005721                16$:    TST     (R1)+           ;ADV POINTER TO NEXT FLAG
014176  005200                        INC     R0              ;INC DRIVE #
014200  022700  000010                CMP     #8.,R0          ;ALL 8 TESTED?
014204  001402                        BEQ     17$             ;BR IF YES

014206  006002                        ROR     R2              ;ELSE GET NEXT BIT OFF DEVICE MAP
014210  000756                        BR      15$             ;& TRY AGAIN

014212  005737  007510        17$:    TST     DRIVS           ;SEE IF MORE DRIVES PRESENT
014216  001402                        BEQ     18$             ;BR IF NO
014220  000137  015154                JMP     NUDRV           ;ELSE EXIT TEST

014224  104075                18$:    ERROR   75              ;NO DRIVES FOUND IN $DEVM
014226  000000                        HALT                    ;SETUP CORRECTLY & PRESS 'CONTINUE'
014230  000137  013534                JMP     ST5             ;TO TRY AGAIN

014234  012765  000040  000010  12$:    MOV     #SCLR,RKCS2(R5) ;SUBSYSTEM CLEAR
014242  013737  001412  007426        MOV     T10,TEMP1       ;SET TIMEOUT
014250  004737  036542                JSR     PC,FRDY         ;FIND RDY
014254  104120                        ERROR   120             ;RDY NOT SET BY END OF SCLR
014256  005737  007540                TST     SIZFLG
014262  001562                        BEQ     TST3            ;;DO NOT SIZE, GOTO NEXT TEST
014264  104401  052125                TYPE    ,MSG10          ;WILL TEST DRIVES
```

```
3261  014270  005037  007510          CLR     DRIVS           ;# OF DRIVES PRESENT
3262  014274  005000                  CLR     R0              ;DRV ADDR
3263  014276  012701  007512          MOV     #DRIV0,R1       ;DRV FLAG
3264  014302                  1$:
3265  014302  104415                  SCOP1
3266  014304  012706  001100          MOV     #STACK,SP       ;RESTORE STK PTR
3267
3268  014310  012765  000040  000010  MOV     #SCLR,RKCS2(R5) ;SUBSYSTEM CLEAR
3269  014316  013737  001412  007426  MOV     T10,TEMP1       ;SET TIMEOUT
3270  014324  004737  036542          JSR     PC,FRDY         ;FIND RDY
3271  014330  104120                  ERROR   120             ;RDY NOT SET BY END OF SCLR
3272  014332  010065  000010          MOV     R0,RKCS2(R5)    ;SELECT THE DRIVE ADDR
3273  014336  012765  000001  000000  MOV     #SELDRV,RKCS1(R5) ;SELECT DRIVE CMD
3274  014344  013737  001412  007426  MOV     T10,TEMP1
3275  014352  004737  036542          JSR     PC,FRDY         ;FIND RDY
3276  014356  104117                  ERROR   117             ;NO RDY AFTER SELECT DRIVE CMD.
3277  014360  032737  100000  007370  BIT     #CERR,HCS1
3278  014366  001046                  BNE     2$
3279  014370  013737  007416  007426  MOV     HMR2,TEMP1
3280  014376  042737  177770  007426  BIC     #^C<DRVMSK>,TEMP1
3281  014404  020037  007426          CMP     R0,TEMP1        ;S/B SAME
3282  014410  001016                  BNE     3$
3283  014412  005700                  TST     R0
3284  014414  001003                  BNE     4$
3285  014416  005737  007502          TST     DDPCH           ;SEE IF XXDP CHAIN MODE
3286  014422  001014                  BNE     5$
3287  014424  005237  007510  4$:     INC     DRIVS           ;INC DRIVE COUNT.
3288  014430  005211                  INC     (R1)            ;SET DRIVE PRESENT FLAG
3289  014432  104401  001205          TYPE    ,$CRLF
3290  014436  010046                  MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
3291                                  ;;TYPE DR #
3292  014440  104403                  TYPOS                   ;;GO TYPE--OCTAL ASCII
3293  014442     001                  .BYTE   1               ;;TYPE 1 DIGIT(S)
3294  014443     000                  .BYTE   0               ;;SUPPRESS LEADING ZEROS
3295  014444  000403                  BR      5$
3296
3297  014446  004737  037250  3$:     JSR     PC,BYP          ;TYPE BYPASS DR #
3298  014452  104001                  ERROR   1               ;WRITTEN DR # DOES NOT MATCH RKMR2 DR #
3299
3300  014454  005721          5$:     TST     (R1)+           ;SHIFT PTR TO NEXT DR. FLAG
3301  014456  005200                  INC     R0              ;INC DR #
3302  014460  022700  000010          CMP     #8.,R0
3303  014464  001306                  BNE     1$              ;MORE LEFT.
3304  014466  005737  007510          TST     DRIVS
3305  014472  001054                  BNE     10$
3306  014474  104076                  ERROR   76              ;NO DRIVES FOUND ON BUSS
3307  014476  000000                  HALT                    ;SETUP CORRECTLY
3308  014500  000137  013534          JMP     ST5             ;AND PRESS 'CONTINUE'
3309
3310  014504  032737  001000  007372  2$:     BIT     #MDS,HCS2
3311  014512  001015                  BNE     6$
3312  014514  032737  000400  007372          BIT     #UFE,HCS2
3313  014522  001015                  BNE     7$
3314  014524  032737  000001  007402          BIT     #DRA,HDS
3315  014532  001015                  BNE     8$
3316  014534  032737  010000  007372          BIT     #NED,HCS2
```

```
3317  014542  001424                        BEQ     9$
3318  014544  000743                        BR      5$
3319
3320  014546  004737  037250          6$:   JSR     PC,BYP          ;TYPE BYP DR #
3321  014552  104002                        ERROR   2               ;MDS DETECTED
3322  014554  000737                        BR      5$
3323
3324  014556  004737  037250          7$:   JSR     PC,BYP
3325  014562  104003                        ERROR   3               ;UFE DETECTED
3326  014564  000733                        BR      5$
3327
3328  014566  032737  010000  007372  8$:   BIT     #NED,HCS2
3329  014574  001713                        BEQ     4$
3330  014576  104401  052323                TYPE    ,MSG15          ;DRV#
3331  014602  010046                        MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
3332                                                                ;;TYPE DR#
3333  014604  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
3334  014606     001                        .BYTE   1               ;;TYPE 1 DIGIT(S)
3335  014607     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
3336  014610  104010                        ERROR   10              ;DRA & NED BOTH SET
3337  014612  000720                        BR      5$
3338
3339  014614  004737  037250          9$:   JSR     PC,BYP
3340  014620  104004                        ERROR   4               ;NO DRA & NO NED = OTHER PORT SELECTED
3341  014622  000714                        BR      5$
3342  014624  000137  015154          10$:  JMP     NUDRV
3343
3344                                ;;**************************************************************
3345                                ;*TEST 3        VERIFY OPERATOR DRIVE SELECTIONS
3346                                ;*
3347                                ;*      THIS TEST IS ENTERED ONLY IF DRIVE SELECTION IS NOT
3348                                ;*      DEFAULTED.  EVERY DRIVE FROM 0 TO 7 IS ADDRESSED &
3349                                ;*      CONTROLLER ERROR (CERR) IS EXAMINED. IF NOT SET, THE
3350                                ;*      PROGRAM WILL ASSUME THE DRIVE IS PRESENT.  IT WILL THEN CHECK
3351                                ;*      TO SEE THAT THE DRIVE WAS INPUTTED FOR TESTING.  IF NOT, IT WILL
3352                                ;*      BE AN ERROR.  IF CERR WAS SET, THAT DRIVE WILL BE BYPASSED
3353                                ;*      ONLY IF THE ERROR WAS A RESULT OF MDS OR UFE SET OR BOTH
3354                                ;*      NED & DRA RESET (WRONG PORT).  IF CERR IS  A RESULT OF
3355                                ;*      NED ONLY, IT IS CHECKED AGAINT THE INPUTTED INFOR TO
3356                                ;*      VERIFY IT WAS NOT SPECIFIED.
3357                                ;*
3358                                ;;**************************************************************
3359  014630  000004                TST3:   SCOPE
3360  014632  012737  000001  001174        MOV     #1,$TIMES       ;;DO 1 ITERATION
3361  014640  012706  001100                MOV     #STACK,SP       ;RESTORE STK PTR
3362  014644  005000                        CLR     R0              ;DRIVE ADDR
3363  014646  012701  007512                MOV     #DRIV0,R1       ;DRIVE FLAG
3364  014652                        1$:
3365  014652  104415                        SCOP1
3366  014654  012706  001100                MOV     #STACK,SP       ;RESTORE STK PTR
3367
3368  014660  012765  000040  000010        MOV     #SCLR,RKCS2(R5) ;SUBSYSTEM CLEAR
3369  014666  013737  001412  007426        MOV     T10,TEMP1       ;SET TIME OUT
3370  014674  004737  036542                JSR     PC,FRDY         ;FIND RDY
3371  014700  104120                        ERROR   120             ;NO RDY AFTER SCLR
3372  014702  010065  000010                MOV     R0,RKCS2(R5)    ;DRV ADDR
```

```
3373  014706  012765  000001  000000          MOV     #SELDRV,RKCS1(R5) ;SELECT DRIVE CMD
3374  014714  013737  001412  007426          MOV     T10,TEMP1
3375  014722  004737  036542                  JSR     PC,FRDY           ;FIND RDY
3376  014726  104117                          ERROR   117               ;NO RDY AFTER SELECT DRIVE CMD.
3377  014730  032737  100000  007370          BIT     #CERR,HCS1
3378  014736  001036                          BNE     2$
3379  014740  013737  007416  007426          MOV     HMR2,TEMP1
3380  014746  042737  177770  007426          BIC     #^C<DRVMSK>,TEMP1
3381  014754  020037  007426                  CMP     R0,TEMP1          ;S/B SAME
3382  014760  001010                          BNE     3$
3383  014762  005711                  11$:    TST     (R1)
3384  014764  001417                          BEQ     5$
3385  014766  005721                  4$:     TST     (R1)+             ;SHIFT PTR TO NEXT DR FLAG
3386  014770  005200                          INC     R0                ;INC DR#
3387  014772  022700  000010                  CMP     #8.,R0
3388  014776  001325                          BNE     1$                ;MORE LEFT
3389  015000  000467                          BR      TST4              ;;GO TO NEXT TEST
3390
3391  015002  004737  037250          3$:     JSR     PC,BYP            ;TRY BYPASS DRIVE#
3392  015006  104001                          ERROR   1                 ;WRITTEN DR# DOES NOT MATCH RKMR2 DR#
3393  015010  005711                          TST     (R1)
3394  015012  001765                          BEQ     4$                ;BRANCH IF NOT SPEC BY INPUT
3395  015014  005337  007510          12$:    DEC     DRIVS             ;DECREMENT TOTAL DRIVS
3396  015020  005011                          CLR     (R1)              ;CLEAR DRIVE FLAG
3397  015022  000761                          BR      4$
3398
3399  015024  004737  037250          5$:     JSR     PC,BYP
3400  015030  104005                          ERROR   5                 ;DR PRESENT BUT NOT SPECIFIED BY OPERATOR
3401  015032  000755                          BR      4$
3402
3403  015034  032737  001000  007372  2$:     BIT     #MDS,HCS2
3404  015042  001027                          BNE     6$
3405  015044  032737  000400  007372          BIT     #UFE,HCS2
3406  015052  001027                          BNE     7$
3407  015054  032737  000001  007402          BIT     #DRA,HDS
3408  015062  001005                          BNE     8$
3409  015064  032737  010000  007372          BIT     #NED,HCS2
3410  015072  001423                          BEQ     9$
3411  015074  000404                          BR      10$
3412  015076  032737  010000  007372  8$:     BIT     #NED,HCS2
3413  015104  001726                          BEQ     11$
3414  015106  005711                  10$:    TST     (R1)
3415  015110  001726                          BEQ     4$
3416
3417  015112  004737  037250                  JSR     PC,BYP            ;TYPE BYPASS DRIVE#
3418  015116  104006                          ERROR   6
3419  015120  000735                          BR      12$
3420
3421  015122  004737  037250          6$:     JSR     PC,BYP            ;TYPE BYPASS DRIVE#
3422  015126  104002                          ERROR   2                 ;MDS DETECTED
3423  015130  000762                          BR      8$
3424
3425  015132  004737  037250          7$:     JSR     PC,BYP
3426  015136  104003                          ERROR   3                 ;UFE DETECTED
3427  015140  000756                          BR      8$
3428
```

```
3429  015142  004737  037250          9$:     JSR     PC,BYP
3430  015146  104004                          ERROR   4               ;DRA & NED RESET - OTHER PORT SELECTED
3431  015150  000752                          BR      8$
3432
3433  015152  001237                          BNE     1$              ;BRANCH IF MORE LEFT.
3434
3435
3436                                          ;
3437                                          ;THIS PART OF THE PROGRAM WILL BE REPEATED FOR EACH
3438                                          ;DRIVE PRESENT
3439                                          ;
3440                                          ;'$UNIT' CONTAINS THE ADDRESS OF THE DRIVE CURRENTLY
3441                                          ;UNDER TEST
3442
3443  015154  005037  001532          NUDRV:  CLR     BYPCERR         ;ENTER HERE FROM LAST TEST
3444                                                                  ;ALLOW CHECKING CERR IN 'FRDY'
3445
3446                                  ;;**************************************************************
3447                                  ;*TEST 4        FIND NEXT DRIVE TO BE TESTED
3448                                  ;*
3449                                  ;*      THIS TEST FINDS THE NEXT DRIVE PRESENT & PUTS THAT
3450                                  ;*      ADDRESS IN '$UNIT'.
3451                                  ;*      THROUGHOUT THE FOLLOWING TESTS, THE DRIVE TESTED IS
3452                                  ;*      THE DRIVE WHOSE ADDRESS IS IN '$UNIT'.
3453                                  ;*
3454                                  ;;**************************************************************
3455  015160  000004                  TST4:   SCOPE
3456  015162  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
3457  015170  012706  001100                  MOV     #$TACK,SP       ;RESTORE STK PTR
3458  015174  012737  000004  001214          MOV     #$TN-1,$TESTN
3459  015202  012737  000004  001102          MOV     #$TN-1,$TSTNM
3460
3461  015210  005737  007510                  TST     DRIVS           ;ANY DRIVES PRESENT?
3462  015214  001004                          BNE     4$              ;YES BRANCH
3463  015216  104401  053237                  TYPE    ,MSG27          ;ALL DRIVES TESTED
3464  015222  000137  036062                  JMP     $EOP1           ;NO, GO TO END
3465
3466  015226  013701  001346          4$:     MOV     DRVPTR,R1       ;ADDR OF NEXT DRIVE FLAG
3467  015232  005737  001220                  TST     $DEVCT          ;IS FIRST DRIVE BEING CHECKED
3468  015236  001402                          BEQ     2$              ;YES, BRANCH
3469  015240  005237  001222          1$:     INC     $UNIT           ;INCR DRIVE ADDR TO NEXT DRIVE
3470  015244  005721                  2$:     TST     (R1)+           ;IS DRIVE PRESENT?
3471  015246  001774                          BEQ     1$              ;NO,FIND NEXT DRIVE PRESENT
3472  015250  005737  007502                  TST     DDPCH           ;DDP CHAIN MODE?
3473  015254  001403                          BEQ     3$              ;NO, BRANCH
3474  015256  005737  001222                  TST     $UNIT           ;YES, IS IT DRIVE 0?
3475  015262  001766                          BEQ     1$              ;IF YES, DON'T TEST DR 0
3476  015264  010137  001346          3$:     MOV     R1,DRVPTR       ;STORE POINTER TO THE NEXT DR. FLAG
3477  015270  104401  052323                  TYPE    ,MSG15          ;"DRIVE"
3478  015274  013700  001222                  MOV     $UNIT,R0
3479  015300  010046                          MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
3480                                                                  ;;DRIVE #
3481  015302  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
3482  015304     001                          .BYTE   1               ;;TYPE 1 DIGIT(S)
3483  015305     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
3484
```

```
 3485  015306  104401  001205                TYPE    ,$CRLF
 3486
 3487  015312                            PFSRT:                          ;ENTER HERE FOR POWER FAIL RESTART
 3488                                      ;;*****************************************************************
 3489                                      ;*TEST 5        PRINT DRIVE SERIAL NUMBER
 3490                                      ;*
 3491                                      ;*      THIS TEST READS & PRINTS THE DRIVE SERIAL # FROM MSG A, WORD 11
 3492                                      ;*      IN BCD & IS PERFORMED ON THE 1ST PASS ONLY
 3493                                      ;*
 3494                                      ;;*****************************************************************
 3495  015312  000004                     TST5:   SCOPE
 3496  015314  012737  000001  001174             MOV     #1,$TIMES       ;;DO 1 ITERATION
 3497  015322  012706  001100                     MOV     #STACK,SP       ;RESTORE STK PTR
 3498
 3499  015326  005737  001216                     TST     $PASS
 3500  015332  001046                             BNE     TST6            ;;GO TO NEXT IF NOT FIRST PASS
 3501  015334  004737  040452                     JSR     PC,SUBCLR       ;DO SUBSYS CLEAR
 3502  015340  104024                             ERROR   24              ;CERR AFTER SCLR
 3503
 3504  015342  104401  052335                     TYPE    ,MSG16          ;DRIVE SERIAL NO.
 3505  015346  012765  000003  000026             MOV     #3,RKMR1(R5)    ;SELECT BYTE 3
 3506  015354  004737  040100                     JSR     PC,GSTAT        ;GET STATUS
 3507  015360  013701  007416                     MOV     HMR2,R1         ;GET SERIAL #
 3508  015364  012704  050024                     MOV     #$OCTVL,R4      ;GET ADDR CHAR BUFF
 3509  015370  010446                             MOV     R4,-(SP)        ;STORE ON STACK FOR $SUPRS
 3510  015372  012703  000003                     MOV     #3,R3           ;SETUP CHAR COOUNT
 3511  015376  006101                             ROL     R1              ;INITIALIZE BIT POSITIONS
 3512  015400  006101                             ROL     R1
 3513  015402  006101                     1$:     ROL     R1              ;GET NEXT 4 BITS
 3514  015404  006101                             ROL     R1
 3515  015406  006101                             ROL     R1
 3516  015410  006101                             ROL     R1
 3517  015412  010100                             MOV     R1,R0           ;GET WORKING COPY
 3518  015414  042700  177760                     BIC     #177760,R0      ;CLEAR ALL BUT LOW 4 BITS
 3519  015420  052700  000060                     BIS     #60,R0          ;CONVERT TO ASCII DIGIT
 3520  015424  110024                             MOVB    R0,(R4)+        ;PUT ASCII DIGIT INTO CHAR BUFF
 3521  015426  005303                             DEC     R3
 3522  015430  001364                             BNE     1$              ;BR IF ALL 3 CHARS NOT DONE
 3523  015432  105014                             CLRB    (R4)            ;ELSE INSERT NULL TERMINATOR
 3524
 3525  015434  004737  050272                     JSR     PC,$SUPRS       ;TYPE
 3526  015440  104401  001205                     TYPE    ,$CRLF
 3527  015444  104401  001205                     TYPE    ,$CRLF
 3528
 3529                                      ;;*****************************************************************
 3530                                      ;*TEST 6        SET VV WITH PACK COMMAND
 3531                                      ;*
 3532                                      ;*      IF VV IS RESET, THE PACK COMMAND IS USED TO SET IT.
 3533                                      ;*
 3534                                      ;;*****************************************************************
 3535  015450  000004                     TST6:   SCOPE
 3536  015452  012737  000001  001174             MOV     #1,$TIMES       ;;DO 1 ITERATION
 3537  015460  012706  001100                     MOV     #STACK,SP       ;RESTORE STK PTR
 3538
 3539  015464  004737  040452                     JSR     PC,SUBCLR
 3540  015470  104024                             ERROR   24              ;CERR AFTER SCLR
```

```
                                                BIT     #D.VV,HMR2
                                                BNE     TST7            ;;GO TO NEXT TEST IF VV SET

                                                SCOP1
                                                MOV     #STACK,SP       ;RESTORE STK PTR

                                                JSR     PC,SUBCLR
                                                ERROR   24              ;CERR AFTER SCLR

                                                MOV     #PACK,RKCS1(R5) ;CMD TO SET VV
                                                MOV     #10,TEMP1
                                                JSR     PC,FRDY         ;FIND RDY
                                                ERROR   116             ;RDY NOT SET AFTER PACK CMD

                                                BIT     #D.VV,HMR2
                                                BNE     TST7            ;;GO TO NEXT TEST IF VV NOW SET
                                                ERROR   27              ;PACK DID NOT SET V.V.


;;*****************************************************************
;*TEST 7         READ & SAVE BAD SECTOR INFO & TYPE PACK SERIAL #
;*
;*      THIS TEST VERIFIES THAT CYL 410. TRACK 2 CAN BE READ.
;*      THIS AREA CONTAINS BAD SECTOR INFO WHICH IS WRITTEN BY THE
;*      FACTORY DURING MANF.  ALL BAD SECTOR INFO (BSE) WILL BE STORED
;*      AT THIS TIME TO MASK FUTURE READ HEADER OR DATA ERROR PRINTOUTS.
;*
;*      SECTORS 0,2,4,6,8 CONTAIN IDENTICAL INFO FOR 22 SECTOR HARDWARE DETECTED BAD SEC
;*      SECTORS 10,12,14,16,18,20 CONTAIN IDENTICAL INFO FOR 22 SECTOR SOFTWARE DETECTED
;*
;*      SECTORS 1,3,5,7,9 CONTAIN IDENTICAL INFO FOR 20 SECTOR HARDWARE DETECTED BAD SEC
;*      SECTORS 11,13,15,17,19,21 CONTAIN IDENTICAL INFO FOR 20 SECTOR SOFTWARE DETECTED
;*
;*      IF BSE INFO CANNOT BE READ, OR IF AFTER READING THE BSE INFO
;*      IT IS DETERMINED THAT AN ALIGNMENT CARTRIDGE IS USED,
;*      A MESSAGE WILL BE TYPED INDICATING THAT ALL
;*      FUTURE FORMAT AND READ-WRITE TESTS WILL BE BYPASSED.
;*      THIS IS DONE SO AS NOT TO DESTROY BSE INFO OR AN ALIGNMENT PACK BY WRITING
;*
;*      THE PACK SERIAL # IS TYPED IN OCTAL & FOR THE FIRST PASS ONLY.
;*
;;*****************************************************************
TST7:   SCOPE
                                                MOV     #1,$TIMES       ;;DO 1 ITERATION
                                                MOV     #STACK,SP       ;RESTORE STK PTR

                                                JSR     PC,SUBCLR
                                                ERROR   24              ;CERR AFTER SCLR


                                                MOV     #CCLR,RKCS1(R5)
                                                MOV     $UNIT,RKCS2(R5)
                                                MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
                                                                        ;RESET CYL DIFF/OFFSET & CYL ADDR REG
```

```
3597
3598  015616  013737  001412  007426          MOV     T10,TEMP1       ;IN RKMR2 & RKMR3 RESP.
3599  015624  004737  036542                  JSR     PC,FRDY         ;SETUP TIMEOUT
3600  015630  104124                          ERROR   124             ;FIND RDY
3601                                                                  ;RDY NOT SET AFTER RECAL CMD
3602  015632  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3603  015640  004737  040100                  JSR     PC,GSTAT
3604  015644  032737  020000  007416          BIT     #D.RTZ,HMR2
3605  015652  001001                          BNE     64$
3606  015654  104244                          ERROR   244             ;RTZ NOT SET DURING RECAL CMD
3607  015656  013737  001412  007430  64$:    MOV     T10,TEMP2       ;SETUP TIMEOUT
3608  015664  004737  037056                  JSR     PC,FATT1        ;FIND ATTN
3609  015670  104055                          ERROR   55              ;NO ATTN AFTER RECAL CMD
3610
3611  015672  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
3612  015700  013765  001222  000010          MOV     SUNIT,RKCS2(R5) ;DRIVE#
3613  015706  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
3614  015714  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
3615  015722  004737  036542                  JSR     PC,FRDY         ;FIND RDY
3616  015726  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
3617  015730  004737  037024                  JSR     PC,TSTATN       ;TEST FOR ATTN
3618  015734  000401                          BR      65$
3619  015736  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
3620  015740                          65$:
3621
3622
3623
3624  015740  004737  040452                  JSR     PC,SUBCLR
3625  015744  104024                          ERROR   24              ;CERR AFTER SCLR
3626
3627  015746  005037  007430                  CLR     TEMP2           ;SECTOR CTR
3628  015752  005037  007432                  CLR     TEMP3           ;0=22 SECTOR HARDWARE DETECTED TABLE
3629                                                                  ;1=22 SECTOR SOFTWARE DETECTED TABLE
3630                                                                  ;2=20 SECTOR HARDWARE DETECTED TABLE
3631                                                                  ;3=20 SECTOR SOFTWARE DETECTED TABLE
3632  015756  012737  003352  007434          MOV     #BSE22H,TEMP4   ;STORE 22 SECTOR HARDWARE BSE ADDR.
3633  015764  013765  007434  000004          MOV     TEMP4,RKBA(R5)
3634  015772  012737  001000  007436          MOV     #1000,TEMP5     ;TRACK 2, SECTOR 0
3635  016000  013765  007436  000006          MOV     TEMP5,RKDA(R5)
3636
3637  016006  012765  000632  000020  1$:     MOV     #410.,RKDC(R5)  ;CYL 410
3638  016014  012765  177400  000002          MOV     #-256.,RKWC(R5) ;LOAD WORD CT
3639  016022  012765  000021  000000          MOV     #RDDATA,RKCS1(R5);READ DATA COMMAND
3640  016030  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP TIMEOUT
3641  016036  004737  036542                  JSR     PC,FRDY         ;FIND RDY
3642  016042  104226                          ERROR   226             ;NO RDY AFTER READ DATA CMD
3643  016044  004737  040100                  JSR     PC,GSTAT        ;GET FRESH DATA
3644  016050  032737  100000  007370          BIT     #CERR,HCS1
3645  016056  001504                          BEQ     8$
3646  016060  104227                          ERROR   227             ;CERR AFTER READ DATA CMD
3647
3648  016062  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
3649  016070  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
3650  016074  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
3651  016102  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
3652  016110  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
```

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3653  016114  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
3654  016122  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
3655
3656  016130  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
3657  016134  000000                          .WORD   0!0!0           ;& MSGS SPECIFIED HERE
3658  016136  104054                          ERROR   54              ;MSG A0 ERROR AFTER READ DATA CMD
3659  016140  104026                          ERROR   26              ;MSH B0 ERROR
3660  016142  104056                          ERROR   56              ;MSG A1 ERROR
3661  016144  104030                          ERROR   30              ;MSG B1 ERROR
3662
3663  016146  004737  040452                  JSR     PC,SUBCLR
3664  016152  104024                          ERROR   24              ;CERR AFTER SUBCLR
3665
3666  016154  005237  007430                  INC     TEMP2
3667  016160  023727  007430  000005          CMP     TEMP2,#5        ;READ ALL 5 SECTORS?
3668  016166  001023                          BNE     5$
3669  016170  005737  007432                  TST     TEMP3
3670  016174  001002                          BNE     2$
3671  016176  104233                          ERROR   233             ;CANT READ SECTORS 0,2,4,6,8
3672  016200  000430                          BR      3$
3673
3674  016202  023727  007432  000001  2$:     CMP     TEMP3,#1
3675  016210  001002                          BNE     4$
3676  016212  104230                          ERROR   230             ;CANT READ SECTORS 10,12...
3677  016214  000422                          BR      3$
3678
3679  016216  023727  007432  000002  4$:     CMP     TEMP3,#2
3680  016224  001002                          BNE     6$
3681  016226  104234                          ERROR   234             ;CANT READ SECTORS 1,3,5 ...
3682  016230  000414                          BR      3$
3683
3684  016232  104231                  6$:     ERROR   231             ;CANT READ SECTORS 11,13,15 ...
3685  016234  000412                          BR      3$
3686
3687  016236  013765  007434  000004  5$:     MOV     TEMP4,RKBA(R5)  ;RESTORE TABLE ADDR
3688  016244  062737  000002  007436          ADD     #2,TEMP5        ;READ 2 SECTORS FROM LAST
3689  016252  013765  007436  000006          MOV     TEMP5,RKDA(R5)
3690  016260  000652                          BR      1$
3691
3692  016262  005237  001526          3$:     INC     BSERR           ;SET BSE FLAG
3693  016266  000553                          BR      TST10           ;;GO TO NEXT TEST
3694  016270  005737  003360          8$:     TST     BSE22H+6        ;TEST CARTRIDGE TYPE
3695  016274  001404                          BEQ     9$              ;BRANCH IF DATA CARTRIDGE
3696  016276  104235                          ERROR   235             ;ALIGNMENT CARTRIDGE USED
3697  016300  005237  001526                  INC     BSERR           ;SET BSE ERROR FLAG
3698  016304  000476                          BR      10$
3699
3700  016306  005237  007432          9$:     INC     TEMP3
3701  016312  023727  007432  000001          CMP     TEMP3,#1
3702  016320  001020                          BNE     11$
3703  016322  005037  007430                  CLR     TEMP2           ;SECTOR CTR
3704  016326  012737  005352  007434          MOV     #BSE22S,TEMP4   ;STORE 22 SECTOR SOFTWARE BSE ADDR
3705  016334  013765  007434  000004          MOV     TEMP4,RKBA(R5)
3706  016342  012737  001012  007436          MOV     #1012,TEMP5     ;TRACK 2, SECTOR 12(8)
3707  016350  013765  007436  000006          MOV     TEMP5,RKDA(R5)
3708  016356  000137  016006                  JMP     1$              ;REPEAT
```

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3709
3710  016362  023727  007432  000002  11$:    CMP     TEMP3,#2
3711  016370  001020                          BNE     12$
3712  016372  005037  007430                  CLR     TEMP2           ;SECTOR CTR
3713  016376  012737  002352  007434          MOV     #BSE20H,TEMP4   ;STORE 20 SECTOR HARDWARE BSE ADDR.
3714  016404  013765  007434  000004          MOV     TEMP4,RKBA(R5)
3715  016412  012737  001001  007436          MOV     #1001,TEMP5     ;TRACK 2, SECTOR 1
3716  016420  013765  007436  000006          MOV     TEMP5,RKDA(R5)
3717  016426  000137  016006                  JMP     1$              ;REPEAT
3718
3719  016432  023727  007432  000003  12$:    CMP     TEMP3,#3
3720  016440  001020                          BNE     10$
3721  016442  005037  007430                  CLR     TEMP2           ;SECTOR CTR
3722  016446  012737  004352  007434          MOV     #BSE20S,TEMP4   ;STORE 20 SECTOR SOFTWARE BSE ADDR
3723  016454  013765  007434  000004          MOV     TEMP4,RKBA(R5)
3724  016462  012737  001013  007436          MOV     #1013,TEMP5     ;TRACK 2, SECTOR 13(8)
3725  016470  013765  007436  000006          MOV     TEMP5,RKDA(R5)
3726  016476  000137  016006                  JMP     1$              ;REPEAT
3727
3728  016502  005737  001216          10$:    TST     $PASS
3729  016506  001043                          BNE     TST10           ;;GO TO NEXT TST IF NOT 1'ST PASS
3730  016510  104401  052361                  TYPE    ,MSG17          ;CART SERIAL #
3731  016514  012746  003352                  MOV     #BSE22H,-(SP)
3732  016520  004737  047722                  JSR     PC,$DB2O        ;CONVERT DBL BINARY WORD TO OCTAL
3733  016524  004737  050272                  JSR     PC,$SUPRS       ;TYPE SERIAL #
3734  016530  104401  001205                  TYPE    ,$CRLF
3735  016534  104401  001205                  TYPE    ,$CRLF
3736
3737  016540  004737  040452                  JSR     PC,SUBCLR
3738  016544  104024                          ERROR   24              ;CERR AFTER SCLR
3739                                                                  ;GO BACK TO CYL 0
3740
3741  016546  012765  000017  000000          MOV     #SEEK,RKCS1(R5) ;SEEK CMD
3742  016554  013737  001414  007426          MOV     T50,TEMP1       ;SETUP TIMEOUT
3743  016562  004737  036542                  JSR     PC,FRDY         ;FIND RDY
3744  016566  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
3745
3746  016570  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP TIMEOUT
3747  016576  004737  037152                  JSR     PC,FATT2        ;FIND ATTN
3748  016602  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
3749
3750  016604  032737  100000  007370          BIT     #CERR,HCS1
3751  016612  001401                          BEQ     66$
3752  016614  104210                          ERROR   210             ;CERR AFTER SEEK CMD
3753
3754  016616                          66$:
3755
3756
3757
3758                                  .SBTTL WRITE TESTS
3759
3760
3761                                  ;;*****************************************************************
3762                                  ;*TEST 10       BASIC WRITE DATA TEST; 1 WORD
3763                                  ;*
3764                                  ;*      THIS TEST VERIFIES THE ABILITY OF THE DRIVE TO WRITE JUST ONE WORD,
```

```
                                        ;*      ALL SECTORS ON CYL 0 ARE GIVEN IDENTICAL HEADERS &
                                        ;*      A WRITE COMMAND IS ISSUED. READ & WRITE CHECK COMMANDS ARE NOT
                                        ;*      PERFORMED. THIS TEST PROVIDES THE TIGHTEST POSSIBLE SCOPE LOOP
                                        ;*      FOR A WRITE ERROR.
                                        ;*
                                        ;;*****************************************************************
016616  000004                  TST10:  SCOPE
016620  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
016626  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR

016632  005737  001340                  TST     BYPWRT
016636  001404                          BEQ     DOWRT
016640  104401  052504                  TYPE    ,MSG19          ;BYPASSING WRITE TESTS
016644  000137  031706                  JMP     @TIMING
016650                          DOWRT:

016650  005737  001526                  TST     BSERR           ;SEE IF ALIGN CART
016654  001406                          BEQ     2$              ;BR IF NO
016656  104401  054343                  TYPE    ,MSG40          ;BSE OR ALIGN CART USED
016662  104401  053155                  TYPE    ,MSG26          ;ABORTING DATA TESTS
016666  000137  031706                  JMP     @TIMING

016672  004737  040452          2$:     JSR     PC,SUBCLR
016676  104024                          ERROR   24              ;CERR AFTER SCLR

016700  005237  007354                  INC     BADHDR          ;USED FOR VALID HALT

016704  012700  001536                  MOV     #HDTAB,R0       ;MAKE ALL CYL 0 HEADERS IDENTICAL

016710  005020                  1$:     CLR     (R0)+           ;HEADER WORD 0: CYL 0
016712  012720  140000                  MOV     #140000,(R0)+   ;HEADER WORD 1: SECTOR 0
016716  012720  140000                  MOV     #140000,(R0)+   ;HEADER WORD 2: XOR OF 1 & 2

016722  020027  001742                  CMP     R0,#HDTAB+132.  ;ALL HEADERS DONE? (22X6=132)
016726  001370                          BNE     1$              ;BR IF NO

016730  012765  001536  000004          MOV     #HDTAB,RKBA(R5) ;HEADER TABLE
016736  012765  177676  000002          MOV     #-66.,RKWC(R5)  ;WORD COUNT

016744  012765  000027  000000          MOV     #<WRHEAD>,RKCS1(R5)     ;WRITE HEADER CMD
016752  013737  001424  007426          MOV     @T50000,TEMP1   ;SETUP  TIMEOUT
016760  004737  036542                  JSR     PC,FRDY         ;FIND RDY
016764  104200                          ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
016766  004737  040100                  JSR     PC,GSTAT        ;GET FRESH STATUS
016772  032737  100000  007370          BIT     #CERR,HCS1
017000  001405                          BEQ     64$
017002  104201                          ERROR   201             ;CERR AFTER WRITE HEADER CMD
017004  104401  053155                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
017010  000137  031706                  JMP     @TIMING
017014                          64$:


017014  104415                  SCOP1
017016  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR

017022  004737  040452                  JSR     PC,SUBCLR
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3821  017026  104024                        ERROR   24              ;CERR AFTER SCLR
3822
3823  017030  005037  001406                CLR     SECTOR
3824  017034  013765  001406  000006  3$:   MOV     SECTOR,RKDA(R5) ;TRACK/SECTOR #
3825  017042  012765  001514  000004        MOV     #DATA1,RKBA(R5) ;DATA TO BE ALL 1'S
3826  017050  012765  177777  000002        MOV     #-1,RKWC(R5)    ;WORD COUNT=1
3827
3828
3829  017056  012765  000023  000000        MOV     #<WRDATA>,RKCS1(R5)     ;WRITE DATA CMD
3830  017064  013737  001424  007426        MOV     T50000,TEMP1    ;SETUP TIMEOUT
3831  017072  004737  036542                JSR     PC,FRDY         ;FIND RDY
3832  017076  104011                        ERROR   11              ;NO RDY AFTER WRITE DATA CMD
3833  017100  004737  040100                JSR     PC,GSTAT        ;GET FRESH STATUS
3834  017104  032737  100000  007370        BIT     #CERR,HCS1
3835  017112  001465                        BEQ     68$             ;BR IF NO ERRORS
3836
3837  017114  032737  000200  007404        BIT     #BSE,HER        ;SEE IF BAD SECTOR FLAG
3838  017122  001421                        BEQ     66$             ;BR IF NO
3839  017124  004737  042122                JSR     PC,TRUERR       ;ELSE SEE IF SECTOR LISTED IN BSE TABLE
3840  017130  000455                        BR      67$             ;RETURN HERE IF NO
3841
3842  017132  005237  001406                INC     SECTOR          ;RETURN HERE IF YES
3843  017136  023727  001406  000012        CMP     SECTOR,#10.     ;ARE 10 CONSEC. SECTORS BAD
3844  017144  001003                        BNE     65$             ;BR IF NO
3845  017146  104046                        ERROR   46              ;ABORTING TEST DETECTED 10 BAD SECTORS
3846  017150  000137  017352                JMP     5$              ;BYPASS TEST
3847  017154  012765  100000  000000  65$:   MOV     #CCLR,RKCS1(R5) ;TRY ANOTHER SECTOR
3848  017162  000137  017034                JMP     3$
3849  017166  104012                66$:    ERROR   12              ;CERR WITH WRITE DATA CMD
3850
3851  017170  012737  010340  007460        MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
3852  017176  005037  007462                CLR     E.B0            ;EXPECTED MSG B0
3853  017202  012737  001720  007464        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
3854  017210  012737  000001  007466        MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
3855  017216  005037  007470                CLR     E.A2            ;EXPECTED MSG A2
3856  017222  012737  000002  007472        MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
3857  017230  012737  000003  007476        MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
3858
3859  017236  004737  037264                JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
3860  017242  000003                        .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
3861  017244  104052                        ERROR   52              ;MSG A0 ERROR AFTER WRITE DATA CMD
3862  017246  104023                        ERROR   23              ;MSH B0 ERROR
3863  017250  104053                        ERROR   53              ;MSG A1 ERROR
3864  017252  104025                        ERROR   25              ;MSG B1 ERROR
3865  017254  104401  053155                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
3866  017260  000137  031706                JMP     TIMING
3867  017264  104063                67$:    ERROR   63              ;BAD SECTOR NOT LISTED IN TABLE
3868  017266                        68$:
3869
3870  017266  012737  010340  007460        MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
3871  017274  005037  007462                CLR     E.B0            ;EXPECTED MSG B0
3872  017300  012737  001720  007464        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
3873  017306  012737  000001  007466        MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
3874  017314  005037  007470                CLR     E.A2            ;EXPECTED MSG A2
3875  017320  012737  000002  007472        MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
3876  017326  012737  000003  007476        MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
```

```
                                JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
                                .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
                                ERROR   52              ;MSG A0 ERROR AFTER WRITE DATA CMD
                                ERROR   23              ;MSH B0 ERROR
                                ERROR   53              ;MSG A1 ERROR
                                ERROR   25              ;MSG B1 ERROR
                        5$:
                        ;;**************************************************************
                        ;*TEST 11       BASIC WRITE DATA TEST; FULL SECTOR
                        ;*
                        ;*      THIS TEST VERIFIES THE ABILITY OF THE DRIVE TO WRITE
                        ;*      A FULL SECTOR.  ALL ZEROS ARE WRITTEN BY THE WRITE DATA COMMAND
                        ;*      & CHECKED BY A RD DATA COMMAND.  A FURTHER CHECK IS PERFORMED
                        ;*      BY THE WRT CHK COMMAND.
                        ;*      THE ABOVE IS REPEATED FOR AN ALL ONES PATTERN.
                        ;*
                        ;;**************************************************************
                        TST11:  SCOPE
                                MOV     #1,$TIMES       ;;DO 1 ITERATION
                                MOV     #STACK,SP       ;RESTORE STK PTR

                                JSR     PC,SUBCLR
                                ERROR   24              ;CERR AFTER SCLR

                                MOV     #HDTAB,RKBA(R5) ;RESTORE TO 22 SECTOR
                                MOV     #-66.,RKWC(R5)  ;STANDARD FORMAT
                                CLR     TOCYL

                                MOV     TOCYL,CALADD    ;SETUP
                                MOV     #0,HEAD         ;TO FILL
                                MOV     #0,FORMAT       ;HEADER
                                JSR     PC,FHDTAB       ;TABLE


                                MOV     #<WRHEAD>,RKCS1(R5)     ;WRITE HEADER CMD
                                MOV     T50000,TEMP1    ;SETUP  TIMEOUT
                                JSR     PC,FRDY         ;FIND RDY
                                ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
                                JSR     PC,GSTAT        ;GET FRESH STATUS
                                BIT     #CERR,HCS1
                                BEQ     64$
                                ERROR   201             ;CERR AFTER WRITE HEADER CMD
                                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
                                JMP     TIMING
                        64$:

                                CLR     BADHDR          ;USED FOR VALID HALT
                                SCOP1
                                MOV     #STACK,SP       ;RESTORE STK PTR

                                JSR     PC,SUBCLR
                                ERROR   24              ;CERR AFTER SCLR

                                CLR     SECTOR
                        8$:     MOV     SECTOR,RKDA(R5) ;SETUP SECTOR
```

```
3933  017544  012765  001510  000004          MOV   #DATAO,RKBA(R5) ;WRITE ALL 0'S
3934  017552  013700  001510                  MOV   DATAO,R0
3935  017556  052765  000020  000010  1$:     BIS   #BAI,RKCS2(R5)
3936  017564  012765  177400  000002          MOV   #-256.,RKWC(R5)
3937
3938  017572  012765  000023  000000          MOV   #<WRDATA>,RKCS1(R5)     ;WRITE DATA CMD
3939  017600  013737  001424  007426          MOV   T50000,TEMP1    ;SETUP TIMEOUT
3940  017606  004737  036542                  JSR   PC,FRDY         ;FIND RDY
3941  017612  104011                          ERROR 11              ;NO RDY AFTER WRITE DATA CMD
3942  017614  004737  040100                  JSR   PC,GSTAT        ;GET FRESH STATUS
3943  017620  032737  100000  007370          BIT   #CERR,HCS1
3944  017626  001465                          BEQ   68$             ;BR IF NO ERRORS
3945
3946  017630  032737  000200  007404          BIT   #BSE,HER        ;SEE IF BAD SECTOR FLAG
3947  017636  001421                          BEQ   66$             ;BR IF NO
3948  017640  004737  042122                  JSR   PC,TRUERR       ;ELSE SEE IF SECTOR LISTED IN BSE TABLE
3949  017644  000455                          BR    67$             ;RETURN HERE IF NO
3950
3951  017646  005237  001406                  INC   SECTOR          ;RETURN HERE IF YES
3952  017652  023727  001406  000012          CMP   SECTOR,#10.     ;ARE 10 CONSEC. SECTORS BAD
3953  017660  001003                          BNE   65$             ;BR IF NO
3954  017662  104046                          ERROR 46              ;ABORTING TEST DETECTED 10 BAD SECTORS
3955  017664  000137  021152                  JMP   7$              ;BYPASS TEST
3956  017670  012765  100000  000000  65$:    MOV   #CCLR,RKCS1(R5) ;TRY ANOTHER SECTOR
3957  017676  000137  017536                  JMP   8$
3958  017702  104012                  66$:    ERROR 12              ;CERR WITH WRITE DATA CMD
3959
3960  017704  012737  010340  007460          MOV   #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
3961  017712  005037  007462                  CLR   E.B0            ;EXPECTED MSG B0
3962  017716  012737  001720  007464          MOV   #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
3963  017724  012737  000001  007466          MOV   #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
3964  017732  005037  007470                  CLR   E.A2            ;EXPECTED MSG A2
3965  017736  012737  000002  007472          MOV   #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
3966  017744  012737  000003  007476          MOV   #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
3967
3968  017752  004737  037264                  JSR   PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
3969  017756  000003                          .WORD T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
3970  017760  104052                          ERROR 52              ;MSG A0 ERROR AFTER WRITE DATA CMD
3971  017762  104023                          ERROR 23              ;MSH B0 ERROR
3972  017764  104053                          ERROR 53              ;MSG A1 ERROR
3973  017766  104025                          ERROR 25              ;MSG B1 ERROR
3974  017770  104401  053155                  TYPE  ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
3975  017774  000137  031706                  JMP   TIMING
3976  020000  104063                  67$:    ERROR 63              ;BAD SECTOR NOT LISTED IN TABLE
3977  020002                          68$:
3978
3979  020002  012737  010340  007460          MOV   #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
3980  020010  005037  007462                  CLR   E.B0            ;EXPECTED MSG B0
3981  020014  012737  001720  007464          MOV   #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
3982  020022  012737  000001  007466          MOV   #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
3983  020030  005037  007470                  CLR   E.A2            ;EXPECTED MSG A2
3984  020034  012737  000002  007472          MOV   #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
3985  020042  012737  000003  007476          MOV   #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
3986
3987  020050  004737  037264                  JSR   PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
3988  020054  000003                          .WORD T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
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3989  020056  104052                        ERROR   52              ;MSG AO ERROR AFTER WRITE DATA CMD
3990  020060  104023                        ERROR   23              ;MSH BO ERROR
3991  020062  104053                        ERROR   53              ;MSG A1 ERROR
3992  020064  104025                        ERROR   25              ;MSG B1 ERROR
3993  020066  104415                        SCOP1
3994  020070  012706  001100                MOV     #STACK,SP       ;RESTORE STK PTR
3995
3996  020074  004737  040452                JSR     PC,SUBCLR
3997  020100  104024                        ERROR   24              ;CERR AFTER SCLR
3998
3999  020102  013765  001406  000006        MOV     SECTOR,RKDA(R5) ;SETUP SECTOR
4000  020110  012765  006352  000004        MOV     #RDTAB,RKBA(R5)
4001  020116  012765  177400  000002        MOV     #-256.,RKWC(R5)
4002
4003
4004  020124  012765  000021  000000        MOV     #<RDDATA>,RKCS1(R5)     ;READ DATA CMD
4005  020132  013737  001424  007426        MOV     T50000,TEMP1    ;SETUP TIMEOUT
4006  020140  004737  036542                JSR     PC,FRDY         ;FIND RDY
4007  020144  104013                        ERROR   13              ;NO RDY AFTER READ DATA CMD
4008  020146  004737  040100                JSR     PC,GSTAT        ;GET FRESH STATUS
4009  020152  032737  100000  007370        BIT     #CERR,HCS1
4010  020160  001454                        BEQ     72$
4011  020162  032737  000200  007404        BIT     #BSE,HER        ;SEE IF BAD SECTOR
4012  020170  001406                        BEQ     70$
4013  020172  104065                        ERROR   65              ;DETECTED BSE IN READ BUT NOT IN WRITE CMD.
4014  020174  000413                        BR      73$
4015  020176  104401  053155        69$:    TYPE    ,MSG26          ;ABORTING DATA TESTS
4016  020202  000137  031706                JMP     @TIMING
4017
4018  020206  032737  100000  007404  70$:  BIT     #DCK,HER        ;SEE IF DATA CHECK ERROR
4019  020214  001402                        BEQ     71$
4020  020216  104021                        ERROR   21              ;DATA CHECK ERROR AFTER READ CMD (ECC)
4021  020220  000401                        BR      73$
4022
4023  020222  104014                71$:    ERROR   14              ;CERR AFTER READ DATA CMD.
4024
4025  020224                        73$:
4026
4027  020224  012737  010340  007460        MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG AO
4028  020232  005037  007462                CLR     E.B0            ;EXPECTED MSG BO
4029  020236  012737  001720  007464        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4030  020244  012737  000001  007466        MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
4031  020252  005037  007470                CLR     E.A2            ;EXPECTED MSG A2
4032  020256  012737  000002  007472        MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
4033  020264  012737  000003  007476        MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
4034
4035  020272  004737  037264                JSR     PC,CHKMSG       ;CHECK MSGS AO, BO, A1, B1
4036  020276  000003                        .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
4037  020300  104054                        ERROR   54              ;MSG AO ERROR AFTER READ DATA CMD
4038  020302  104026                        ERROR   26              ;MSH BO ERROR
4039  020304  104056                        ERROR   56              ;MSG A1 ERROR
4040  020306  104030                        ERROR   30              ;MSG B1 ERROR
4041  020310  000732                        BR      69$
4042  020312                        72$:
4043
4044  020312  012737  010340  007460        MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG AO
```

```
4045  020320  005037  007462                    CLR     E.B0                    ;EXPECTED MSG B0
4046  020324  012737  001720  007464            MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4047  020332  012737  000001  007466            MOV     #1,E.B1                 ;MSG ID FOR EXPECTED MSG B1
4048  020340  005037  007470                    CLR     E.A2                    ;EXPECTED MSG A2
4049  020344  012737  000002  007472            MOV     #2,E.B2                 ;MSG ID FOR EXPECTED MSG B2
4050  020352  012737  000003  007476            MOV     #3,E.B3                 ;MSG ID FOR EXPECTED MSG B3
4051
4052  020360  004737  037264                    JSR     PC,CHKMSG               ;CHECK MSGS A0, B0, A1, B1
4053  020364  000003                            .WORD   T.A2!T.B2!0                     ;& MSGS SPECIFIED HERE
4054  020366  104054                            ERROR   54                      ;MSG A0 ERROR AFTER READ DATA CMD
4055  020370  104026                            ERROR   26                      ;MSH B0 ERROR
4056  020372  104056                            ERROR   56                      ;MSG A1 ERROR
4057  020374  104030                            ERROR   30                      ;MSG B1 ERROR
4058
4059  020376  012701  006352                    MOV     #RDTAB,R1
4060  020402  011137  001466            2$:     MOV     (R1),WD1                ;ACTUAL WORD FOR TYPEOUT
4061  020406  010037  001470                    MOV     R0,WD2                  ;EXPECTED DATA FOR TYPEOUT
4062
4063  020412  020021                            CMP     R0,(R1)+                ;COMPARE READ DATA TABLE AGAINST
4064  020414  001401                            BEQ     3$                      ;THE 'SHOULD BE' VALUE
4065  020416  104020                            ERROR   20                      ;READ DATA DID NOT COMPARE WITH WRITE DATA
4066
4067  020420  020127  007352            3$:     CMP     R1,#RDTAB+512.
4068  020424  001366                            BNE     2$
4069
4070  020426  020037  001510                    CMP     R0,DATA0
4071  020432  001401                            BEQ     4$
4072  020434  000412                            BR      5$
4073
4074  020436  012765  001514  000004    4$:     MOV     #DATA1,RKBA(R5) ;WRITE ALL 1'S
4075  020444  013700  001514                    MOV     DATA1,R0
4076  020450  013765  001406  000006            MOV     SECTOR,RKDA(R5)
4077  020456  000137  017556                    JMP     1$
4078
4079  020462                            5$:
4080  020462  104415                            SCOP1
4081  020464  012706  001100                    MOV     #STACK,SP               ;RESTORE STK PTR
4082
4083  020470  004737  040452                    JSR     PC,SUBCLR
4084  020474  104024                            ERROR   24                      ;CERR AFTER SCLR
4085
4086  020476  052765  000020  000010            BIS     #BAI,RKCS2(R5)  ;THIS PORTION OF THE TEST CHECKS
4087  020504  012765  001514  000004            MOV     #DATA1,RKBA(R5) ;OUT THE WRITE CHECK CMD
4088  020512  012765  177400  000002            MOV     #-256.,RKWC(R5) ;ALL 1'S WERE PREVIOUSLY WRITTEN
4089  020520  013765  001406  000006            MOV     SECTOR,RKDA(R5)
4090
4091  020526  012765  000031  000000            MOV     #<WRTCHK>,RKCS1(R5)     ;WRITE CHECK CMD
4092  020534  013737  001424  007426            MOV     T50000,TEMP1            ;SETUP TIMEOUT
4093  020542  004737  036542                    JSR     PC,FRDY                 ;FIND RDY
4094  020546  104015                            ERROR   15                      ;NO RDY AFTER WRITE CHECK CMD
4095  020550  004737  040100                    JSR     PC,GSTAT                ;GET FRESH STATUS
4096  020554  032737  100000  007370            BIT     #CERR,HCS1
4097  020562  001453                            BEQ     75$
4098  020564  032737  040000  007372            BIT     #WCE,HCS2               ;SEE IF WRITE CHECK ERROR
4099  020572  001410                            BEQ     74$
4100  020574  016537  000024  001466            MOV     RKDB(R5),WD1    ;ACTUAL WORD FOR PRINTOUT
```

```
4101  020602  012737  001514  001470          MOV     DATA1,WD2               ;EXPECTED WORD FOR TYPEOUT
4102  020610  104016                          ERROR   16                      ;WCE AFTER WRITE CMD
4103  020612  000437                          BR      75$
4104
4105  020614  104022                  74$:    ERROR   22                      ;CERR AFTER WRITE CHECK CMD
4106
4107  020616  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4108  020624  005037  007462                  CLR     E.B0                    ;EXPECTED MSG B0
4109  020630  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4110  020636  012737  000001  007466          MOV     #1,E.B1                 ;MSG ID FOR EXPECTED MSG B1
4111  020644  005037  007470                  CLR     E.A2                    ;EXPECTED MSG A2
4112  020650  012737  000002  007472          MOV     #2,E.B2                 ;MSG ID FOR EXPECTED MSG B2
4113  020656  012737  000003  007476          MOV     #3,E.B3                 ;MSG ID FOR EXPECTED MSG B3
4114
4115  020664  004737  037264                  JSR     PC,CHKMSG               ;CHECK MSGS A0, B0, A1, B1
4116  020670  000003                          .WORD   T.A2!T.B2!0                     ;& MSGS SPECIFIED HERE
4117  020672  104057                          ERROR   57                      ;MSG A0 ERROR AFTER WRITE CHECK CMD
4118  020674  104031                          ERROR   31                      ;MSH B0 ERROR
4119  020676  104060                          ERROR   60                      ;MSG A1 ERROR
4120  020700  104032                          ERROR   32                      ;MSG B1 ERROR
4121  020702  104401  053155                  TYPE    ,MSG26                  ;ABORTING DATA TESTS
4122  020706  000137  031706                  JMP     @TIMING
4123
4124  020712                          75$:
4125
4126  020712  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4127  020720  005037  007462                  CLR     E.B0                    ;EXPECTED MSG B0
4128  020724  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4129  020732  012737  000001  007466          MOV     #1,E.B1                 ;MSG ID FOR EXPECTED MSG B1
4130  020740  005037  007470                  CLR     E.A2                    ;EXPECTED MSG A2
4131  020744  012737  000002  007472          MOV     #2,E.B2                 ;MSG ID FOR EXPECTED MSG B2
4132  020752  012737  000003  007476          MOV     #3,E.B3                 ;MSG ID FOR EXPECTED MSG B3
4133
4134  020760  004737  037264                  JSR     PC,CHKMSG               ;CHECK MSGS A0, B0, A1, B1
4135  020764  000003                          .WORD   T.A2!T.B2!0                     ;& MSGS SPECIFIED HERE
4136  020766  104057                          ERROR   57                      ;MSG A0 ERROR AFTER WRITE CHECK CMD
4137  020770  104031                          ERROR   31                      ;MSH B0 ERROR
4138  020772  104060                          ERROR   60                      ;MSG A1 ERROR
4139  020774  104032                          ERROR   32                      ;MSG B1 ERROR
4140
4141  020776  104415                          SCOP1
4142  021000  012706  001100                  MOV     #STACK,SP               ;RESTORE STK PTR
4143
4144  021004  004737  040452                  JSR     PC,SUBCLR
4145  021010  104024                          ERROR   24                      ;CERR AFTER SCLR
4146
4147  021012  012765  001510  000004          MOV     #DATA0,RKBA(R5) ;SETUP TO CHECK AGAINST WRONG DATA
4148  021020  012765  177400  000002          MOV     #-256.,RKWC(R5)
4149
4150  021026  012765  000031  000000          MOV     #WRTCHK,RKCS1(R5)
4151  021034  012737  141520  007426          MOV     #50000.,TEMP1
4152  021042  004737  036542                  JSR     PC,FRDY
4153  021046  104015                          ERROR   15                      ;NO RDY AFTER WRITE CHECK CMD
4154  021050  004737  040100                  JSR     PC,GSTAT                ;GET FRESH STATUS
4155  021054  032737  040000  007372          BIT     #WCE,HCS2               ;EXPECT MISCOMPARE
4156  021062  001001                          BNE     6$
```

```
 4157  021064  104017                          ERROR   17              ;WRITE CHECK CMD NOT FUNCTIONING
 4158                                                                  ;WITH INTENTIONAL MISCOMPARE
 4159  021066                                  6$:
 4160
 4161  021066  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
 4162  021074  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
 4163  021100  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
 4164  021106  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
 4165  021114  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
 4166  021120  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
 4167  021126  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
 4168
 4169  021134  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
 4170  021140  000000                          .WORD   0!0!0           ;& MSGS SPECIFIED HERE
 4171  021142  104057                          ERROR   57              ;MSG A0 ERROR AFT WRT CHK CMD
 4172  021144  104031                          ERROR   31              ;MSH B0 ERROR
 4173  021146  104060                          ERROR   60              ;MSG A1 ERROR
 4174  021150  104032                          ERROR   32              ;MSG B1 ERROR
 4175  021152                                  7$:
 4176
 4177                                          ;;*****************************************************************
 4178                                          ;*TEST 12       20 SECTOR FORMAT TEST
 4179                                          ;*
 4180                                          ;*      ALL 1'S ARE WRITTEN ON A FULL SECTOR IN 20 SECTOR FORMAT.
 4181                                          ;*      MSG B0,B1 ARE CHECKED FOR ANY ERROR CONDITION
 4182                                          ;*
 4183                                          ;;*****************************************************************
 4184  021152  000004                          TST12:  SCOPE
 4185  021154  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
 4186  021162  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
 4187
 4188  021166  004737  040452                  JSR     PC,SUBCLR
 4189  021172  104024                          ERROR   24              ;CERR AFTER SCLR
 4190
 4191  021174  012765  001536  000004          MOV     #HDTAB,RKBA(R5) ;HEADER WORD TABLE
 4192  021202  012765  177704  000002          MOV     #-60.,RKWC(R5)  ;WORD COUNT FOR 20 SECTOR FMT
 4193  021210  005037  001352                  CLR     TOCYL
 4194  021214  005237  007354                  INC     BADHDR          ;USED FOR VALID HALT
 4195
 4196
 4197  021220  013737  001352  001366          MOV     TOCYL,CALADD    ;SETUP
 4198  021226  012737  000000  001474          MOV     #0,HEAD         ;TO FILL
 4199  021234  012737  000001  001502          MOV     #1,FORMAT       ;HEADER
 4200  021242  004737  041434                  JSR     PC,FHDTAB       ;TABLE
 4201
 4202
 4203  021246  012765  010027  000000          MOV     #<CFMT!WRHEAD>,RKCS1(R5)        ;WRITE HEADER CMD
 4204  021254  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP  TIMEOUT
 4205  021262  004737  036542                  JSR     PC,FRDY         ;FIND RDY
 4206  021266  104200                          ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
 4207  021270  004737  040100                  JSR     PC,GSTAT        ;GET FRESH STATUS
 4208  021274  032737  100000  007370          BIT     #CERR,HCS1
 4209  021302  001405                          BEQ     64$
 4210  021304  104201                          ERROR   201             ;CERR AFTER WRITE HEADER CMD
 4211  021306  104401  053155                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
 4212  021312  000137  031706                  JMP     TIMING
```

```
4213  021316                                64$:
4214
4215  021316  104415                              SCOP1
4216  021320  012706  001100                      MOV     #STACK,SP       ;RESTORE STK PTR
4217
4218  021324  004737  040452                      JSR     PC,SUBCLR
4219  021330  104024                              ERROR   24              ;CERR AFTER SCLR
4220
4221  021332  005037  001406                      CLR     SECTOR
4222  021336  013765  001406  000006      4$:     MOV     SECTOR,RKDA(R5)
4223  021344  012765  001514  000004              MOV     #DATA1,RKBA(R5) ;WRITE ALL 1'S
4224  021352  052765  000020  000010              BIS     #BAI,RKCS2(R5)  ;BUSS ADDR INCR INHIBIT
4225  021360  012765  177400  000002              MOV     #-256.,RKWC(R5)  ;DO FULL SECTOR
4226
4227
4228  021366  012765  010023  000000              MOV     #<CFMT!WRDATA>,RKCS1(R5)        ;WRITE DATA CMD
4229  021374  013737  001424  007426              MOV     T50000,TEMP1    ;SETUP TIMEOUT
4230  021402  004737  036542                      JSR     PC,FRDY         ;FIND RDY
4231  021406  104011                              ERROR   11              ;NO RDY AFTER WRITE DATA CMD
4232  021410  004737  040100                      JSR     PC,GSTAT        ;GET FRESH STATUS
4233  021414  032737  100000  007370              BIT     #CERR,HCS1
4234  021422  001465                              BEQ     68$             ;BR IF NO ERRORS
4235
4236  021424  032737  000200  007404              BIT     #BSE,HER        ;SEE IF BAD SECTOR FLAG
4237  021432  001421                              BEQ     66$             ;BR IF NO
4238  021434  004737  042122                      JSR     PC,TRUERR       ;ELSE SEE IF SECTOR LISTED IN BSE TABLE
4239  021440  000455                              BR      67$             ;RETURN HERE IF NO
4240
4241  021442  005237  001406                      INC     SECTOR          ;RETURN HERE IF YES
4242  021446  023727  001406  000012              CMP     SECTOR,#10.     ;ARE 10 CONSEC. SECTORS BAD
4243  021454  001003                              BNE     65$             ;BR IF NO
4244  021456  104046                              ERROR   46              ;ABORTING TEST DETECTED 10 BAD SECTORS
4245  021460  000137  022404                      JMP     3$              ;BYPASS TEST
4246  021464  012765  100000  000000  65$:        MOV     #CCLR,RKCS1(R5) ;TRY ANOTHER SECTOR
4247  021472  000137  021336                      JMP     4$
4248  021476  104012                      66$:    ERROR   12              ;CERR WITH WRITE DATA CMD
4249
4250  021500  012737  010340  007460              MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4251  021506  005037  007462                      CLR     E.B0            ;EXPECTED MSG B0
4252  021512  012737  001720  007464              MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4253  021520  012737  000001  007466              MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
4254  021526  005037  007470                      CLR     E.A2            ;EXPECTED MSG A2
4255  021532  012737  000002  007472              MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
4256  021540  012737  000003  007476              MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
4257
4258  021546  004737  037264                      JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
4259  021552  000003                              .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
4260  021554  104052                              ERROR   52              ;MSG A0 ERROR AFTER WRITE DATA CMD
4261  021556  104023                              ERROR   23              ;MSH B0 ERROR
4262  021560  104053                              ERROR   53              ;MSG A1 ERROR
4263  021562  104025                              ERROR   25              ;MSG B1 ERROR
4264  021564  104401  053155                      TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
4265  021570  000137  031706                      JMP     TIMING
4266  021574  104063                      67$:    ERROR   63              ;BAD SECTOR NOT LISTED IN TABLE
4267  021576                              68$:
4268  021576  012765  010001  000000              MOV     #<CFMT!SELDRV>,RKCS1(R5)
```

```
4269  021604  013737  001412  007426          MOV     T10,TEMP1
4270  021612  004737  036542                  JSR     PC,FRDY         ;FIND RDY
4271  021616  104117                          ERROR   117             ;RDY NOT FOUND AFTER SELDRV CMD
4272  021620  032737  001000  007416          BIT     #D.FORM,HMR2
4273  021626  001001                          BNE     1$
4274  021630  104102                          ERROR   102             ;FORMAT NOT SET
4275
4276  021632                          1$:
4277
4278  021632  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4279  021640  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
4280  021644  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4281  021652  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
4282  021660  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
4283  021664  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
4284  021672  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
4285
4286  021700  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
4287  021704  000000                          .WORD   0!0!0           ;& MSGS SPECIFIED HERE
4288  021706  104052                          ERROR   52              ;MSG A0 ERROR AFTER WRITE DATA CMD
4289  021710  104023                          ERROR   23              ;MSH B0 ERROR
4290  021712  104053                          ERROR   53              ;MSG A1 ERROR
4291  021714  104025                          ERROR   25              ;MSG B1 ERROR
4292  021716  012765  177400  000002          MOV     #-256.,RKWC(R5)
4293  021724  012765  001514  000004          MOV     #DATA1,RKBA(R5)
4294  021732  052765  000020  000010          BIS     #BAI,RKCS2(R5)
4295  021740  013765  001406  000006          MOV     SECTOR,RKDA(R5)
4296
4297  021746  012765  010031  000000          MOV     #<CFMT!WRTCHK>,RKCS1(R5)        ;WRITE CHECK CMD
4298  021754  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP TIMEOUT
4299  021762  004737  036542                  JSR     PC,FRDY         ;FIND RDY
4300  021766  104015                          ERROR   15              ;NO RDY AFTER WRITE CHECK CMD
4301  021770  004737  040100                  JSR     PC,GSTAT        ;GET FRESH STATUS
4302  021774  032737  100000  007370          BIT     #CERR,HCS1
4303  022002  001453                          BEQ     70$
4304  022004  032737  040000  007372          BIT     #WCE,HCS2       ;SEE IF WRITE CHECK ERROR
4305  022012  001410                          BEQ     69$
4306  022014  016537  000024  001466          MOV     RKDB(R5),WD1    ;ACTUAL WORD FOR PRINTOUT
4307  022022  013737  001514  001470          MOV     DATA1,WD2               ;EXPECTED WORD FOR TYPEOUT
4308  022030  104016                          ERROR   16              ;WCE AFTER WRITE CMD
4309  022032  000437                          BR      70$
4310
4311  022034  104022                  69$:    ERROR   22              ;CERR AFTER WRITE CHECK CMD
4312
4313  022036  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4314  022044  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
4315  022050  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4316  022056  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
4317  022064  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
4318  022070  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
4319  022076  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
4320
4321  022104  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
4322  022110  000003                          .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
4323  022112  104057                          ERROR   57              ;MSG A0 ERROR AFTER WRITE CHECK CMD
4324  022114  104031                          ERROR   31              ;MSH B0 ERROR
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4325  022116  104060                        ERROR   60              ;MSG A1 ERROR
4326  022120  104032                        ERROR   32              ;MSG B1 ERROR
4327  022122  104401  053155                TYPE    ,MSG26          ;ABORTING DATA TESTS
4328  022126  000137  031706                JMP     @TIMING
4329
4330  022132                        70$:
4331  022132  012765  010001  000000        MOV     #<CFMT!SELDRV>,RKCS1(R5)
4332  022140  013737  001412  007426        MOV     T10,TEMP1
4333  022146  004737  036542                JSR     PC,FRDY         ;FIND RDY
4334  022152  104117                        ERROR   117             ;NO RDY AFTER SELDRV CMD
4335  022154  032737  001000  007416        BIT     #D.FORM,HMR2
4336  022162  001001                        BNE     2$
4337  022164  104103                        ERROR   103             ;FORMAT NOT SET
4338
4339  022166                        2$:
4340
4341  022166  012737  010340  007460        MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4342  022174  005037  007462                CLR     E.B0            ;EXPECTED MSG B0
4343  022200  012737  001720  007464        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4344  022206  012737  000001  007466        MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
4345  022214  005037  007470                CLR     E.A2            ;EXPECTED MSG A2
4346  022220  012737  000002  007472        MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
4347  022226  012737  000003  007476        MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
4348
4349  022234  004737  037264                JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
4350  022240  000000                        .WORD   0!0!0           ;& MSGS SPECIFIED HERE
4351  022242  104057                        ERROR   57              ;MSG A0 ERROR AFTER WRITE CHECK CMD
4352  022244  104031                        ERROR   31              ;MSH B0 ERROR
4353  022246  104060                        ERROR   60              ;MSG A1 ERROR
4354  022250  104032                        ERROR   32              ;MSG B1 ERROR
4355  022252  104415                        SCOP1
4356  022254  012706  001100                MOV     #STACK,SP       ;RESTORE STK PTR
4357
4358  022260  004737  040452                JSR     PC,SUBCLR
4359  022264  104024                        ERROR   24              ;CERR AFTER SCLR
4360
4361  022266  012765  001536  000004        MOV     #HDTAB,RKBA(R5) ;RESTORE CYL 0 TO 22 SECTOR FMT
4362  022274  012765  177676  000002        MOV     #-66.,RKWC(R5)
4363  022302  005037  001352                CLR     TOCYL
4364
4365
4366  022306  013737  001352  001366        MOV     TOCYL,CALADD    ;SETUP
4367  022314  012737  000000  001474        MOV     #0,HEAD         ;TO FILL
4368  022322  012737  000000  001502        MOV     #0,FORMAT       ;HEADER
4369  022330  004737  041434                JSR     PC,FHDTAB       ;TABLE
4370
4371
4372  022334  012765  000027  000000        MOV     #<WRHEAD>,RKCS1(R5)     ;WRITE HEADER CMD
4373  022342  013737  001424  007426        MOV     T50000,TEMP1    ;SETUP  TIMEOUT
4374  022350  004737  036542                JSR     PC,FRDY         ;FIND RDY
4375  022354  104200                        ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
4376  022356  004737  040100                JSR     PC,GSTAT        ;GET FRESH STATUS
4377  022362  032737  100000  007370        BIT     #CERR,HCS1
4378  022370  001405                        BEQ     71$
4379  022372  104201                        ERROR   201             ;CERR AFTER WRITE HEADER CMD
4380  022374  104401  053155                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
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4381  022400  000137  031706                JMP     TIMING
4382  022404                          71$:
4383
4384  022404  005037  007354          3$:   CLR     BADHDR          ;USED FOR VALID HALT
4385
4386                                  ;;*****************************************************************
4387                                  ;*TEST 13       TEST OFFSET & RTC LOGIC
4388                                  ;*
4389                                  ;*      THE HEADS ARE FIRST OFFSET BY OFFSET COMMANDS.
4390                                  ;*      THIS TEST CHECKS THE RTC LOGIC BY VERIFYING THAT THE
4391                                  ;*      'OFFSET ON' BIT (MSG A,DO) RESETS AND THE OFFSET REG
4392                                  ;*      BECOMES THE CYL DIFF INFO WHEN A SEEK CMD TO A
4393                                  ;*      DIFFERENT CYLINDER IS ISSUED
4394                                  ;*      IT ALSO TESTS THAT DRIVE CLEAR & SEEK TO SELF WILL NOT
4395                                  ;*      CLEAR THE 'OFFSET ON' BIT OR THE OFFSET REG.
4396                                  ;*      ALL OFFSET POSITIONS IN BOTH DIRECTIONS ARE CHECKED
4397                                  ;*
4398                                  ;;*****************************************************************
4399  022410  000004                  TST13:  SCOPE
4400  022412  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
4401  022420  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
4402
4403  022424  012702  000001                  MOV     #1,R2           ;MIN POS OFFSET
4404
4405  022430  004737  040452          1$:     JSR     PC,SUBCLR
4406  022434  104024                          ERROR   24              ;CERR AFTER SCLR
4407
4408  022436  010265  000016                  MOV     R2,RKASOF(R5)   ;SET OFFSET
4409
4410  022442  012737  022536  001176          MOV     #64$,$ESCAPE
4411  022450  012765  000015  000000          MOV     #OFFSET,RKCS1(R5)  ;OFFSET CMD
4412  022456  013737  001420  007426          MOV     T100,TEMP1      ;SETUP TIMEOUT
4413  022464  004737  036542                  JSR     PC,FRDY
4414  022470  104033                          ERROR   33              ;NO RDY AFTER OFFSET CMD
4415
4416  022472  012737  032140  007460          MOV     #<D.PIP!D.SPIN!D.OFF!D.VV!D.DRA>,E.AO  ;EXPECTED MSG AO
4417  022500  005037  007462                  CLR     E.BO
4418  022504  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1
4419  022512  012737  000001  007466          MOV     #1,E.B1
4420
4421  022520  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS AO, BO, A1, B1
4422  022524  000000                          .WORD   0!0!0           ;& MSGS SPECIFIED HERE
4423  022526  104035                          ERROR   35              ;MSG AO ERROR DURING OFFSET CMD
4424  022530  104061                          ERROR   61              ;MSH BO ERROR
4425  022532  104036                          ERROR   36              ;MSG A1 ERROR
4426  022534  104062                          ERROR   62              ;MSG B1 ERROR
4427
4428  022536  005037  001176          64$:    CLR     $ESCAPE
4429  022542  013737  001422  007426          MOV     T5000,TEMP1     ;SETUP TIMEOUT
4430  022550  004737  037152                  JSR     PC,FATT2        ;FIND ATTN
4431  022554  104034                          ERROR   34              ;NO ATTN AFTER OFFSET CMD
4432
4433
4434  022556  012737  052340  007460          MOV     #<D.DSC!D.OFF!D.SPIN!D.DRDY!D.VV!D.DRA>,E.AO  ;EXPECTED MSG AO
4435  022564  005037  007462                  CLR     E.BO            ;EXPECTED MSG BO
4436  022570  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
```

```
4437  022576  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
4438  022604  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
4439  022610  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
4440  022616  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
4441
4442  022624  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
4443  022630  000003                          .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
4444  022632  104260                          ERROR   260             ;MSG A0 ERROR AFTER OFFSET CMD
4445  022634  104261                          ERROR   261             ;MSH B0 ERROR
4446  022636  104037                          ERROR   37              ;MSG A1 ERROR
4447  022640  104040                          ERROR   40              ;MSG B1 ERROR
4448
4449  022642  005737  001364                  TST     CYLADD
4450  022646  001401                          BEQ     17$
4451  022650  104042                          ERROR   42              ;CYL ADDR IN B2 WAS NOT 0
4452                                                                  ;AFTER OFFSET CMD FROM CYL 0
4453  022652                          17$:
4454  022652  010265  000016                  MOV     R2,RKASOF(R5)   ;REFRESH RKASOF
4455
4456  022656  032702  000200                  BIT     #BIT7,R2
4457  022662  001005                          BNE     65$             ;BR IF NEG OFFSET
4458
4459  022664  020237  001362                  CMP     R2,CYLDIF       ;CHECK POS OFFSET
4460  022670  001406                          BEQ     66$
4461  022672  104114                          ERROR   114             ;OFFSET IN A2 NOT = RKASOF
4462  022674  000404                          BR      66$             ;AFTER OFFSET CMD
4463
4464  022676  020137  001362          65$:    CMP     R1,CYLDIF       ;CHECK NEG OFFSET
4465  022702  001401                          BEQ     66$
4466  022704  104114                          ERROR   114             ;OFFSET IN A2 NOT = RKASOF
4467                                                                  ;AFTER OFFSET CMD
4468  022706                          66$:
4469
4470  022706  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
4471  022714  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;DRIVE#
4472  022722  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
4473  022730  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
4474  022736  004737  036542                  JSR     PC,FRDY         ;FIND RDY
4475  022742  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
4476  022744  004737  037024                  JSR     PC,TSTATN       ;TEST FOR ATTN
4477  022750  000401                          BR      67$
4478  022752  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
4479  022754                          67$:
4480
4481  022754  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
4482  022762  004737  040100                  JSR     PC,GSTAT
4483  022766  032737  002000  007416          BIT     #D.OFF,HMR2
4484  022774  001001                          BNE     4$
4485  022776  104043                          ERROR   43              ;OFFSET BIT IN RKMR2 CLEARED
4486                                                                  ;AFTER DRIVE CLEAR CMD & SELECT DRV CMD
4487  023000  012737  012340  007460  4$:     MOV     #<D.OFF!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED A0
4488  023006  005037  007462                  CLR     E.B0
4489  023012  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1
4490  023020  012737  000001  007466          MOV     #1,E.B1
4491
4492  023026  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
```

```
4493  023032  000003                        .WORD   T.A2!T.B2!0          ;& MSGS SPECIFIED HERE
4494  023034  104273                        ERROR   273             ;MSG A0 ERROR AFTER DRIVE CLEAR CMD
4495  023036  104265                        ERROR   265             ;MSH B0 ERROR
4496  023040  104274                        ERROR   274             ;MSG A1 ERROR
4497  023042  104266                        ERROR   266             ;MSG B1 ERROR
4498  023044  010265  000016                MOV     R2,RKASOF(R5)   ;REFRESH RKASOF
4499
4500  023050  032702  000200                BIT     #BIT7,R2
4501  023054  001005                        BNE     68$             ;BR IF NEG OFFSET
4502
4503  023056  020237  001362                CMP     R2,CYLDIF       ;CHECK POS OFFSET
4504  023062  001406                        BEQ     69$
4505  023064  104115                        ERROR   115             ;OFFSET IN A2 NOT = RKASOF
4506  023066  000404                        BR      69$             ;AFTER DRIVE CLEAR CMD
4507
4508  023070  020137  001362        68$:    CMP     R1,CYLDIF       ;CHECK NEG OFFSET
4509  023074  001401                        BEQ     69$
4510  023076  104115                        ERROR   115             ;OFFSET IN A2 NOT = RKASOF
4511                                                                ;AFTER DRIVE CLEAR CMD
4512  023100                        69$:
4513
4514  023100  012765  000017  000000        MOV     #SEEK,RKCS1(R5) ;SEEK CMD
4515  023106  013737  001414  007426        MOV     T50,TEMP1       ;SETUP TIMEOUT
4516  023114  004737  036542                JSR     PC,FRDY         ;FIND RDY
4517  023120  104131                        ERROR   131             ;NO RDY AFTER SEEK CMD
4518
4519  023122  013737  001424  007426        MOV     T50000,TEMP1    ;SETUP TIMEOUT
4520  023130  004737  037152                JSR     PC,FATT2        ;FIND ATTN
4521  023134  104132                        ERROR   132             ;NO ATTN AFTER SEEK CMD
4522
4523  023136  032737  100000  007370        BIT     #CERR,HCS1
4524  023144  001401                        BEQ     70$
4525  023146  104210                        ERROR   210             ;CERR AFTER SEEK CMD
4526
4527  023150                        70$:
4528
4529
4530  023150  032737  002000  007416        BIT     #D.OFF,HMR2
4531  023156  001001                        BNE     7$
4532  023160  104045                        ERROR   45              ;OFFSET BIT CLEARED IN RKMR2 AFTER SEEK TO SELF.
4533
4534  023162                        7$:
4535
4536  023162  012737  052340  007460        MOV     #<D.DSC!D.OFF!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4537  023170  005037  007462                CLR     E.B0            ;EXPECTED MSG B0
4538  023174  012737  001720  007464        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4539  023202  012737  000001  007466        MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
4540  023210  005037  007470                CLR     E.A2            ;EXPECTED MSG A2
4541  023214  012737  000002  007472        MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
4542  023222  012737  000003  007476        MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
4543
4544  023230  004737  037264                JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
4545  023234  000003                        .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
4546  023236  104140                        ERROR   140             ;MSG A0 ERROR AFTER SEEK TO SELF
4547  023240  104141                        ERROR   141             ;MSH B0 ERROR
4548  023242  104142                        ERROR   142             ;MSG A1 ERROR
```

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4549  023244  104143                        ERROR   143             ;MSG B1 ERROR
4550  023246  010265  000016                MOV     R2,RKASOF(R5)   ;REFRESH RKASOF
4551
4552  023252  032702  000200                BIT     #BIT7,R2
4553  023256  001005                        BNE     71$             ;BR IF NEG OFFSET
4554
4555  023260  020237  001362                CMP     R2,CYLDIF       ;CHECK POS OFFSET
4556  023264  001406                        BEQ     72$
4557  023266  104123                        ERROR   123             ;OFFSET IN A2 NOT = RKASOF
4558  023270  000404                        BR      72$             ;AFTER SEEK TO SELF
4559
4560  023272  020137  001362        71$:    CMP     R1,CYLDIF       ;CHECK NEG OFFSET
4561  023276  001401                        BEQ     72$
4562  023300  104123                        ERROR   123             ;OFFSET IN A2 NOT = RKASOF
4563                                                                ;AFTER SEEK TO SELF
4564  023302                        72$:
4565
4566  023302  004737  040452                JSR     PC,SUBCLR
4567  023306  104024                        ERROR   24              ;CERR AFTER SCLR
4568
4569  023310  012737  000012  001352        MOV     #10.,TOCYL
4570  023316  012765  000012  000020        MOV     #10.,RKDC(R5)   ;SETUP CYL 10
4571                                                                ;DO ACTUAL IMPLIED SEEK TO CYL 10 TO VERIFY
4572                                                                ;OFFSET BIT IN RKMR2 CLEARED
4573
4574
4575  023324  012700  001742                MOV     #RHTAB,R0
4576  023330  012765  000025  000000        MOV     #<RDHEAD>,RKCS1(R5)     ;READ HEADER CMD
4577  023336  013737  001424  007426        MOV     T50000,TEMP1    ;SETUP  TIMEOUT
4578  023344  004737  036542                JSR     PC,FRDY         ;FIND RDY
4579  023350  104171                        ERROR   171             ;NO RDY AFTER READ HEADER CMD
4580  023352  032737  100000  007370        BIT     #CERR,HCS1
4581  023360  001405                        BEQ     74$
4582  023362  104174                        ERROR   174             ;CERR AFTER READ HEADER CMD
4583  023364  104401  053155                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING TESTS
4584  023370  000137  031706                JMP     TIMING
4585
4586  023374  016520  000024        74$:    MOV     RKDB(R5),(R0)+  ;1'ST WORD FROM SILO TO RHTAB
4587  023400  016520  000024                MOV     RKDB(R5),(R0)+  ;2'ND WORD
4588  023404  016520  000024                MOV     RKDB(R5),(R0)+  ;3'RD WORD
4589
4590
4591  023410  032765  100000  000010        BIT     #DLT,RKCS2(R5)
4592  023416  001407                        BEQ     75$
4593  023420  004737  040100                JSR     PC,GSTAT
4594  023424  104173                        ERROR   173             ;DLT AFTER READ HEADER CMD
4595  023426  104401  053155                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING TESTS
4596  023432  000137  031706                JMP     TIMING
4597  023436                        75$:
4598
4599  023436  012737  010340  007460        MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4600  023444  005037  007462                CLR     E.B0            ;EXPECTED MSG B0
4601  023450  012737  001720  007464        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4602  023456  012737  000001  007466        MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
4603  023464  005037  007470                CLR     E.A2            ;EXPECTED MSG A2
4604  023470  012737  000002  007472        MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
```

```
4605  023476  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
4606
4607  023504  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
4608  023510  000003                          .WORD   T.A2!T.B2!0     ;& MSGS SPECIFIED HERE
4609  023512  104301                          ERROR   301             ;MSG A0 ERROR AFTER READ HEADER CMD
4610  023514  104271                          ERROR   271             ;MSH B0 ERROR
4611  023516  104302                          ERROR   302             ;MSG A1 ERROR
4612  023520  104272                          ERROR   272             ;MSG B1 ERROR
4613
4614  023522  023737  001742  001352          CMP     RHTAB,TOCYL     ;CHECK WORD 0 ONLY, CYL#
4615  023530  001401                          BEQ     73$             ;BR IF SAME
4616  023532  104051                          ERROR   51              ;WRONG CYL# ON HEADER
4617  023534                          73$:
4618
4619
4620  023534  032737  002000  007416          BIT     #D.OFF,HMR2
4621  023542  001401                          BEQ     9$
4622  023544  104101                          ERROR   101             ;OFFSET NOT CLEARED AFTER READ HEADER WITH MOVEMENT
4623
4624  023546  023727  001364  000012  9$:     CMP     CYLADD,#10.
4625  023554  001401                          BEQ     10$
4626  023556  104122                          ERROR   122             ;DID NOT GO TO CYL 10
4627
4628  023560  005737  001362          10$:    TST     CYLDIF
4629  023564  001401                          BEQ     16$
4630  023566  104101                          ERROR   101             ;OFFSET NOT CLEARED IN RKMR2
4631
4632  023570  004737  040452          16$:    JSR     PC,SUBCLR
4633  023574  104024                          ERROR   24              ;CERR AFTER SCLR
4634
4635  023576  012765  000017  000000          MOV     #SEEK,RKCS1(R5) ;SEEK CMD
4636  023604  013737  001414  007426          MOV     T50,TEMP1       ;SETUP TIMEOUT
4637  023612  004737  036542                  JSR     PC,FRDY         ;FIND RDY
4638  023616  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
4639
4640  023620  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP TIMEOUT
4641  023626  004737  037152                  JSR     PC,FATT2        ;FIND ATTN
4642  023632  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
4643
4644  023634  032737  100000  007370          BIT     #CERR,HCS1
4645  023642  001401                          BEQ     76$
4646  023644  104210                          ERROR   210             ;CERR AFTER SEEK CMD
4647
4648  023646                          76$:
4649
4650
4651  023646  032702  000200                  BIT     #BIT7,R2        ;SEE IF DOING NEG OFFSETS
4652  023652  001014                          BNE     18$             ;BR IF YES
4653
4654  023654  005202                          INC     R2
4655  023656  020227  000061                  CMP     R2,#61          ;SEE IF JUST DID MAX POS OFFSET
4656  023662  001402                          BEQ     20$             ;BR IF YES
4657  023664  000137  022430                  JMP     1$              ;ELSE DO NEXT POS OFFSET
4658
4659  023670  012702  000201          20$:    MOV     #201,R2         ;SETUP NEG OFFSET FOR RKASOF
4660  023674  012701  000101                  MOV     #101,R1         ;SETUP NEG OFFSET OFOR MSG A
```

```
 4661  023700  000137  022430                    JMP     1$              ;DO NEG OFFSET
 4662
 4663  023704  005201                    18$:    INC     R1
 4664  023706  005202                            INC     R2
 4665  023710  020227  000261                    CMP     R2,#261         ;SEE IF ALL NEG OFFSETS DONE
 4666  023714  001402                            BEQ     TST14           ;;GO TO NEXT TST
 4667  023716  000137  022430                    JMP     1$              ;DO ANOTHER
 4668
 4669                                    ;;*****************************************************************
 4670                                    ;*TEST 14       TEST READ DATA AT ALL HEAD OFFSET POSITIONS
 4671                                    ;*
 4672                                    ;*      THIS TEST VERIFIES THAT THE HEAD OFFSET LOGIC IS OPERATIONAL BY
 4673                                    ;*      WRITING ALL 1'S PATTERNS ON CYLINDER 0, HEAD 0. THEN
 4674                                    ;*      PERFORMING READ DATA FROM CENTERLINE AND MOVING OUT + AND - OFFSET
 4675                                    ;*      POSITIONS UNTIL A FAILURE OCCURES.  THE FAILING OFFSET POSITIONS
 4676                                    ;*      ARE PRINTED OUT IF LESS THAN THE OFFSET TOLERANCE TO BE SPECIFIED.
 4677                                    ;*      OFFSET CODES ARE ALSO VERIFIED BY READING MSG A, STATUS 00 & 10.
 4678                                    ;*
 4679                                    ;*      ALL HEADS ARE TESTED AT CYLINDER 0
 4680                                    ;*      IF THERE ARE NO FAILURES AT ALL, THIS INDICATES THAT
 4681                                    ;*
 4682                                    ;*              A. HEADS DID NOT MOVE AT ALL
 4683                                    ;*      OR      B. THE COMBINATION OF DISC SURFACE, HEADS, R/W AMP
 4684                                    ;*                 ARE EXCEPTIONALLY GOOD.
 4685                                    ;*
 4686                                    ;*      AN APPROPRIATE MESSAGE WILL BE TYPED.
 4687                                    ;*
 4688                                    ;;*****************************************************************
 4689  023722  000004                    TST14:  SCOPE
 4690  023724  012737  000001  001174            MOV     #1,$TIMES       ;;DO 1 ITERATION
 4691  023732  012706  001100                    MOV     #STACK,SP       ;RESTORE STK PTR
 4692
 4693  023736  004737  040452                    JSR     PC,SUBCLR
 4694  023742  104024                            ERROR   24              ;CERR AFTER SCLR
 4695
 4696  023744  012765  001514  000004            MOV     #DATA1,RKBA(R5) ;WRITE ALL 1'S
 4697  023752  052765  000020  000010            BIS     #BAI,RKCS2(R5)  ;BUSS ADDR INCR INHIBIT
 4698  023760  012765  177400  000002            MOV     #-256.,RKWC(R5) ;SECTOR 0 ONLY
 4699                                                                    ;WILL DO AN IMPLIED SEEK TO CYL 0.
 4700                                                                    ;WAS ON CYL 1 FROM LAST TEST
 4701  023766  005037  001406                    CLR     SECTOR
 4702  023772  013765  001406  000006    11$:    MOV     SECTOR,RKDA(R5)
 4703
 4704  024000  012765  000023  000000            MOV     #<WRDATA>,RKCS1(R5)     ;WRITE DATA CMD
 4705  024006  013737  001424  007426            MOV     T50000,TEMP1    ;SETUP TIMEOUT
 4706  024014  004737  036542                    JSR     PC,FRDY         ;FIND RDY
 4707  024020  104011                            ERROR   11              ;NO RDY AFTER WRITE DATA CMD
 4708  024022  004737  040100                    JSR     PC,GSTAT        ;GET FRESH STATUS
 4709  024026  032737  100000  007370            BIT     #CERR,HCS1
 4710  024034  001465                            BEQ     67$             ;BR IF NO ERRORS
 4711
 4712  024036  032737  000200  007404            BIT     #BSE,HER        ;SEE IF BAD SECTOR FLAG
 4713  024044  001421                            BEQ     65$             ;BR IF NO
 4714  024046  004737  042122                    JSR     PC,TRUERR       ;ELSE SEE IF SECTOR LISTED IN BSE TABLE
 4715  024052  000455                            BR      66$             ;RETURN HERE IF NO
 4716
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4717  024054  005237  001406                    INC     SECTOR                  ;RETURN HERE IF YES
4718  024060  023727  001406  000012            CMP     SECTOR,#10.             ;ARE 10 CONSEC. SECTORS BAD
4719  024066  001003                            BNE     64$                     ;BR IF NO
4720  024070  104046                            ERROR   46                      ;ABORTING TEST DETECTED 10 BAD SECTORS
4721  024072  000137  025534                    JMP     10$                     ;BYPASS TEST
4722  024076  012765  100000  000000  64$:      MOV     #CCLR,RKCS1(R5)         ;TRY ANOTHER SECTOR
4723  024104  000137  023772                    JMP     11$
4724  024110  104012                  65$:      ERROR   12                      ;CERR WITH WRITE DATA CMD
4725
4726  024112  012737  010340  007460            MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4727  024120  005037  007462                    CLR     E.B0                    ;EXPECTED MSG B0
4728  024124  012737  001720  007464            MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4729  024132  012737  000001  007466            MOV     #1,E.B1                 ;MSG ID FOR EXPECTED MSG B1
4730  024140  005037  007470                    CLR     E.A2                    ;EXPECTED MSG A2
4731  024144  012737  000002  007472            MOV     #2,E.B2                 ;MSG ID FOR EXPECTED MSG B2
4732  024152  012737  000003  007476            MOV     #3,E.B3                 ;MSG ID FOR EXPECTED MSG B3
4733
4734  024160  004737  037264                    JSR     PC,CHKMSG               ;CHECK MSGS A0, B0, A1, B1
4735  024164  000003                            .WORD   T.A2!T.B2!0                     ;& MSGS SPECIFIED HERE
4736  024166  104052                            ERROR   52                      ;MSG A0 ERROR AFTER WRITE DATA CMD
4737  024170  104023                            ERROR   23                      ;MSH B0 ERROR
4738  024172  104053                            ERROR   53                      ;MSG A1 ERROR
4739  024174  104025                            ERROR   25                      ;MSG B1 ERROR
4740  024176  104401  053155                    TYPE    ,MSG26                  ;ABORTING DATA TESTS TO DO TIMING
4741  024202  000137  031706                    JMP     TIMING
4742  024206  104063                  66$:      ERROR   63                      ;BAD SECTOR NOT LISTED IN TABLE
4743  024210                           67$:
4744
4745  024210  012737  010340  007460            MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4746  024216  005037  007462                    CLR     E.B0                    ;EXPECTED MSG B0
4747  024222  012737  001720  007464            MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4748  024230  012737  000001  007466            MOV     #1,E.B1                 ;MSG ID FOR EXPECTED MSG B1
4749  024236  005037  007470                    CLR     E.A2                    ;EXPECTED MSG A2
4750  024242  012737  000002  007472            MOV     #2,E.B2                 ;MSG ID FOR EXPECTED MSG B2
4751  024250  012737  000003  007476            MOV     #3,E.B3                 ;MSG ID FOR EXPECTED MSG B3
4752
4753  024256  004737  037264                    JSR     PC,CHKMSG               ;CHECK MSGS A0, B0, A1, B1
4754  024262  000003                            .WORD   T.A2!T.B2!0                     ;& MSGS SPECIFIED HERE
4755  024264  104052                            ERROR   52                      ;MSG A0 ERROR AFTER WRITE DATA CMD
4756  024266  104023                            ERROR   23                      ;MSH B0 ERROR
4757  024270  104053                            ERROR   53                      ;MSG A1 ERROR
4758  024272  104025                            ERROR   25                      ;MSG B1 ERROR
4759  024274  012765  001514  000004            MOV     #DATA1,RKBA(R5)
4760  024302  052765  000020  000010            BIS     #BAI,RKCS2(R5)
4761  024310  012765  177400  000002            MOV     #-256.,RKWC(R5)
4762  024316  013765  001406  000006            MOV     SECTOR,RKDA(R5)
4763
4764  024324  012765  000031  000000            MOV     #<WRTCHK>,RKCS1(R5)     ;WRITE CHECK CMD
4765  024332  013737  001424  007426            MOV     T50000,TEMP1            ;SETUP TIMEOUT
4766  024340  004737  036542                    JSR     PC,FRDY                 ;FIND RDY
4767  024344  104015                            ERROR   15                      ;NO RDY AFTER WRITE CHECK CMD
4768  024346  004737  040100                    JSR     PC,GSTAT                ;GET FRESH STATUS
4769  024352  032737  100000  007370            BIT     #CERR,HCS1
4770  024360  001453                            BEQ     69$
4771  024362  032737  040000  007372            BIT     #WCE,HCS2               ;SEE IF WRITE CHECK ERROR
4772  024370  001410                            BEQ     68$
```

```
4773  024372  016537  000024  001466          MOV     RKDB(R5),WD1    ;ACTUAL WORD FOR PRINTOUT
4774  024400  013737  001514  001470          MOV     DATA1,WD2               ;EXPECTED WORD FOR TYPEOUT
4775  024406  104016                          ERROR   16              ;WCE AFTER WRITE CMD
4776  024410  000437                          BR      69$
4777
4778  024412  104022                  68$:    ERROR   22              ;CERR AFTER WRITE CHECK CMD
4779
4780  024414  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4781  024422  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
4782  024426  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4783  024434  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
4784  024442  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
4785  024446  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
4786  024454  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
4787
4788  024462  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
4789  024466  000003                          .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
4790  024470  104057                          ERROR   57              ;MSG A0 ERROR AFTER WRITE CHECK CMD
4791  024472  104031                          ERROR   31              ;MSH B0 ERROR
4792  024474  104060                          ERROR   60              ;MSG A1 ERROR
4793  024476  104032                          ERROR   32              ;MSG B1 ERROR
4794  024500  104401  053155                  TYPE    ,MSG26          ;ABORTING DATA TESTS
4795  024504  000137  031706                  JMP     @TIMING
4796
4797  024510                          69$:
4798
4799  024510  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
4800  024516  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
4801  024522  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
4802  024530  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
4803  024536  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
4804  024542  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
4805  024550  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
4806
4807  024556  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
4808  024562  000003                          .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
4809  024564  104057                          ERROR   57              ;MSG A0 ERROR AFTER WRITE CHECK CMD
4810  024566  104031                          ERROR   31              ;MSH B0 ERROR
4811  024570  104060                          ERROR   60              ;MSG A1 ERROR
4812  024572  104032                          ERROR   32              ;MSG B1 ERROR
4813
4814  024574  104401  052053                  TYPE    ,MSG8           ;READ WITH OFFSET TEST
4815  024600  005001                          CLR     R1              ;HEAD #
4816
4817  024602  012700  000001          9$:     MOV     #1,R0           ;INIT OFFSET COUNTER
4818  024606  104401  052112                  TYPE    ,MSG9           ;HEAD #
4819  024612  010146                          MOV     R1,-(SP)        ;;SAVE R1 FOR TYPEOUT
4820                                                                  ;;TYPE HEAD #
4821  024614  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
4822  024616     001                          .BYTE   1               ;;TYPE 1 DIGIT(S)
4823  024617     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
4824  024620  104401  001205                  TYPE    ,$CRLF
4825
4826  024624  005037  001472          1$:     CLR     OFFERR          ;WRITE CHECK ERROR FLAG
4827
4828  024630  004737  040452                  JSR     PC,SUBCLR
```

```
 4829  024634  104024                          ERROR   24                  ;CERR AFTER SCLR
 4830
 4831  024636  010065  000016                  MOV     R0,RKASOF(R5)       ;OFFSET VALUE
 4832  024642  000301                          SWAB    R1
 4833  024644  010165  000006                  MOV     R1,RKDA(R5)         ;HEAD NO.
 4834  024650  000301                          SWAB    R1
 4835
 4836  024652  012737  024746  001176          MOV     #70$,$ESCAPE
 4837  024660  012765  000015  000000          MOV     #OFFSET,RKCS1(R5)   ;OFFSET CMD
 4838  024666  013737  001420  007426          MOV     T100,TEMP1          ;SETUP TIMEOUT
 4839  024674  004737  036542                  JSR     PC,FRDY
 4840  024700  104033                          ERROR   33                  ;NO RDY AFTER OFFSET CMD
 4841
 4842  024702  012737  032140  007460          MOV     #<D.PIP!D.SPIN!D.OFF!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
 4843  024710  005037  007462                  CLR     E.B0
 4844  024714  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1
 4845  024722  012737  000001  007466          MOV     #1,E.B1
 4846
 4847  024730  004737  037264                  JSR     PC,CHKMSG           ;CHECK MSGS A0, B0, A1, B1
 4848  024734  000000                          .WORD   0!0!0               ;& MSGS SPECIFIED HERE
 4849  024736  104035                          ERROR   35                  ;MSG A0 ERROR DURING OFFSET CMD
 4850  024740  104061                          ERROR   61                  ;MSH B0 ERROR
 4851  024742  104036                          ERROR   36                  ;MSG A1 ERROR
 4852  024744  104062                          ERROR   62                  ;MSG B1 ERROR
 4853
 4854  024746  005037  001176          70$:    CLR     $ESCAPE
 4855  024752  013737  001422  007426          MOV     T5000,TEMP1         ;SETUP TIMEOUT
 4856  024760  004737  037152                  JSR     PC,FATT2            ;FIND ATTN
 4857  024764  104034                          ERROR   34                  ;NO ATTN AFTER OFFSET CMD
 4858
 4859
 4860  024766  012737  052340  007460          MOV     #<D.DSC!D.OFF!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
 4861  024774  005037  007462                  CLR     E.B0                ;EXPECTED MSG B0
 4862  025000  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
 4863  025006  012737  000001  007466          MOV     #1,E.B1             ;MSG ID FOR EXPECTED MSG B1
 4864  025014  005037  007470                  CLR     E.A2                ;EXPECTED MSG A2
 4865  025020  012737  000002  007472          MOV     #2,E.B2             ;MSG ID FOR EXPECTED MSG B2
 4866  025026  012737  000003  007476          MOV     #3,E.B3             ;MSG ID FOR EXPECTED MSG B3
 4867
 4868  025034  004737  037264                  JSR     PC,CHKMSG           ;CHECK MSGS A0, B0, A1, B1
 4869  025040  000003                          .WORD   T.A2!T.B2!0                 ;& MSGS SPECIFIED HERE
 4870  025042  104260                          ERROR   260                 ;MSG A0 ERROR AFTER OFFSET CMD
 4871  025044  104261                          ERROR   261                 ;MSH B0 ERROR
 4872  025046  104037                          ERROR   37                  ;MSG A1 ERROR
 4873  025050  104040                          ERROR   40                  ;MSG B1 ERROR
 4874
 4875
 4876  025052  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
 4877  025060  013765  001222  000010          MOV     $UNIT,RKCS2(R5)     ;DRIVE#
 4878  025066  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)            ;DRIVE CLEAR CMD
 4879  025074  013737  001412  007426          MOV     T10,TEMP1           ;SETUP TIMEOUT
 4880  025102  004737  036542                  JSR     PC,FRDY             ;FIND RDY
 4881  025106  104151                          ERROR   151                 ;NO RDY AFTER DRIVE CLEAR CMD
 4882  025110  004737  037024                  JSR     PC,TSTATN           ;TEST FOR ATTN
 4883  025114  000401                          BR      71$
 4884  025116  104154                          ERROR   154                 ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
```

```
 4885  025120                          71$:
 4886
 4887  025120  012765  001514  000004          MOV     #DATA1,RKBA(R5)
 4888  025126  052765  000020  000010          BIS     #BAI,RKCS2(R5)
 4889  025134  012765  177400  000002          MOV     #-256.,RKWC(R5)
 4890  025142  013765  001406  000006          MOV     SECTOR,RKDA(R5)
 4891  025150  012765  000031  000000          MOV     #WRTCHK,RKCS1(R5)  ;WRITE CHECK CMD
 4892  025156  012737  141520  007426          MOV     #50000.,TEMP1      ;SETUP TIMEOUT
 4893  025164  004737  036542                  JSR     PC,FRDY            ;FIND RDY
 4894  025170  104015                          ERROR   15                 ;NO RDY AFTER WRITE CHECK CMD
 4895  025172  004737  040100                  JSR     PC,GSTAT           ;GET FRESH STATUS
 4896  025176  032737  040000  007372          BIT     #WCE,HCS2
 4897  025204  001421                          BEQ     2$
 4898
 4899  025206  016537  000024  001466          MOV     RKDB(R5),WD1       ;GET MISCOMPARED WORD
 4900  025214  005237  001472                  INC     OFFERR             ;BAD WRITE CHK ERROR=SET ERR FLG.
 4901
 4902  025220  005737  001472                  TST     OFFERR
 4903  025224  001411                          BEQ     2$
 4904  025226  104401  054301                  TYPE    ,MSG39             ;WRITE CHECK FAILURE AT OFFSET
 4905  025232  010046                          MOV     R0,-(SP)           ;;SAVE R0 FOR TYPEOUT
 4906                                                                     ;;TYPE OFFSET VALUE
 4907  025234  104403                          TYPOS                      ;;GO TYPE--OCTAL ASCII
 4908  025236     006                          .BYTE   6                  ;;TYPE 6 DIGITS
 4909  025237     000                          .BYTE   0                  ;;SUPPRESS LEADING ZEROS
 4910  025240  104401  001205                  TYPE    ,$CRLF
 4911  025244  104401  001205                  TYPE    ,$CRLF
 4912
 4913  025250  032700  000200          2$:     BIT     #BIT7,R0           ;SEE IF OFFSET IS + OR -
 4914  025254  001023                          BNE     5$                 ;BR IF - OFFSET
 4915
 4916  025256  020027  000060                  CMP     R0,#60
 4917  025262  001412                          BEQ     4$
 4918  025264  005737  001472                  TST     OFFERR
 4919  025270  001404                          BEQ     3$
 4920  025272  012700  000200          8$:     MOV     #200,R0            ;SETUP FOR NEG OFFSET
 4921  025276  000137  024624                  JMP     1$
 4922
 4923  025302  005200                  3$:     INC     R0
 4924  025304  000137  024624                  JMP     1$
 4925
 4926  025310  005737  001472          4$:     TST     OFFERR
 4927  025314  001366                          BNE     8$                 ;DO NEG OFFSETS
 4928  025316  104401  054143                  TYPE    ,MSG37             ;NO WRITE CHECK ERROR AT MAX POS OFFSET
 4929                                                                     ;NOTE! EITHER HEADS DID NOT MOVE
 4930                                                                     ;OR READ/WRITE AMP IS EXCEPTIONALLY GOOD.
 4931  025322  000763                          BR      8$                 ;DO NEG OFFSETS
 4932
 4933  025324  020027  000260          5$:     CMP     R0,#260
 4934  025330  001404                          BEQ     6$
 4935  025332  005737  001472                  TST     OFFERR
 4936  025336  001076                          BNE     TST15              ;;GO TO NEXT TST
 4937  025340  000760                          BR      3$
 4938
 4939  025342  005737  001472          6$:     TST     OFFERR
 4940  025346  001002                          BNE     7$
```

```
4941  025350  104401  054221                TYPE    ,MSG38          ;NO WRITE CHECK ERROR AT MAX NEG OFFSET
4942                                                                  ;NOTE! EITHER HEADS DID NOT MOVE
4943                                                                  ;OR READ/WRITE AMP IS EXECEPTIONALLY GOOD.
4944  025354                        7$:
4945
4946  025354  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
4947  025362  013765  001222  000010        MOV     $UNIT,RKCS2(R5)
4948  025370  012765  000013  000000        MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
4949                                                                  ;RESET CYL DIFF/OFFSET & CYL ADDR REG
4950                                                                  ;IN RKMR2 & RKMR3 RESP.
4951  025376  013737  001412  007426        MOV     T10,TEMP1       ;SETUP TIMEOUT
4952  025404  004737  036542                JSR     PC,FRDY         ;FIND RDY
4953  025410  104124                        ERROR   124             ;RDY NOT SET AFTER RECAL CMD
4954
4955  025412  012765  000001  000026        MOV     #1,RKMR1(R5)    ;SELECT WORD 1
4956  025420  004737  040100                JSR     PC,GSTAT
4957  025424  032737  020000  007416        BIT     #D.RTZ,HMR2
4958  025432  001001                        BNE     72$
4959  025434  104244                        ERROR   244             ;RTZ NOT SET DURING RECAL CMD
4960  025436  013737  001412  007430  72$:  MOV     T10,TEMP2       ;SETUP TIMEOUT
4961  025444  004737  037056                JSR     PC,FATT1        ;FIND ATTN
4962  025450  104055                        ERROR   55              ;NO ATTN AFTER RECAL CMD
4963
4964  025452  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
4965  025460  013765  001222  000010        MOV     $UNIT,RKCS2(R5) ;DRIVE#
4966  025466  012765  000005  000000        MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
4967  025474  013737  001412  007426        MOV     T10,TEMP1       ;SETUP TIMEOUT
4968  025502  004737  036542                JSR     PC,FRDY         ;FIND RDY
4969  025506  104151                        ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
4970  025510  004737  037024                JSR     PC,TSTATN       ;TEST FOR ATTN
4971  025514  000401                        BR      73$
4972  025516  104154                        ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
4973  025520                        73$:
4974
4975
4976  025520  005201                        INC     R1              ;HEAD CTR
4977  025522  020127  000003                CMP     R1,#3           ;SEE IF ALL HEADS DONE
4978  025526  001402                        BEQ     TST15           ;;BR IF YES
4979  025530  000137  024602                JMP     9$              ;ELSE REPEAT ALL FOR NEXT HEAD
4980  025534                        10$:
4981                                        ;;*****************************************************************
4982                                        ;*TEST 15       WRITE WITH HEADS OFFSET
4983                                        ;*
4984                                        ;*      THIS TEST VERIFIES THAT WHEN ATTEMPTING TO
4985                                        ;*      WRITE WITH HEADS OFFSET THAT THE OFFSET WILL CLEAR
4986                                        ;*      & THE DRIVE WILL WRITE
4987                                        ;*      SINCE THE WRITE COMMAND HAS AN IMPLIED RTC.
4988                                        ;*      THIS TEST IS PERFORMED FOR MAX POS & NEG OFFSETS ONLY
4989                                        ;*
4990                                        ;;*****************************************************************
4991  025534  000004                TST15:  SCOPE
4992  025536  012737  000001  001174        MOV     #1,$TIMES       ;;DO 1 ITERATION
4993  025544  012706  001100                MOV     #STACK,SP       ;RESTORE STK PTR
4994
4995  025550  012700  000260                MOV     #260,R0         ;MAX NEG OFFSET
4996
```

```
 4997  025554  004737  040452          1$:     JSR     PC,SUBCLR
 4998  025560  104024                          ERROR   24                      ;CERR AFTER SCLR
 4999
 5000  025562  010065  000016                  MOV     R0,RKASOF(R5)   ;SET OFFSET
 5001
 5002  025566  012737  025662  001176          MOV     #64$,$ESCAPE
 5003  025574  012765  000015  000000          MOV     #OFFSET,RKCS1(R5)  ;OFFSET CMD
 5004  025602  013737  001420  007426          MOV     T100,TEMP1      ;SETUP TIMEOUT
 5005  025610  004737  036542                  JSR     PC,FRDY
 5006  025614  104033                          ERROR   33              ;NO RDY AFTER OFFSET CMD
 5007
 5008  025616  012737  032140  007460          MOV     #<D.PIP!D.SPIN!D.OFF!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
 5009  025624  005037  007462                  CLR     E.B0
 5010  025630  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1
 5011  025636  012737  000001  007466          MOV     #1,E.B1
 5012
 5013  025644  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
 5014  025650  000000                          .WORD   0!0!0           ;& MSGS SPECIFIED HERE
 5015  025652  104035                          ERROR   35              ;MSG A0 ERROR DURING OFFSET CMD
 5016  025654  104061                          ERROR   61              ;MSH B0 ERROR
 5017  025656  104036                          ERROR   36              ;MSG A1 ERROR
 5018  025660  104062                          ERROR   62              ;MSG B1 ERROR
 5019
 5020  025662  005037  001176          64$:    CLR     $ESCAPE
 5021  025666  013737  001422  007426          MOV     T5000,TEMP1     ;SETUP TIMEOUT
 5022  025674  004737  037152                  JSR     PC,FATT2        ;FIND ATTN
 5023  025700  104034                          ERROR   34              ;NO ATTN AFTER OFFSET CMD
 5024
 5025
 5026  025702  012737  052340  007460          MOV     #<D.DSC!D.OFF!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
 5027  025710  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
 5028  025714  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
 5029  025722  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
 5030  025730  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
 5031  025734  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
 5032  025742  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
 5033
 5034  025750  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
 5035  025754  000003                          .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
 5036  025756  104260                          ERROR   260             ;MSG A0 ERROR AFTER OFFSET CMD
 5037  025760  104261                          ERROR   261             ;MSH B0 ERROR
 5038  025762  104037                          ERROR   37              ;MSG A1 ERROR
 5039  025764  104040                          ERROR   40              ;MSG B1 ERROR
 5040
 5041
 5042  025766  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
 5043  025774  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;DRIVE#
 5044  026002  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
 5045  026010  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
 5046  026016  004737  036542                  JSR     PC,FRDY         ;FIND RDY
 5047  026022  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
 5048  026024  004737  037024                  JSR     PC,TSTATN       ;TEST FOR ATTN
 5049  026030  000401                          BR      65$
 5050  026032  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
 5051  026034                          65$:
 5052
```

```
5053
5054  026034  012765  001510  000004          MOV     #DATA0,RKBA(R5) ;WRITE ALL 0'S
5055  026042  052765  000020  000010          BIS     #BAI,RKCS2(R5)  ;BUS ADDR INCR INHIBIT
5056  026050  012765  177400  000002          MOV     #-256.,RKWC(R5) ;SECTOR 0 ONLY
5057  026056  005037  001406                  CLR     SECTOR
5058  026062  013765  001406  000006  4$:     MOV     SECTOR,RKDA(R5)
5059
5060  026070  012765  000023  000000          MOV     #<WRDATA>,RKCS1(R5)     ;WRITE DATA CMD
5061  026076  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP TIMEOUT
5062  026104  004737  036542                  JSR     PC,FRDY         ;FIND RDY
5063  026110  104011                          ERROR   11              ;NO RDY AFTER WRITE DATA CMD
5064  026112  004737  040100                  JSR     PC,GSTAT        ;GET FRESH STATUS
5065  026116  032737  100000  007370          BIT     #CERR,HCS1
5066  026124  001465                          BEQ     69$             ;BR IF NO ERRORS
5067
5068  026126  032737  000200  007404          BIT     #BSE,HER        ;SEE IF BAD SECTOR FLAG
5069  026134  001421                          BEQ     67$             ;BR IF NO
5070  026136  004737  042122                  JSR     PC,TRUERR       ;ELSE SEE IF SECTOR LISTED IN BSE TABLE
5071  026142  000455                          BR      68$             ;RETURN HERE IF NO
5072
5073  026144  005237  001406                  INC     SECTOR          ;RETURN HERE IF YES
5074  026150  023727  001406  000012          CMP     SECTOR,#10.     ;ARE 10 CONSEC. SECTORS BAD
5075  026156  001003                          BNE     66$             ;BR IF NO
5076  026160  104046                          ERROR   46              ;ABORTING TEST DETECTED 10 BAD SECTORS
5077  026162  000137  027102                  JMP     3$              ;BYPASS TEST
5078  026166  012765  100000  000000  66$:     MOV     #CCLR,RKCS1(R5) ;TRY ANOTHER SECTOR
5079  026174  000137  026062                  JMP     4$
5080  026200  104012                  67$:    ERROR   12              ;CERR WITH WRITE DATA CMD
5081
5082  026202  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
5083  026210  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
5084  026214  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5085  026222  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
5086  026230  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
5087  026234  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
5088  026242  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
5089
5090  026250  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
5091  026254  000003                          .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
5092  026256  104052                          ERROR   52              ;MSG A0 ERROR AFTER WRITE DATA CMD
5093  026260  104023                          ERROR   23              ;MSH B0 ERROR
5094  026262  104053                          ERROR   53              ;MSG A1 ERROR
5095  026264  104025                          ERROR   25              ;MSG B1 ERROR
5096  026266  104401  053155                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
5097  026272  000137  031706                  JMP     TIMING
5098  026276  104063                  68$:    ERROR   63              ;BAD SECTOR NOT LISTED IN TABLE
5099  026300                           69$:
5100
5101  026300  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
5102  026306  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
5103  026312  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5104  026320  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
5105  026326  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
5106  026332  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
5107  026340  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
5108
```

```
5109  026346  004737  037264          JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
5110  026352  000003                  .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
5111  026354  104052                  ERROR   52              ;MSG A0 ERROR AFTER WRITE DATA CMD
5112  026356  104023                  ERROR   23              ;MSH B0 ERROR
5113  026360  104053                  ERROR   53              ;MSG A1 ERROR
5114  026362  104025                  ERROR   25              ;MSG B1 ERROR
5115
5116  026364  005737  001362          TST     CYLDIF          ;SEE IF MSG A2=0
5117  026370  001401                  BEQ     70$             ;BR IF YES
5118  026372  104104                  ERROR   104             ;MSG A2 NOT CLEARED AFTER WRITE CMD WITH OFFSET
5119  026374  005737  001364  70$:    TST     CYLADD          ;SEE IF MSG B2=0
5120  026400  001401                  BEQ     71$             ;BR IF YES
5121  026402  104105                  ERROR   105             ;MSG B2 NOT CLEARED AFTER WRITE CMD WITH OFFSET
5122  026404                  71$:
5123
5124  026404  104415                  SCOP1
5125  026406  012706  001100          MOV     #STACK,SP       ;RESTORE STK PTR
5126
5127  026412  004737  040452          JSR     PC,SUBCLR
5128  026416  104024                  ERROR   24              ;CERR AFTER SCLR
5129
5130
5131  026420  012765  001510  000004  MOV     #DATA0,RKBA(R5)
```

```
5132  026426  052765  000020  000010          BIS     #BAI,RKCS2(R5)
5133  026434  012765  177400  000002          MOV     #-256.,RKWC(R5)
5134  026442  013765  001406  000006          MOV     SECTOR,RKDA(R5)
5135
5136  026450  012765  000031  000000          MOV     #<WRTCHK>,RKCS1(R5)     ;WRITE CHECK CMD
5137  026456  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP TIMEOUT
5138  026464  004737  036542                  JSR     PC,FRDY         ;FIND RDY
5139  026470  104015                          ERROR   15              ;NO RDY AFTER WRITE CHECK CMD
5140  026472  004737  040100                  JSR     PC,GSTAT        ;GET FRESH STATUS
5141  026476  032737  100000  007370          BIT     #CERR,HCS1
5142  026504  001453                          BEQ     73$
5143  026506  032737  040000  007372          BIT     #WCE,HCS2       ;SEE IF WRITE CHECK ERROR
5144  026514  001410                          BEQ     72$
5145  026516  016537  000024  001466          MOV     RKDB(R5),WD1    ;ACTUAL WORD FOR PRINTOUT
5146  026524  013737  001510  001470          MOV     DATA0,WD2               ;EXPECTED WORD FOR TYPEOUT
5147  026532  104016                          ERROR   16              ;WCE AFTER WRITE CMD
5148  026534  000437                          BR      73$
5149
5150  026536  104022                  72$:    ERROR   22              ;CERR AFTER WRITE CHECK CMD
5151
5152  026540  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
5153  026546  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
5154  026552  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5155  026560  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
5156  026566  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
5157  026572  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
5158  026600  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
5159
5160  026606  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
5161  026612  000003                          .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
5162  026614  104057                          ERROR   57              ;MSG A0 ERROR AFTER WRITE CHECK CMD
5163  026616  104031                          ERROR   31              ;MSH B0 ERROR
5164  026620  104060                          ERROR   60              ;MSG A1 ERROR
5165  026622  104032                          ERROR   32              ;MSG B1 ERROR
5166  026624  104401  053155                  TYPE    ,MSG26          ;ABORTING DATA TESTS
5167  026630  000137  031706                  JMP     TIMING
5168
5169  026634                          73$:
5170
5171  026634  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
5172  026642  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
5173  026646  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5174  026654  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
5175  026662  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
5176  026666  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
5177  026674  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
5178
5179  026702  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
5180  026706  000003                          .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
5181  026710  104057                          ERROR   57              ;MSG A0 ERROR AFTER WRITE CHECK CMD
5182  026712  104031                          ERROR   31              ;MSH B0 ERROR
5183  026714  104060                          ERROR   60              ;MSG A1 ERROR
5184  026716  104032                          ERROR   32              ;MSG B1 ERROR
5185
```

```
5186  026720  020027  000260                  CMP     R0,#260
5187  026724  001004                          BNE     2$              ;BR IF JUST DID POS OFFSET
5188  026726  012700  000060                  MOV     #60,R0          ;ELSE SETUP FOR POS OFFSET
5189  026732  000137  025554                  JMP     1$
5190
5191  026736                          2$:
5192
5193  026736  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
5194  026744  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
5195  026752  012765  000013  000000          MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
5196                                          ;RESET CYL DIFF/OFFSET & CYL ADDR REG
5197                                          ;IN RKMR2 & RKMR3 RESP.
5198  026760  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
5199  026766  004737  036542                  JSR     PC,FRDY         ;FIND RDY
5200  026772  104124                          ERROR   124             ;RDY NOT SET AFTER RECAL CMD
5201
5202  026774  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
5203  027002  004737  040100                  JSR     PC,GSTAT
5204  027006  032737  020000  007416          BIT     #D.RTZ,HMR2
5205  027014  001001                          BNE     74$
5206  027016  104244                          ERROR   244             ;RTZ NOT SET DURING RECAL CMD
5207  027020  013737  001412  007430  74$:    MOV     T10,TEMP2       ;SETUP TIMEOUT
5208  027026  004737  037056                  JSR     PC,FATT1        ;FIND ATTN
5209  027032  104055                          ERROR   55              ;NO ATTN AFTER RECAL CMD
5210
5211  027034  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
5212  027042  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;DRIVE#
5213  027050  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
5214  027056  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
5215  027064  004737  036542                  JSR     PC,FRDY         ;FIND RDY
5216  027070  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
5217  027072  004737  037024                  JSR     PC,TSTATN       ;TEST FOR ATTN
5218  027076  000401                          BR      75$
5219  027100  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
5220  027102                          75$:
5221
5222
5223  027102                          3$:
5224
```

```
                        ;;*****************************************************************
                        ;*TEST 16       TEST CURRENT CROSS-OVER CYLINDERS
                        ;*
                        ;*      THIS TEST VERIFIES THAT THE DRIVE CAN WRITE & READ OFF
                        ;*      CURRENT CHANGE CYLINDERS X & Y IN THE FOLLOWING WAY:
                        ;*
                        ;*      SPIRAL WRITING IS PERFORMED FROM CYLINDER X TO CYLINDER Y
                        ;*      WITH A DATA PATTERN FILLING THE ENTIRE 2 CYLINDERS.
                        ;*
                        ;*      A WRITE CHECK IS THEN PREFORMED TO VERIFY DATA WAS PROPERLY WRITTEN.
                        ;*      THIS TEST IS PERFORMED FOR ALL 3 HEADS.
                        ;*
                        ;*      CYLINDER X:  63  127  191  255  319  383
                        ;*      CYLINDER Y:  64  128  192  256  320  384
                        ;*
                        ;;*****************************************************************
027102  000004          TST16:  SCOPE
027104  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
027112  012706  001100                  MOV     #STACK,SP

027116  012700  001426                  MOV     #CYL,R0         ;CYL ADDR TABLE

027122  004737  040452          1$:     JSR     PC,SUBCLR
027126  104024                          ERROR   24              ;CERR AFTER SCLR

027130  005037  001406                  CLR     SECTOR
027134  013765  001406  000006  5$:     MOV     SECTOR,RKDA(R5)

027142  011065  000020                  MOV     (R0),RKDC(R5)   ;CYL #
027146  012765  001516  000004          MOV     #DPAT1,RKBA(R5) ;DATA PATTERN
027154  052765  000020  000010          BIS     #BAI,RKCS2(R5)  ;BUSS ADDR INCREMENT INHIBIT
027162  012765  076000  000002          MOV     #-6*22.*256.,RKWC(R5) ;WORD COUNT TO SPIRAL & FILL 2 CYLINDERS

027170  012765  000023  000000          MOV     #<WRDATA>,RKCS1(R5)     ;WRITE DATA CMD
027176  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP TIMEOUT
027204  004737  036542                  JSR     PC,FRDY         ;FIND RDY
027210  104011                          ERROR   11              ;NO RDY AFTER WRITE DATA CMD
027212  004737  040100                  JSR     PC,GSTAT        ;GET FRESH STATUS
027216  032737  100000  007370          BIT     #CERR,HCS1
027224  001465                          BEQ     67$             ;BR IF NO ERRORS

027226  032737  000200  007404          BIT     #BSE,HER        ;SEE IF BAD SECTOR FLAG
027234  001421                          BEQ     65$             ;BR IF NO
027236  004737  042122                  JSR     PC,TRUERR       ;ELSE SEE IF SECTOR LISTED IN BSE TABLE
027242  000455                          BR      66$             ;RETURN HERE IF NO

027244  005237  001406                  INC     SECTOR          ;RETURN HERE IF YES
027250  023727  001406  000012          CMP     SECTOR,#10.     ;ARE 10 CONSEC. SECTORS BAD
027256  001003                          BNE     64$             ;BR IF NO
027260  104046                          ERROR   46              ;ABORTING TEST DETECTED 10 BAD SECTORS
027262  000137  030146                  JMP     2$              ;BYPASS TEST
027266  012765  100000  000000  64$:    MOV     #CCLR,RKCS1(R5) ;TRY ANOTHER SECTOR
027274  000137  027134                  JMP     5$
027300  104012                  65$:    ERROR   12              ;CERR WITH WRITE DATA CMD

027302  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.AO  ;EXPECTED MSG AO
```

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5281  027310  005037  007462                    CLR     E.B0                    ;EXPECTED MSG B0
5282  027314  012737  001720  007464            MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5283  027322  012737  000001  007466            MOV     #1,E.B1                 ;MSG ID FOR EXPECTED MSG B1
5284  027330  005037  007470                    CLR     E.A2                    ;EXPECTED MSG A2
5285  027334  012737  000002  007472            MOV     #2,E.B2                 ;MSG ID FOR EXPECTED MSG B2
5286  027342  012737  000003  007476            MOV     #3,E.B3                 ;MSG ID FOR EXPECTED MSG B3
5287
5288  027350  004737  037264                    JSR     PC,CHKMSG               ;CHECK MSGS A0, B0, A1, B1
5289  027354  000003                            .WORD   T.A2!T.B2!0                     ;& MSGS SPECIFIED HERE
5290  027356  104052                            ERROR   52                      ;MSG A0 ERROR AFTER WRITE DATA CMD
5291  027360  104023                            ERROR   23                      ;MSH B0 ERROR
5292  027362  104053                            ERROR   53                      ;MSG A1 ERROR
5293  027364  104025                            ERROR   25                      ;MSG B1 ERROR
5294  027366  104401  053155                    TYPE    ,MSG26                  ;ABORTING DATA TESTS TO DO TIMING
5295  027372  000137  031706                    JMP     TIMING
5296  027376  104063                  66$:      ERROR   63                      ;BAD SECTOR NOT LISTED IN TABLE
5297  027400                           67$:
5298
5299  027400  012737  010340  007460            MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
5300  027406  005037  007462                    CLR     E.B0                    ;EXPECTED MSG B0
5301  027412  012737  001720  007464            MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5302  027420  012737  000001  007466            MOV     #1,E.B1                 ;MSG ID FOR EXPECTED MSG B1
5303  027426  005037  007470                    CLR     E.A2                    ;EXPECTED MSG A2
5304  027432  012737  000002  007472            MOV     #2,E.B2                 ;MSG ID FOR EXPECTED MSG B2
5305  027440  012737  000003  007476            MOV     #3,E.B3                 ;MSG ID FOR EXPECTED MSG B3
5306
5307  027446  004737  037264                    JSR     PC,CHKMSG               ;CHECK MSGS A0, B0, A1, B1
5308  027452  000003                            .WORD   T.A2!T.B2!0                     ;& MSGS SPECIFIED HERE
5309  027454  104052                            ERROR   52                      ;MSG A0 ERROR AFTER WRITE DATA CMD
5310  027456  104023                            ERROR   23                      ;MSH B0 ERROR
5311  027460  104053                            ERROR   53                      ;MSG A1 ERROR
5312  027462  104025                            ERROR   25                      ;MSG B1 ERROR
5313
5314  027464  011065  000020                    MOV     (R0),RKDC(R5)
5315  027470  013765  001406  000006            MOV     SECTOR,RKDA(R5)
5316  027476  012765  001516  000004            MOV     #DPAT1,RKBA(R5)
```

```
5317  027504  052765  000020  000010          BIS     #BAI,RKCS2(R5)
5318  027512  012765  076000  000002          MOV     #-6*22.*256.,RKWC(R5)
5319
5320  027520  012765  000031  000000          MOV     #<WRTCHK>,RKCS1(R5)     ;WRITE CHECK CMD
5321  027526  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP TIMEOUT
5322  027534  004737  036542                  JSR     PC,FRDY         ;FIND RDY
5323  027540  104015                          ERROR   15              ;NO RDY AFTER WRITE CHECK CMD
5324  027542  004737  040100                  JSR     PC,GSTAT        ;GET FRESH STATUS
5325  027546  032737  100000  007370          BIT     #CERR,HCS1
5326  027554  001453                          BEQ     69$
5327  027556  032737  040000  007372          BIT     #WCE,HCS2       ;SEE IF WRITE CHECK ERROR
5328  027564  001410                          BEQ     68$
5329  027566  016537  000024  001466          MOV     RKDB(R5),WD1    ;ACTUAL WORD FOR PRINTOUT
5330  027574  013737  001516  001470          MOV     DPAT1,WD2               ;EXPECTED WORD FOR TYPEOUT
5331  027602  104016                          ERROR   16              ;WCE AFTER WRITE CMD
5332  027604  000437                          BR      69$
5333
5334  027606  104022                  68$:    ERROR   22              ;CERR AFTER WRITE CHECK CMD
5335
5336  027610  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
5337  027616  005037  007462                  CLR     E.B0                    ;EXPECTED MSG B0
5338  027622  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5339  027630  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
5340  027636  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
5341  027642  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
5342  027650  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
5343
5344  027656  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
5345  027662  000003                          .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
5346  027664  104057                          ERROR   57              ;MSG A0 ERROR AFTER WRITE CHECK CMD
5347  027666  104031                          ERROR   31              ;MSH B0 ERROR
5348  027670  104060                          ERROR   60              ;MSG A1 ERROR
5349  027672  104032                          ERROR   32              ;MSG B1 ERROR
5350  027674  104401  053155                  TYPE    ,MSG26          ;ABORTING DATA TESTS
5351  027700  000137  031706                  JMP     TIMING
5352
5353  027704                          69$:
5354
5355  027704  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
5356  027712  005037  007462                  CLR     E.B0                    ;EXPECTED MSG B0
5357  027716  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5358  027724  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
5359  027732  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
5360  027736  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
5361  027744  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
5362
5363  027752  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
5364  027756  000003                          .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
5365  027760  104057                          ERROR   57              ;MSG A0 ERROR AFTER WRITE CHECK CMD
5366  027762  104031                          ERROR   31              ;MSH B0 ERROR
5367  027764  104060                          ERROR   60              ;MSG A1 ERROR
5368  027766  104032                          ERROR   32              ;MSG B1 ERROR
5369  027770  022027  000577          3$:     CMP     (R0)+,#383.     ;ALL CYLINDERS DONE?
5370  027774  001402                          BEQ     4$              ;BR IF YES
5371  027776  000137  027122                  JMP     1$              ;ELSE REPEAT
5372
```

```
5373  030002                                4$:
5374
5375  030002  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
5376  030010  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
5377  030016  012765  000013  000000          MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
5378                                                                        ;RESET CYL DIFF/OFFSET & CYL ADDR REG
5379                                                                        ;IN RKMR2 & RKMR3 RESP.
5380  030024  013737  001412  007426          MOV     T10,TEMP1               ;SETUP TIMEOUT
5381  030032  004737  036542                  JSR     PC,FRDY                 ;FIND RDY
5382  030036  104124                          ERROR   124                     ;RDY NOT SET AFTER RECAL CMD
5383
5384  030040  012765  000001  000026          MOV     #1,RKMR1(R5)            ;SELECT WORD 1
5385  030046  004737  040100                  JSR     PC,GSTAT
5386  030052  032737  020000  007416          BIT     #D.RTZ,HMR2
5387  030060  001001                          BNE     70$
5388  030062  104244                          ERROR   244                     ;RTZ NOT SET DURING RECAL CMD
5389  030064  013737  001412  007430  70$:    MOV     T10,TEMP2               ;SETUP TIMEOUT
5390  030072  004737  037056                  JSR     PC,FATT1                ;FIND ATTN
5391  030076  104055                          ERROR   55                      ;NO ATTN AFTER RECAL CMD
5392
5393  030100  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
5394  030106  013765  001222  000010          MOV     $UNIT,RKCS2(R5)         ;DRIVE#
5395  030114  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
5396  030122  013737  001412  007426          MOV     T10,TEMP1               ;SETUP TIMEOUT
5397  030130  004737  036542                  JSR     PC,FRDY                 ;FIND RDY
5398  030134  104151                          ERROR   151                     ;NO RDY AFTER DRIVE CLEAR CMD
5399  030136  004737  037024                  JSR     PC,TSTATN               ;TEST FOR ATTN
5400  030142  000401                          BR      71$
5401  030144  104154                          ERROR   154                     ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
5402  030146                                71$:
5403
5404
5405  030146                                2$:
5406
5407                                        ;;*****************************************************************
5408                                        ;*TEST 17       TEST HEAD SWITCHING TIME
5409                                        ;*
5410                                        ;*      TESTS THE ABILITY TO SWITCH HEADS IN LESS THEN 10MS WHEN HEADS SPIRAL.
5411                                        ;*
5412                                        ;*      1. SECTOR 17 IS FIRST LOCATED AND A WRITE DATA COMMAND OF 512 WORDS
5413                                        ;*         TO SECTOR 21 IS ISSUED.
5414                                        ;*      2. THE PROGRAM NOW KNOWS THAT THE DRIVE WILL NOT HAVE TO TRAVEL
5415                                        ;*         A FULL REVOLUTION BEFORE FINDING SECTOR 21.
5416                                        ;*      3. SINCE EACH SECTOR TAKES APPROX. 1.2MS, THE TIME BETWEEN
5417                                        ;*         THE START OF THE WRITE COMMAND (FROM SECTOR 21, HEAD 0; TO
5418                                        ;*         SECTOR 0, HEAD 1) AND CONTROLLER READY SHOULD BE APPROX 6MS
5419                                        ;*
5420                                        ;*      THE ABOVE IS REPEATED FOR HEAD SWITCHING BETWEEN 1 TO 2
5421                                        ;*
5422                                        ;*      THIS TEST IS BYPASSED IF NEITHER L OR P CLOCK IS PRESENT
5423                                        ;*
5424                                        ;;*****************************************************************
5425  030146  000004                        TST17:  SCOPE
5426  030150  012737  000001  001174                MOV     #1,$TIMES       ;;DO 1 ITERATION
5427  030156  012706  001100                        MOV     #STACK,SP
5428
```

```
5429  030162  005737  007536          TST     DOTIM           ;BYPASS THIS TEST IF
5430  030166  001001                  BNE     1$              ;NEITHER L OR P CLOCK PRESENT
5431  030170  000520                  BR      TST20           ;;GO TO NEXT TEST
5432
5433  030172  012737  000025  007436  1$:     MOV     #25,TEMP5       ;HEAD 0, SECTOR 21 TO BE PUT IN RKDA
5434  030200  004737  040452          2$:     JSR     PC,SUBCLR
5435  030204  104024                          ERROR   24              ;CERR AFTER SCLR
5436
5437  030206  004737  041222                  JSR     PC,FSEC23       ;FIND SECTOR 23
5438  030212  104106                          ERROR   106             ;CANNOT FIND SECTOR 23
5439  030214  000506                  BR      TST20           ;;GO TO NEXT TEST
5440
5441  030216  012765  001512  000004          MOV     #DATA01,RKBA(R5) ;DATA 0101
5442  030224  052765  000020  000010          BIS     #BAI,RKCS2(R5)  ;BUSS ADDR INCREMENT INHIBIT
5443  030232  012765  177000  000002          MOV     #-512.,RKWC(R5) ;WORD COUNT
5444  030240  013765  007436  000006          MOV     TEMP5,RKDA(R5)  ;HEAD & SECTOR
5445  030246  012765  000023  000000          MOV     #WRDATA,RKCS1(R5) ;WRITE DATA CMD
5446
5447  030254  012727  002000  007426          MOV     #2000,#TEMP1
5448  030262  004737  037232                  JSR     PC,DLY          ;DO DELAY
5449
5450  030266  032765  000200  000000  7$:     BIT     #RDY,RKCS1(R5)  ;LOOK FOR CONTROLLER READY
5451  030274  001006                  BNE     8$
5452  030276  004737  036542                  JSR     PC,FRDY         ;FIND RDY AND GET FRESH STATUS
5453  030302  104011                          ERROR   11              ;NO RDY AFTER SEL DRV CMD
5454  030304  004737  040100                  JSR     PC,GSTAT
5455  030310  104107                          ERROR   107             ;HEAD SWITCHING LONGER THAN DELAY
5456
5457  030312  032765  100000  000000  8$:     BIT     #CERR,RKCS1(R5)
5458  030320  001444                  BEQ     3$
5459  030322  104012                          ERROR   12              ;CERR AFTER WRITE DATA
5460
5461  030324  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
5462  030332  005037  007462                  CLR     E.B0            ;EXPECTED MSG B0
5463  030336  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5464  030344  012737  000001  007466          MOV     #1,E.B1         ;MSG ID FOR EXPECTED MSG B1
5465  030352  005037  007470                  CLR     E.A2            ;EXPECTED MSG A2
5466  030356  012737  000002  007472          MOV     #2,E.B2         ;MSG ID FOR EXPECTED MSG B2
5467  030364  012737  000003  007476          MOV     #3,E.B3         ;MSG ID FOR EXPECTED MSG B3
5468
5469  030372  004737  037264                  JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
5470  030376  000000                          .WORD   0!0!0           ;& MSGS SPECIFIED HERE
5471  030400  104052                          ERROR   52              ;MSG A0 ERROR AFTER WRITE DATA CMD
5472  030402  104023                          ERROR   23              ;MSH B0 ERROR
5473  030404  104053                          ERROR   53              ;MSG A1 ERROR
5474  030406  104025                          ERROR   25              ;MSG B1 ERROR
5475
5476  030410  023727  007436  000425          CMP     TEMP5,#425      ;HEAD 1,SECTOR 21 DONE?
5477  030416  001405                  BEQ     TST20           ;;GO TO NEXT TEST
```

```
5478  030420  012737  000425  007436          MOV     #425,TEMP5
5479  030426  000137  030200                  JMP     2$                      ;ELSE REPEAT FOR HEAD 1, SECTOR 21
5480  030432                                  3$:
5481
5482                                          ;;**********************************************************************
5483                                          ;*TEST 20       DRIVE OFF TRACK TEST
5484                                          ;*
5485                                          ;*      THIS TEST CHECKS FOR SERVO OSCILLATIONS DURING SETTLING TIME BEYOND
5486                                          ;*      THE ALLOTED 3MS.
5487                                          ;*
5488                                          ;*      1.  INITIALLY, EVERY CYLINDER IS FORMATTED WITH IDENTICAL HEADERS
5489                                          ;*          (UNIQUE TO EACH CYLINDER)
5490                                          ;*      2.  A FULL SECTOR WRITE COMMAND IS ISSUED BY A SINGLE CYL SEEK FROM 0 TO 1.
5491                                          ;*          AS HEADERS ARE IDENTICAL, THE NEXT SECTOR TO COME UNDER THE
5492                                          ;*          HEADS WILL IMMEDIATELY BE WRITTEN.
5493                                          ;*      3.  IF THERE IS OSCILLATION SENSED BY READING THE TRIBITS,
5494                                          ;*          DRIVE OFF TRACK ERROR WILL SET.
5495                                          ;*
5496                                          ;*      IN THIS MANNER OSCILLATING SEEKS ARE PERFORMED BETWEEN ALL MAJOR CYLINDERS.
5497                                          ;*      100 OSCILLATIONS ARE PERFORMED AT EACH MAJOR CYLINDER
5498                                          ;*      BEFORE DOING THE NEXT CYLINDER
5499                                          ;*
5500                                          ;;**********************************************************************
5501  030432  000004                          TST20:  SCOPE
5502  030434  012737  000001  001174                  MOV     #1,$TIMES       ;;DO 1 ITERATION
5503  030442  012706  001100                          MOV     #STACK,SP       ;RESTORE STK PTR
5504  030446  005237  007354                          INC     BADHDR          ;USED FOR VALID HALT
5505  030452  005037  001352                          CLR     TOCYL
5506  030456  012737  100000  007436                  MOV     #BIT15,TEMP5
5507
5508  030464  004737  040452                  1$:     JSR     PC,SUBCLR
5509  030470  104024                                  ERROR   24              ;CERR AFTER SCLR
5510
5511  030472  012700  001536                          MOV     #HDTAB,R0       ;FORMAT HEADERS ON ALL MAJOR CYL.
5512
5513  030476  013720  001352                  2$:     MOV     TOCYL,(R0)+     ;HEADER WORD 0: CYL #
5514  030502  012720  140000                          MOV     #140000,(R0)+   ;HEADER WORD 1: ALL SECTOR 0
5515  030506  012710  140000                          MOV     #140000,(R0)    ;HEADER WORD 2: XOR OF 0 & 1
5516  030512  053720  001352                          BIS     TOCYL,(R0)+     ;ADD CYL # TO WORD 2
5517
5518  030516  020027  001742                          CMP     R0,#HDTAB+132.  ;ALL 22 SECTORS DONE? (22X6=132)
5519  030522  001365                                  BNE     2$              ;BR IF NO
5520
5521  030524  012765  001536  000004                  MOV     #HDTAB,RKBA(R5)
5522  030532  012765  177676  000002                  MOV     #-66.,RKWC(R5)
5523  030540  013765  001352  000020                  MOV     TOCYL,RKDC(R5)
5524
5525  030546  012765  000027  000000                  MOV     #<WRHEAD>,RKCS1(R5)     ;WRITE HEADER CMD
5526  030554  013737  001424  007426                  MOV     T50000,TEMP1    ;SETUP  TIMEOUT
5527  030562  004737  036542                          JSR     PC,FRDY         ;FIND RDY
5528  030566  104200                                  ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
5529  030570  004737  040100                          JSR     PC,GSTAT        ;GET FRESH STATUS
5530  030574  032737  100000  007370                  BIT     #CERR,HCS1
5531  030602  001405                                  BEQ     64$
5532  030604  104201                                  ERROR   201             ;CERR AFTER WRITE HEADER CMD
5533  030606  104401  053155                          TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
```

```
5534  030612  000137  031706                JMP     TIMING
5535  030616                        64$:
5536
5537
5538  030616  006137  007436                ROL     TEMP5           ;SET CARRY ONLY ONCE
5539  030622  006137  001352                ROL     TOCYL           ;SELECT NEXT MAJOR CYL
5540  030626  023727  001352  001000        CMP     TOCYL,#1000     ;ALL MAJOR CYL FORMATTED?
5541  030634  001313                        BNE     1$              ;BR IF NO
5542  030636  005065  000020                CLR     RKDC(R5)        ;SETUP TO RETURN TO CYL 0
5543
5544  030642  012765  000017  000000        MOV     #SEEK,RKCS1(R5) ;SEEK CMD
5545  030650  013737  001414  007426        MOV     T50,TEMP1       ;SETUP TIMEOUT
5546  030656  004737  036542                JSR     PC,FRDY         ;FIND RDY
5547  030662  104131                        ERROR   131             ;NO RDY AFTER SEEK CMD
5548
5549  030664  013737  001424  007426        MOV     T50000,TEMP1    ;SETUP TIMEOUT
5550  030672  004737  037152                JSR     PC,FATT2        ;FIND ATTN
5551  030676  104132                        ERROR   132             ;NO ATTN AFTER SEEK CMD
5552
5553  030700  032737  100000  007370        BIT     #CERR,HCS1
5554  030706  001401                        BEQ     65$
5555  030710  104210                        ERROR   210             ;CERR AFTER SEEK CMD
5556
5557  030712                        65$:
5558
5559  030712  012737  031420  001176        MOV     #FORM,$ESCAPE
5560  030720  005000                        CLR     R0              ;ITERATION COUNTER
5561  030722  012737  000001  001352        MOV     #1,TOCYL        ;SETUP TO CYL #
5562  030730  005037  001350                CLR     FRCYL
5563
5564  030734  104415                        SCOP1
5565  030736  012706  001100                MOV     #STACK,SP       ;RESTORE STK PTR
5566
5567  030742  013737  001352  001360        MOV     TOCYL,CALDIF    ;SETUP FOR ERROR PRINTOUT
5568
5569  030750  004737  040452        3$:     JSR     PC,SUBCLR
5570  030754  104024                        ERROR   24              ;CERR AFTER SCLR,
5571
5572  030756  013765  001352  000020        MOV     TOCYL,RKDC(R5)  ;GO TO CYL #
5573  030764  012765  001514  000004        MOV     #DATA1,RKBA(R5) ;ALL 1'S
5574  030772  052765  000020  000010        BIS     #BAI,RKCS2(R5)
5575  031000  012765  177400  000002        MOV     #-256.,RKWC(R5) ; SECTOR TO BE ALL 1'S
5576
5577  031006  012765  000023  000000        MOV     #WRDATA,RKCS1(R5) ;WRITE DATA CMD
5578  031014  013737  001424  007426        MOV     T50000,TEMP1
5579  031022  004737  036542                JSR     PC,FRDY         ;FIND RDY
5580  031026  104011                        ERROR   11              ;NO RDY AFTER WRITE DATA CMD.
5581
5582  031030  004737  040100                JSR     PC,GSTAT        ;GET FRESH STATUS
5583  031034  032737  020000  007420        BIT     #D.DROT,HMR3    ;SEE IF DRIVE OFF TRACK
5584  031042  001401                        BEQ     5$
5585  031044  104112                        ERROR   112             ;DRIVE OFF TRACK AFTER WRITE DATA CMD
5586
5587  031046  032737  100000  007370  5$:   BIT     #CERR,HCS1
5588  031054  001401                        BEQ     6$
5589  031056  104012                        ERROR   12              ;CERR SET AFTER WRITE DATA CMD
```

```
5590
5591  031060                          6$:
5592
5593  031060  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
5594  031066  005037  007462                  CLR     E.B0                ;EXPECTED MSG B0
5595  031072  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5596  031100  012737  000001  007466          MOV     #1,E.B1             ;MSG ID FOR EXPECTED MSG B1
5597  031106  005037  007470                  CLR     E.A2                ;EXPECTED MSG A2
5598  031112  012737  000002  007472          MOV     #2,E.B2             ;MSG ID FOR EXPECTED MSG B2
5599  031120  012737  000003  007476          MOV     #3,E.B3             ;MSG ID FOR EXPECTED MSG B3
5600
5601  031126  004737  037264                  JSR     PC,CHKMSG           ;CHECK MSGS A0, B0, A1, B1
5602  031132  000003                          .WORD   T.A2!T.B2!0                 ;& MSGS SPECIFIED HERE
5603  031134  104052                          ERROR   52                  ;MSG A0 ERROR AFTER WRITE DATA CMD
5604  031136  104023                          ERROR   23                  ;MSH B0 ERROR
5605  031140  104053                          ERROR   53                  ;MSG A1 ERROR
5606  031142  104025                          ERROR   25                  ;MSG B1 ERROR
5607  031144  023737  001364  001352          CMP     CYLADD,TOCYL
5608  031152  001401                          BEQ     7$
5609  031154  104113                          ERROR   113                 ;CYL ADDR IN RKMR3 NOT = RKDC
5610
5611  031156                          7$:
5612  031156  104415                          SCOP1
5613  031160  012706  001100                  MOV     #STACK,SP           ;RESTORE STK PTR
5614
5615  031164  004737  040452                  JSR     PC,SUBCLR
5616  031170  104024                          ERROR   24                  ;CERR AFTER SCLR
5617
5618                                                                      ;RETURN TO CYL 0
5619  031172  012765  001514  000004          MOV     #DATA1,RKBA(R5)
5620  031200  052765  000020  000010          BIS     #BAI,RKCS2(R5)
5621  031206  012765  177400  000002          MOV     #-256.,RKWC(R5)
5622
5623  031214  012765  000023  000000          MOV     #WRDATA,RKCS1(R5)
5624  031222  013737  001424  007426          MOV     T50000,TEMP1
5625  031230  004737  036542                  JSR     PC,FRDY             ;FIND RDY
5626  031234  104011                          ERROR   11                  ;NO RDY AFTER WRITE DATA CMD
5627
5628  031236  004737  040100                  JSR     PC,GSTAT            ;GET FRESH STATUS
5629  031242  032737  020000  007420          BIT     #D.DROT,HMR3
5630  031250  001401                          BEQ     8$
5631  031252  104112                          ERROR   112                 ;DRIVE OFF TRACK AFTER WRITE DATA CMD
5632
5633  031254  032737  100000  007370  8$:     BIT     #CERR,HCS1
5634  031262  001401                          BEQ     9$
5635  031264  104012                          ERROR   12                  ;CERR AFTER WRITE DATA CMD
5636
5637  031266                          9$:
5638
5639  031266  012737  010340  007460          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,E.A0  ;EXPECTED MSG A0
5640  031274  005037  007462                  CLR     E.B0                ;EXPECTED MSG B0
5641  031300  012737  001720  007464          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.SSP>,E.A1  ;EXPECTED A1
5642  031306  012737  000001  007466          MOV     #1,E.B1             ;MSG ID FOR EXPECTED MSG B1
5643  031314  005037  007470                  CLR     E.A2                ;EXPECTED MSG A2
5644  031320  012737  000002  007472          MOV     #2,E.B2             ;MSG ID FOR EXPECTED MSG B2
5645  031326  012737  000003  007476          MOV     #3,E.B3             ;MSG ID FOR EXPECTED MSG B3
```

```
5646
5647  031334  004737  037264          JSR     PC,CHKMSG       ;CHECK MSGS A0, B0, A1, B1
5648  031340  000003                  .WORD   T.A2!T.B2!0             ;& MSGS SPECIFIED HERE
5649  031342  104052                  ERROR   52              ;MSG A0 ERROR AFTER WRITE DATA CMD
5650  031344  104023                  ERROR   23              ;MSH B0 ERROR
5651  031346  104053                  ERROR   53              ;MSG A1 ERROR
5652  031350  104025                  ERROR   25              ;MSG B1 ERROR
5653  031352  005737  001364          TST     CYLADD
5654  031356  001401                  BEQ     10$
5655  031360  104042                  ERROR   42              ;NOT BACK TO CYL 0
5656
5657  031362  005200          10$:    INC     R0
5658  031364  020027  000144          CMP     R0,#100.        ;ALL ITERATIONS DONE?
5659  031370  001402                  BEQ     13$             ;BR IF YES
5660  031372  000137  030750          JMP     3$              ;ELSE DO AGAIN
5661
5662  031376  005000          13$:    CLR     R0              ;RESET ITERATION CTR
5663  031400  006337  001352          ASL     TOCYL
5664  031404  023727  001352  001000  CMP     TOCYL,#1000     ;ALL MAJOR CYL DONE?
5665  031412  001402                  BEQ     FORM            ;BR IF YES
5666  031414  000137  030750          JMP     3$              ;ELSE DO NEXT CYL
5667
5668  031420  005037  001352  FORM:   CLR     TOCYL           ;RESTORE TO ORIG 22 SECTOR FORMAT.
5669  031424  012737  100000  007436  MOV     #BIT15,TEMP5
5670
5671  031432  004737  040452  12$:    JSR     PC,SUBCLR
5672  031436  104024                  ERROR   24              ;CERR AFTER SCLR
5673
5674  031440  012765  001536  000004  MOV     #HDTAB,RKBA(R5) ;REFORMAT ALL MAJOR CYLINDERS
5675  031446  012765  177676  000002  MOV     #-66.,RKWC(R5)
5676  031454  013765  001352  000020  MOV     TOCYL,RKDC(R5)
5677
5678  031462  013737  001352  001366  MOV     TOCYL,CALADD    ;SETUP
5679  031470  012737  000000  001474  MOV     #0,HEAD         ;TO FILL
5680  031476  012737  000000  001502  MOV     #0,FORMAT       ;HEADER
5681  031504  004737  041434          JSR     PC,FHDTAB       ;TABLE
5682
5683
5684  031510  012765  000027  000000  MOV     #<WRHEAD>,RKCS1(R5)     ;WRITE HEADER CMD
5685  031516  013737  001424  007426  MOV     T50000,TEMP1    ;SETUP TIMEOUT
5686  031524  004737  036542          JSR     PC,FRDY         ;FIND RDY
5687  031530  104200                  ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
5688  031532  004737  040100          JSR     PC,GSTAT        ;GET FRESH STATUS
5689  031536  032737  100000  007370  BIT     #CERR,HCS1
5690  031544  001405                  BEQ     64$
5691  031546  104201                  ERROR   201             ;CERR AFTER WRITE HEADER CMD
5692  031550  104401  053155          TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
5693  031554  000137  031706          JMP     TIMING
5694  031560                  64$:
5695
5696
5697  031560  006137  007436          ROL     TEMP5
5698  031564  006137  001352          ROL     TOCYL
5699  031570  023727  001352  001000  CMP     TOCYL,#1000     ;ALL MAJOR CYL REFORMATTED?
5700  031576  001315                  BNE     12$             ;BR IF NO
5701
```

```
5702  031600  005065  000020          CLR     RKDC(R5)          ;SETUP TO RETURN TO CYL 0
5703  031604  005037  001176          CLR     $ESCAPE
5704
5705  031610  012765  000017  000000  MOV     #SEEK,RKCS1(R5)   ;SEEK CMD
5706  031616  013737  001414  007426  MOV     T50,TEMP1         ;SETUP TIMEOUT
5707  031624  004737  036542          JSR     PC,FRDY           ;FIND RDY
5708  031630  104131                  ERROR   131               ;NO RDY AFTER SEEK CMD
5709
5710  031632  013737  001424  007426  MOV     T50000,TEMP1      ;SETUP TIMEOUT
5711  031640  004737  037152          JSR     PC,FATT2          ;FIND ATTN
5712  031644  104132                  ERROR   132               ;NO ATTN AFTER SEEK CMD
5713
5714  031646  032737  100000  007370  BIT     #CERR,HCS1
5715  031654  001401                  BEQ     65$
5716  031656  104210                  ERROR   210               ;CERR AFTER SEEK CMD
5717
5718  031660                  65$:
5719
5720
5721  031660  005737  007356          TST     HPEND             ;SEE IF HALT PENDING
5722  031664  001406                  BEQ     4$                ;BR IF NO
5723  031666  005037  007356          CLR     HPEND             ;CLEAR FOR FUTURE FORMATTING
5724  031672  005037  007354          CLR     BADHDR            ;HEADERS NOW OK
5725  031676  000137  043460          JMP     STOP              ;GO BACK & HALT CPU
5726
5727  031702  005037  007354  4$:     CLR     BADHDR            ;HEADERS NOW OK
5728
5729                          .SBTTL  SERVO & SPINDLE TIMING TESTS
5730
5731  031706                  TIMING:
5732
5733
5734
5735
5736                          ;;*****************************************************************
5737                          ;*TEST 21       TIME BETWEEN OUTER LIMIT TO HEADS HOME DURING UNLOAD
5738                          ;*
5739                          ;*      TIME IS MEASURED FROM ATTN ASSERTING (APPROXIMATES REV & OUTER LIMIT)
5740                          ;*      TO HEADS HOME ASSERTING. EXPECTED TIME APPROX 285MS
5741                          ;*
5742                          ;*      ALL TIMING TESTS ARE BYPASSED IF NEITHER
5743                          ;*      L OR P CLOCK IS PRESENT & WILL BE INDICATED BY A MESSAGE
5744                          ;*
5745                          ;;*****************************************************************
5746  031706  000004          TST21:  SCOPE
5747  031710  012737  000001  001174          MOV     #1,$TIMES         ;;DO 1 ITERATION
5748  031716  012706  001100          MOV     #STACK,SP
5749
5750  031722  005737  001342          TST     BYPTIM            ;SEE IF BYPASS TIMING TESTS
5751  031726  001404                  BEQ     TIME1             ;BR IF NO
5752  031730  104401  054456          TYPE    ,MSG41            ;BYPASS TIMING TESTS
5753  031734  000137  036034          JMP     $EOP
5754  031740                  TIME1:
5755  031740  005737  007536          TST     DOTIM
5756  031744  001004                  BNE     1$
5757  031746  104401  052212          TYPE    ,MSG13            ;TIMING TESTS BYPASSED
```

```
5758  031752  000137  036034                  JMP     $EOP
5759
5760  031756  004737  040452          1$:     JSR     PC,SUBCLR
5761  031762  104024                          ERROR   24              ;CERR AFTER SCLR
5762
5763  031764  104401  054515                  TYPE    ,MSG42          ;ALL TIMING TESTS BYPASSED
5764  031770  000137  036034                  JMP     $EOP
5765
5766  031774  004737  042262                  JSR     PC,CALCLK       ;CALIB TIME TO GO THRU 'LOOP'
5767  032000  005237  007352                  INC     UNLD            ;USED FOR VALID HALT
5768
5769  032004  012737  032176  001176          MOV     #4$,$ESCAPE
5770  032012  012765  000007  000000          MOV     #UNLOAD,RKCS1(R5)       ;UNLOAD CMD
5771  032020  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
5772  032026  004737  037152                  JSR     PC,FATT2        ;FIND ATTN
5773  032032  104073                          ERROR   73              ;NO ATTN AFTER UNLOAD CMD
5774
5775
5776  032034  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
5777  032042  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;DRIVE#
5778  032050  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
5779  032056  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
5780  032064  004737  036542                  JSR     PC,FRDY         ;FIND RDY
5781  032070  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
5782  032072  004737  037024                  JSR     PC,TSTATN       ;TEST FOR ATTN
5783  032076  000401                          BR      64$
5784  032100  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
5785  032102                          64$:
5786
5787
5788  032102  005037  001452                  CLR     LPCNT
5789  032106  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
5790
5791  032114  004737  040100          2$:     JSR     PC,GSTAT
5792  032120  032737  000040  007416          BIT     #D.HDHM,HMR2
5793  032126  001006                          BNE     3$              ;BR IF GOT HEAD HOME
5794  032130  004737  042726                  JSR     PC,LOOP         ;ELSE GO THRU LOOP
5795  032134  005737  001452                  TST     LPCNT           ;TEST FOR OVERFLOW
5796  032140  001365                          BNE     2$              ;BR IF NO
5797  032142  104066                          ERROR   66              ;NO HEAD HOME AFTER UNLOAD CMD
5798
5799  032144  104401  052411          3$:     TYPE    ,MSG18          ;TIME BEING MEASURED
5800  032150  013737  001452  001160          MOV     LPCNT,$TMPO     ;SETUP FOR MULT
5801  032156  004737  043004                  JSR     PC,TYPTIM       ;TYPE TIME IN USEC
5802  032162  104401  054567                  TYPE    ,MSG43          ;LIMITS
5803  032166  104401  001205                  TYPE    ,$CRLF
5804  032172  104401  001205                  TYPE    ,$CRLF
5805
5806  032176  005037  001176          4$:     CLR     $ESCAPE
5807
5808                                  ;;*****************************************************************
5809                                  ;*TEST 22       TEST LOW VELOCITY TIMES DURING LOADING
5810                                  ;*
5811                                  ;*      THIS TEST ISSUES A START SPINDLE COMMAND
5812                                  ;*      AFTER 'HEADS HOME' HAS BEEN DETECTED FROM THE PREVIOUS TEST.
5813                                  ;*      THE FOLLOWING "LOW VELOCITY" TIMES ARE CHECKED AGAINST
```

```
                        ;*      LIMITS TO BE DEFINED:
                        ;*
                        ;*      TIME 1:  TIME BETWEEN HEADS HOME NEGATING & SERVO SIG PRES ASSERTING
                        ;*                 EXPECTED TIME APPROX 285 MS
                        ;*
                        ;*      TIME 2:  TIME BETWEEN OUTER LIMIT & INNER LIMIT
                        ;*
                        ;*                 TIME IS MEASURED FROM SERVO SIG PRES (APPROX OUTER LIMIT)
                        ;*                 TO REV (APPROX INNER LIMIT)
                        ;*                 EXPECTED TIME APPROX 2.25 SEC
                        ;*
                        ;*      TIME 3:  TIME BETWEEN INNER LIMIT & OUTER LIMIT
                        ;*
                        ;*                 TIME IS MEASURED FROM REV ASSERTING (FROM ABOVE)
                        ;*                 TO REV NEGATING (APPROX OUTER LIMIT)
                        ;*                 EXPECTED TIME APPROX 2.25 SEC
                        ;*
                        ;;*****************************************************************
032202  000004         TST22:  SCOPE
032204  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
032212  012706  001100                  MOV     #$STACK,SP      ;RESTORE STK PTR
032216  004737  040452                  JSR     PC,SUBCLR
032222  104024                          ERROR   24              ;CERR AFTER SCLR
032224  004737  042262                  JSR     PC,CALCLK       ;CALIB TIME TO GO THRU 'LOOP'
032230  012765  000011  000000          MOV     #SRTSPL,RKCS1(R5)       ;START SPINDLE CMD
032236  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
032244  004737  036542                  JSR     PC,FRDY         ;FIND RDY
032250  104121                          ERROR   121             ;RDY NOT SET AFTER START SPIN CMD
032252  012737  032656  001176          MOV     #9$,$ESCAPE
032260  013737  001370  001372          MOV     HZ,COUNT
032266  012737  000074  001374          MOV     #60.,SEC
032274  012765  000001  000026          MOV     #1,RKMR1(R5)
032302  004737  043236                  JSR     PC,CLKON        ;TURN CLOCK ON FOR 60 SEC TIMEOUT
032306  004737  040100          1$:     JSR     PC,GSTAT
032312  032737  000040  007416          BIT     #D.HDHM,HMR2
032320  001406                          BEQ     2$              ;BR IF HEAD HOME = 0
032322  005737  001376                  TST     TIMUP
032326  001767                          BEQ     1$
032330  004737  043332                  JSR     PC,CLKOF
032334  104067                          ERROR   67              ;HEAD HOME NOT CLEARED DURING LOAD CMD
032336  004737  043332          2$:     JSR     PC,CLKOF
032342  005037  001452                  CLR     LPCNT           ;SETUP FOR TIME 1
032346  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
032354  004737  040100          3$:     JSR     PC,GSTAT
032360  032737  000020  007416          BIT     #D.SSP,HMR2
032366  001006                          BNE     4$              ;BR IF GOT TFOK
032370  004737  042726                  JSR     PC,LOOP         ;ELSE GO THRU LOOP
032374  005737  001452                  TST     LPCNT           ;TEST FOR OVERFLOW
032400  001365                          BNE     3$              ;BR IF NO
```

```
5870  032402  104070                        ERROR   70              ;SERVO SIG PRES NOT SET DURING LOAD CMD
5871  032404  013737  001452  001442  4$:   MOV     LPCNT,TIM1      ;STORE LOOP COUNT FOR TIME 1
5872
5873
5874  032412  005037  001452                CLR     LPCNT           ;SETUP FOR TIME 2
5875  032416  012765  000001  000026        MOV     #1,RKMR1(R5)
5876
5877  032424  004737  040100          5$:   JSR     PC,GSTAT
5878  032430  032737  004000  007416        BIT     #D.REV,HMR2
5879  032436  001006                        BNE     6$              ;BR IF GOT REV
5880  032440  004737  042726                JSR     PC,LOOP
5881  032444  005737  001452                TST     LPCNT           ;TEST FOR OVERFLOW
5882  032450  001365                        BNE     5$              ;BR IF NO
5883  032452  104071                        ERROR   71              ;REV NOT SET DURING LOAD
5884  032454  013737  001452  001444  6$:   MOV     LPCNT,TIM2      ;STORE LOOP COUNT FOR TIME 2
5885
5886
5887  032462  005037  001452                CLR     LPCNT           ;SETUP FOR TIME 3
5888  032466  012765  000001  000026        MOV     #1,RKMR1(R5)
5889
5890  032474  004737  040100          7$:   JSR     PC,GSTAT
5891  032500  032737  004000  007416        BIT     #D.REV,HMR2
5892  032506  001406                        BEQ     8$
5893  032510  004737  042726                JSR     PC,LOOP
5894  032514  005737  001452                TST     LPCNT
5895  032520  001365                        BNE     7$
5896  032522  104072                        ERROR   72              ;REV NOT CLEARED DURING LOAD
5897  032524  013737  001452  001446  8$:   MOV     LPCNT,TIM3      ;STORE LOOP COUNT FOR TIME 3
5898
5899
5900  032532  104401  052542                TYPE    ,MSG20          ;TIME 1 MEASUREMENT
5901  032536  013737  001442  001160        MOV     TIM1,$TMP0      ;SETUP FOR MULT
5902  032544  004737  043004                JSR     PC,TYPTIM       ;TYPE TIME IN USEC
5903  032550  104401  054567                TYPE    ,MSG43          ;LIMITS
5904
5905  032554  104401  052636                TYPE    ,MSG21          ;TIME 2 MEASUREMENT
5906  032560  013737  001444  001160        MOV     TIM2,$TMP0
5907  032566  004737  043004                JSR     PC,TYPTIM
5908  032572  104401  054635                TYPE    ,MSG44          ;LIMITS
5909
5910  032576  104401  052730                TYPE    ,MSG22          ;TIME 3 MEASUREMENT
5911  032602  013737  001446  001160        MOV     TIM3,$TMP0
5912  032610  004737  043004                JSR     PC,TYPTIM
5913  032614  104401  054635                TYPE    ,MSG44          ;LIMITS
5914
5915  032620  104401  001205                TYPE    ,$CRLF
5916  032624  104401  001205                TYPE    ,$CRLF
5917  032630  005037  001176                CLR     $ESCAPE
5918
5919  032634  013737  001422  007426        MOV     T5000,TEMP1
5920  032642  004737  037152                JSR     PC,FATT2        ;FIND ATTN
5921  032646  104074                        ERROR   74              ;NO ATTN AFTER START SPIN CMD
5922  032650  005037  007352                CLR     UNLD            ;USED FOR VALID HALT
5923  032654  000414                        BR      TST23           ;;GO TO NEXT TEST
5924
5925  032656  005037  001176          9$:   CLR     $ESCAPE
```

```
 5926  032662  013737  001420  007430          MOV     T100,TEMP2
 5927  032670  004737  037056                  JSR     PC,FATT1        ;FIND ATTN
 5928  032674  104074                          ERROR   74              ;NO ATTN AFTER START SPIN CMD
 5929  032676  005037  007352                  CLR     UNLD
 5930  032702  000137  036034                  JMP     $EOP            ;ABORT DRIVE
 5931
 5932                                  ;;*****************************************************************
 5933                                  ;*TEST 23       MEASURE ROTATIONAL SPEED
 5934                                  ;*
 5935                                  ;*      THIS TEST MEASURES INDEX TIMING BY:
 5936                                  ;*
 5937                                  ;*              A.  CHANGE FORMAT TO 20 SECTOR & READ HEADER.
 5938                                  ;*                  CONTROLLER RDY STARTS THE TIMER
 5939                                  ;*              B.  CHANGE FORMAT TO 22 SECTOR & READ HEADER.
 5940                                  ;*                  CONTROLLER RDY ENDS THE TIMER.
 5941                                  ;*
 5942                                  ;*      INDEX TIMING IS THE TIME BETWEEN THE 2 CONT. RDY TIMES.
 5943                                  ;*      THIS IS BECAUSE A CHANGE OF FORMAT INHIBITS SECTOR PULSES
 5944                                  ;*      UNTIL THE NEXT INDEX APPEARS-THUS KEEPING A GIVEN
 5945                                  ;*      FORMAT COMPLETE THROUGHOUT AN ENTIRE CYLINDER
 5946                                  ;*
 5947                                  ;*      THE TIME IS THE AVERAGE OF 100 READINGS.
 5948                                  ;*
 5949                                  ;;*****************************************************************
 5950  032706  000004                  TST23:  SCOPE
 5951  032710  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
 5952  032716  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
 5953
 5954  032722  004737  040452                  JSR     PC,SUBCLR
 5955  032726  104024                          ERROR   24              ;CERR AFTER SCLR
 5956
 5957  032730  004737  042262                  JSR     PC,CALCLK       ;CALIB TIME TO GO THRU 'LOOP'
 5958
 5959  032734  005000                          CLR     R0              ;ITERATION COUNTER
 5960  032736  005037  001456                  CLR     SUM             ;LO WORD OF REV TIME SUM
 5961  032742  005037  001460                  CLR     SUM+2           ;HI WORD OF REV TIME SUM
 5962
 5963  032746  012765  010025  000000  1$:     MOV     #<CFMT!RDHEAD>,RKCS1(R5)        ;CHANGE TO 20 SECTOR FMT & READ HEADER
 5964  032754  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP TIMEOUT
 5965  032762  004737  036542                  JSR     PC,FRDY         ;FIND RDY
 5966  032766  104171                          ERROR   171             ;NO RDY AFTER READ HDR CMD
 5967
 5968  032770  005700                          TST     R0              ;TEST FOR SECTOR 0 AFTER FORMAT CHANGE
 5969  032772  001007                          BNE     4$              ;DO ONLY ONCE
 5970
 5971  032774  004737  040532                  JSR     PC,RDSEC
 5972  033000  005737  001406                  TST     SECTOR
 5973  033004  001402                          BEQ     4$
 5974  033006  104064                          ERROR   64              ;CANT FIND SECTOR 0 FROM INDEX
 5975                                                                  ;AFTER FORMAT CHANGE & RDY REC'D
 5976  033010  000464                          BR      TST24           ;;GOTO NEXT TEST
 5977
 5978  033012  005037  001452          4$:     CLR     LPCNT           ;COUNT PASSES THRU LOOP
 5979  033016  012765  000025  000000          MOV     #RDHEAD,RKCS1(R5)       ;CHANGE TO 22 SECTOR FMT & READ HEADER
 5980  033024  013737  001424  007426          MOV     T50000,TEMP1    ;SETUP TIMEOUT
 5981  033032  032765  000200  000000  2$:     BIT     #RDY,RKCS1(R5)
```

```
 5982  033040  001007                    BNE     3$              ;EXIT IF GOT RDY
 5983  033042  004737  042726            JSR     PC,LOOP         ;ELSE GO THRU LOOP
 5984  033046  005337  007426            DEC     TEMP1
 5985  033052  001367                    BNE     2$
 5986  033054  104171                    ERROR   171             ;NO RDY AFTER READ HDR CMD
 5987  033056  000441                    BR      TST24           ;;GO TO NEXT TST
 5988
 5989  033060  004737  040532  3$:       JSR     PC,RDSEC
 5990  033064  005737  001406            TST     SECTOR
 5991  033070  001402                    BEQ     5$
 5992  033072  104064                    ERROR   64              ;CANT FIND SECTOR 0 FROM INDEX
 5993                                                            ;AFTER FORMAT CHANGE & RDY REC'D
 5994  033074  000432                    BR      TST24           ;;GOTO NEXT TEST
 5995
 5996  033076  013702  001452  5$:       MOV     LPCNT,R2        ;FROM LOOP
 5997  033102  013703  001454            MOV     LPTIM,R3        ;FROM CALCLK
 5998  033106  010246                    MOV     R2,-(SP)                ;;PUT THE MULTIPLER ON THE STACK
 5999  033110  010346                    MOV     R3,-(SP)                ;;PUT THE MULTIPLICAND ON THE STACK
 6000  033112  004737  050332            JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
 6001  033116  012616                    MOV     (SP)+,(SP)      ;;DISREGARD THE MSB'S
 6002  033120  012603                    MOV     (SP)+,R3                ;;GET THE LSB'S OF THE PRODUCT
 6003
 6004  033122  060337  001456            ADD     R3,SUM          ;R3 CONTAINS LOW ORDER PRODUCT
 6005  033126  005537  001460            ADC     SUM+2
 6006
 6007  033132  005200                    INC     R0
 6008  033134  020027  000144            CMP     R0,#100.
 6009  033140  001302                    BNE     1$
 6010
 6011  033142  104401  053107            TYPE    ,MSG24          ;AVG ROTATIONAL TIME
 6012
 6013  033146  004737  043052            JSR     PC,AVGTIM       ;CALC & TYPEOUT AVG TIME
 6014  033152  104401  001205            TYPE    ,$CRLF
 6015  033156  104401  001205            TYPE    ,$CRLF
 6016
 6017                                  ;;*****************************************************************
 6018                                  ;*TEST 24       MEASURE MAX SEEK TIME
 6019                                  ;*
 6020                                  ;*      THIS TEST MEASURES THE MAX SEEK TIME BETWEEN CYLINDERS 0 & 410
 6021                                  ;*      THE AVERAGE TIME OF 100 SEEKS IN BOTH DIRECTIONS ARE PRINTED
 6022                                  ;*      IF NOT WITHIN LIMITS TO BE SUPPLIED.
 6023                                  ;*      MAX SEEK TIME SHOULD BE LESS THAN 70MS.
 6024                                  ;*
 6025                                  ;;*****************************************************************
 6026  033162  000004                  TST24:  SCOPE
 6027  033164  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
 6028  033172  012706  001100                  MOV     #STACK,SP
 6029
 6030
 6031  033176  004737  042262            JSR     PC,CALCLK       ;CALIB TIME TO GO THRU 'LOOP'
 6032
 6033  033202  005000                    CLR     R0              ;ITERATION COUNTER
 6034  033204  005037  001456            CLR     SUM             ;LO WORD OF FOWARD SEEK TIME
 6035  033210  005037  001460            CLR     SUM+2           ;HI WORD OF FOWARD SEEK TIME
 6036  033214  005037  001462            CLR     SUM1            ;LO WORD OF REVERSE SEEK TIME
 6037  033220  005037  001464            CLR     SUM1+2          ;HI WORD OF REVERSE SEEK TIME
```

```
6038
6039  033224  004737  040452          1$:   JSR     PC,SUBCLR
6040  033230  104024                        ERROR   24              ;CERR AFTER SCLR
6041
6042  033232  012737  033524  001176        MOV     #7$,$ESCAPE
6043
6044  033240  012765  000632  000020        MOV     #410.,RKDC(R5)  ;SETUP FOR CYL 410.
6045  033246  012765  000017  000000  2$:   MOV     #SEEK,RKCS1(R5) ;SEEK CMD
6046  033254  013737  001414  007426        MOV     T50,TEMP1
6047  033262  004737  036542                JSR     PC,FRDY         ;FIND RDY
6048  033266  104131                        ERROR   131             ;NO RDY AFTER SEEK CMD
6049
6050  033270  005037  001452                CLR     LPCNT           ;COUNT PASSES THRU LOOP
6051  033274  013704  001222                MOV     $UNIT,R4
6052  033300  004737  042752                JSR     PC,FATT3        ;FIND ATTN AND STEP 'LPCNT'
6053  033304  104132                        ERROR   132             ;NO ATTN AFTER SEEK CMD
6054
6055  033306  004737  040100                JSR     PC,GSTAT
6056  033312  032737  100000  007370        BIT     #CERR,HCS1
6057  033320  001401                        BEQ     5$
6058  033322  104210                        ERROR   210             ;CERR AFTER SEEK CMD.
6059
6060  033324  013737  001452  001160  5$:   MOV     LPCNT,$TMP0     ;FROM LOOP
6061  033332  013737  001454  001162        MOV     LPTIM,$TMP1     ;FROM CALCLK
6062  033340  013746  001160                MOV     $TMP0,-(SP)             ;;PUT THE MULTIPLER ON THE STACK
6063  033344  013746  001162                MOV     $TMP1,-(SP)             ;;PUT THE MULTIPLICAND ON THE STACK
6064  033350  004737  050332                JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
6065  033354  012637  001162                MOV     (SP)+,$TMP1             ;;GET THE LSB'S OF THE PRODUCT
6066  033360  012637  001164                MOV     (SP)+,$TMP1+2   ;;GET THE MSB'S OF THE PRODUCT
6067
6068  033364  005765  000020                TST     RKDC(R5)
6069  033370  001414                        BEQ     6$              ;BR IF THIS SEEK WAS REVERSE TO CYL 0
6070
6071  033372  063737  001162  001456        ADD     $TMP1,SUM       ;SUM UP FOWARD SEEK TIMES (LSB)
6072  033400  005537  001460                ADC     SUM+2
6073  033404  063737  001164  001460        ADD     $TMP2,SUM+2     ;MSB
6074
6075  033412  004737  040452                JSR     PC,SUBCLR
6076  033416  104024                        ERROR   24              ;CERR AFTER SCLR
6077  033420  000712                        BR      2$              ;SEEK TO CYL 0
6078
6079  033422  063737  001162  001462  6$:   ADD     $TMP1,SUM1      ;SUM UP REVERSE SEEK TIMES (LSB)
6080  033430  005537  001464                ADC     SUM1+2
6081  033434  063737  001164  001464        ADD     $TMP2,SUM1+2    ;MSB
6082
6083  033442  005200                        INC     R0
6084  033444  020027  000144                CMP     R0,#100.        ;ALL SEEKS DONE?
6085  033450  001265                        BNE     1$              ;BR & REPEAT IF NO TO CYL 410.
6086
6087  033452  104401  053267                TYPE    ,MSG28          ;FOWARD SEEK TIME
6088  033456  004737  043052                JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (FOWARD)
6089
6090  033462  104401  053346                TYPE    ,MSG29          ;REVERSE SEEK TIME
6091  033466  013737  001462  001456        MOV     SUM1,SUM        ;SETUP FOR
6092  033474  013737  001464  001460        MOV     SUM1+2,SUM+2    ;AVGTIM ROUTINE
6093  033502  004737  043052                JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (REVERSE)
```

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6094
6095  033506  104401  001205                TYPE    .$CRLF
6096  033512  104401  001205                TYPE    .$CRLF
6097  033516  005037  001176                CLR     $ESCAPE
6098  033522  000464                        BR      TST25           ;;GO TO NEXT TEST
6099
6100  033524  005037  001176        7$:     CLR     $ESCAPE
6101
6102  033530  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
6103  033536  013765  001222  000010        MOV     $UNIT,RKCS2(R5)
6104  033544  012765  000013  000000        MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
6105                                                                ;RESET CYL DIFF/OFFSET & CYL ADDR REG
6106                                                                ;IN RKMR2 & RKMR3 RESP.
6107  033552  013737  001412  007426        MOV     T10,TEMP1       ;SETUP TIMEOUT
6108  033560  004737  036542                JSR     PC,FRDY         ;FIND RDY
6109  033564  104124                        ERROR   124             ;RDY NOT SET AFTER RECAL CMD
6110
6111  033566  012765  000001  000026        MOV     #1,RKMR1(R5)    ;SELECT WORD 1
6112  033574  004737  040100                JSR     PC,GSTAT
6113  033600  032737  020000  007416        BIT     #D.RTZ,HMR2
6114  033606  001001                        BNE     64$
6115  033610  104244                        ERROR   244             ;RTZ NOT SET DURING RECAL CMD
6116  033612  013737  001412  007430  64$:  MOV     T10,TEMP2       ;SETUP TIMEOUT
6117  033620  004737  037056                JSR     PC,FATT1        ;FIND ATTN
6118  033624  104055                        ERROR   55              ;NO ATTN AFTER RECAL CMD
6119
6120  033626  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
6121  033634  013765  001222  000010        MOV     $UNIT,RKCS2(R5) ;DRIVE#
6122  033642  012765  000005  000000        MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
6123  033650  013737  001412  007426        MOV     T10,TEMP1       ;SETUP TIMEOUT
6124  033656  004737  036542                JSR     PC,FRDY         ;FIND RDY
6125  033662  104151                        ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
6126  033664  004737  037024                JSR     PC,TSTATN       ;TEST FOR ATTN
6127  033670  000401                        BR      65$
6128  033672  104154                        ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
6129  033674                        65$:
6130
6131
6132
6133
6134                                  ;;*****************************************************************
6135                                  ;*TEST 25       MEASURE MIN SEEK TIME
6136                                  ;*
6137                                  ;*      THIS TEST MEASURES THE MIN SEEK TIME BETWEEN CYLINDER 0 & 1
6138                                  ;*      THE AVERAGE TIME OF 100 SEEKS IN BOTH DIRECTIONS ARE PRINTED
6139                                  ;*      IF NOT WITHIN LIMITS TO BE SUPPLIED.
6140                                  ;*      MIN SEEK TIME SHOULD BE LESS THAN 10MS.
6141                                  ;*
6142                                  ;;*****************************************************************
6143  033674  000004                TST25:  SCOPE
6144  033676  012737  000001  001174        MOV     #1,$TIMES       ;;DO 1 ITERATION
6145  033704  012706  001100                MOV     #STACK,SP
6146
6147
6148  033710  004737  042262                JSR     PC,CALCLK       ;CALIB TIME TO GO THRU 'LOOP'
6149
```

```
6150  033714  005000                    CLR     R0              ;ITERATION COUNTER
6151  033716  005037  001456            CLR     SUM             ;LO WORD OF FOWARD SEEK TIME
6152  033722  005037  001460            CLR     SUM+2           ;HI WORD OF FOWARD SEEK TIME
6153  033726  005037  001462            CLR     SUM1            ;LO WORD OF REVERSE SEEK TIME
6154  033732  005037  001464            CLR     SUM1+2          ;HI WORD OF REVERSE SEEK TIME
6155
6156  033736  004737  040452    1$:     JSR     PC,$UBCLR
6157  033742  104024                    ERROR   24              ;CERR AFTER SCLR
6158
6159  033744  012737  034236  001176    MOV     #7$,$ESCAPE
6160
6161  033752  012765  000001  000020    MOV     #1,RKDC(R5)     ;SETUP FOR CYL 1
6162  033760  012765  000017  000000 2$: MOV     #SEEK,RKCS1(R5) ;SEEK CMD
6163  033766  013737  001414  007426    MOV     T50,TEMP1
6164  033774  004737  036542            JSR     PC,FRDY         ;FIND RDY
6165  034000  104131                    ERROR   131             ;NO RDY AFTER SEEK CMD
6166
6167  034002  005037  001452            CLR     LPCNT           ;COUNT PASSES THRU LOOP
6168  034006  013704  001222            MOV     $UNIT,R4
6169  034012  004737  042752            JSR     PC,FATT3        ;FIND ATTN AND STEP 'LPCNT'
6170  034016  104132                    ERROR   132             ;NO ATTN AFTER SEEK CMD
6171
6172  034020  004737  040100            JSR     PC,GSTAT
6173  034024  032737  100000  007370    BIT     #CERR,HCS1
6174  034032  001401                    BEQ     5$
6175  034034  104210                    ERROR   210             ;CERR AFTER SEEK CMD.
6176
6177  034036  013737  001452  001160 5$: MOV     LPCNT,$TMP0     ;FROM LOOP
6178  034044  013737  001454  001162    MOV     LPTIM,$TMP1     ;FROM CALCLK
6179  034052  013746  001160            MOV     $TMP0,-(SP)             ;;PUT THE MULTIPLER ON THE STACK
6180  034056  013746  001162            MOV     $TMP1,-(SP)             ;;PUT THE MULTIPLICAND ON THE STACK
6181  034062  004737  050332            JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
6182  034066  012637  001162            MOV     (SP)+,$TMP1             ;;GET THE LSB'S OF THE PRODUCT
6183  034072  012637  001164            MOV     (SP)+,$TMP1+2   ;;GET THE MSB'S OF THE PRODUCT
6184
6185  034076  005765  000020            TST     RKDC(R5)
6186  034102  001414                    BEQ     6$              ;BR IF THIS SEEK WAS REVERSE TO CYL 0
6187
6188  034104  063737  001162  001456    ADD     $TMP1,SUM       ;SUM UP FOWARD SEEK TIMES (LSB)
6189  034112  005537  001460            ADC     SUM+2
6190  034116  063737  001164  001460    ADD     $TMP2,SUM+2     ;MSB
6191
6192  034124  004737  040452            JSR     PC,$UBCLR
6193  034130  104024                    ERROR   24              ;CERR AFTER SCLR
6194  034132  000712                    BR      2$              ;SEEK TO CYL 0
6195
6196  034134  063737  001162  001462 6$: ADD     $TMP1,SUM1      ;SUM UP REVERSE SEEK TIMES (LSB)
6197  034142  005537  001464            ADC     SUM1+2
6198  034146  063737  001164  001464    ADD     $TMP2,SUM1+2    ;MSB
6199
6200  034154  005200                    INC     R0
6201  034156  020027  000144            CMP     R0,#100.        ;ALL SEEKS DONE?
6202  034162  001265                    BNE     1$              ;BR & REPEAT IF NO TO CYL 1
6203
6204  034164  104401  053426            TYPE    ,MSG30          ;FOWARD SEEK TIME
6205  034170  004737  043052            JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (FOWARD)
```

```
6206
6207  034174  104401  053514                  TYPE    ,MSG31          ;REVERSE SEEK TIME
6208  034200  013737  001462  001456          MOV     $SUM1,SUM       ;SETUP FOR
6209  034206  013737  001464  001460          MOV     SUM1+2,SUM+2    ;AVGTIM ROUTINE
6210  034214  004737  043052                  JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (REVERSE)
6211
6212  034220  104401  001205                  TYPE    ,$CRLF
6213  034224  104401  001205                  TYPE    ,$CRLF
6214  034230  005037  001176                  CLR     $ESCAPE
6215  034234  000464                          BR      TST26           ;;GO TO NEXT TEST
6216
6217  034236  005037  001176          7$:     CLR     $ESCAPE
6218
6219  034242  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
6220  034250  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
6221  034256  012765  000013  000000          MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
6222                                                                  ;RESET CYL DIFF/OFFSET & CYL ADDR REG
6223                                                                  ;IN RKMR2 & RKMR3 RESP.
6224  034264  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
6225  034272  004737  036542                  JSR     PC,FRDY         ;FIND RDY
6226  034276  104124                          ERROR   124             ;RDY NOT SET AFTER RECAL CMD
6227
6228  034300  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
6229  034306  004737  040100                  JSR     PC,GSTAT
6230  034312  032737  020000  007416          BIT     #D.RTZ,HMR2
6231  034320  001001                          BNE     64$
6232  034322  104244                          ERROR   244             ;RTZ NOT SET DURING RECAL CMD
6233  034324  013737  001412  007430  64$:    MOV     T10,TEMP2       ;SETUP TIMEOUT
6234  034332  004737  037056                  JSR     PC,FATT1        ;FIND ATTN
6235  034336  104055                          ERROR   55              ;NO ATTN AFTER RECAL CMD
6236
6237  034340  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
6238  034346  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;DRIVE#
6239  034354  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
6240  034362  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
6241  034370  004737  036542                  JSR     PC,FRDY         ;FIND RDY
6242  034374  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
6243  034376  004737  037024                  JSR     PC,TSTATN       ;TEST FOR ATTN
6244  034402  000401                          BR      65$
6245  034404  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
6246  034406                          65$:
6247
6248
6249
6250
6251                                  ;;*****************************************************************
6252                                  ;*TEST 26       MEASURE 137 CYLINDER SEEK TIME
6253                                  ;*
6254                                  ;*      THIS TEST MEASURES THE AVERAGE SEEK TIME BETWEEN CYLINDERS 0 & 137
6255                                  ;*      THE AVERAGE TIME OF 100 SEEKS IN BOTH DIRECTIONS ARE PRINTED
6256                                  ;*      IF NOT WITHIN LIMITS TO BE SUPPLIED.
6257                                  ;*      AVERAGE SEEK TIME SHOULD BE LESS THAN 40MS
6258                                  ;*
6259                                  ;;*****************************************************************
6260  034406  000004                  TST26:  SCOPE
6261  034410  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
```

```
6262  034416  012706  001100                  MOV     #STACK,SP
6263
6264
6265  034422  004737  042262                  JSR     PC,CALCLK       ;CALIB TIME TO GO THRU 'LOOP'
6266
6267  034426  005000                          CLR     R0              ;ITERATION COUNTER
6268  034430  005037  001456                  CLR     SUM             ;LO WORD OF FOWARD SEEK TIME
6269  034434  005037  001460                  CLR     SUM+2           ;HI WORD OF FOWARD SEEK TIME
6270  034440  005037  001462                  CLR     SUM1            ;LO WORD OF REVERSE SEEK TIME
6271  034444  005037  001464                  CLR     SUM1+2          ;HI WORD OF REVERSE SEEK TIME
6272
6273  034450  004737  040452          1$:     JSR     PC,SUBCLR
6274  034454  104024                          ERROR   24              ;CERR AFTER SCLR
6275
6276  034456  012737  034750  001176          MOV     #7$,$ESCAPE
6277
6278  034464  012765  000211  000020          MOV     #137.,RKDC(R5)  ;SETUP FOR CYL 137.
6279  034472  012765  000017  000000  2$:     MOV     #SEEK,RKCS1(R5) ;SEEK CMD
6280  034500  013737  001414  007426          MOV     T50,TEMP1
6281  034506  004737  036542                  JSR     PC,FRDY         ;FIND RDY
6282  034512  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
6283
6284  034514  005037  001452                  CLR     LPCNT           ;COUNT PASSES THRU LOOP
6285  034520  013704  001222                  MOV     $UNIT,R4
6286  034524  004737  042752                  JSR     PC,FATT3        ;FIND ATTN AND STEP 'LPCNT'
6287  034530  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
6288
6289  034532  004737  040100                  JSR     PC,GSTAT
6290  034536  032737  100000  007370          BIT     #CERR,HCS1
6291  034544  001401                          BEQ     5$
6292  034546  104210                          ERROR   210             ;CERR AFTER SEEK CMD.
6293
6294  034550  013737  001452  001160  5$:     MOV     LPCNT,$TMP0     ;FROM LOOP
6295  034556  013737  001454  001162          MOV     LPTIM,$TMP1     ;FROM CALCLK
6296  034564  013746  001160                  MOV     $TMP0,-(SP)             ;;PUT THE MULTIPLER ON THE STACK
6297  034570  013746  001162                  MOV     $TMP1,-(SP)             ;;PUT THE MULTIPLICAND ON THE STACK
6298  034574  004737  050332                  JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
6299  034600  012637  001162                  MOV     (SP)+,$TMP1             ;;GET THE LSB'S OF THE PRODUCT
6300  034604  012637  001164                  MOV     (SP)+,$TMP1+2   ;;GET THE MSB'S OF THE PRODUCT
6301
6302  034610  005765  000020                  TST     RKDC(R5)
6303  034614  001414                          BEQ     6$              ;BR IF THIS SEEK WAS REVERSE TO CYL 0
6304
6305  034616  063737  001162  001456          ADD     $TMP1,SUM       ;SUM UP FOWARD SEEK TIMES (LSB)
6306  034624  005537  001460                  ADC     SUM+2
6307  034630  063737  001164  001460          ADD     $TMP2,SUM+2     ;MSB
6308
6309  034636  004737  040452                  JSR     PC,SUBCLR
6310  034642  104024                          ERROR   24              ;CERR AFTER SCLR
6311  034644  000712                          BR      2$              ;SEEK TO CYL 0
6312
6313  034646  063737  001162  001462  6$:     ADD     $TMP1,SUM1      ;SUM UP REVERSE SEEK TIMES (LSB)
6314  034654  005537  001464                  ADC     SUM1+2
6315  034660  063737  001164  001464          ADD     $TMP2,SUM1+2    ;MSB
6316
6317  034666  005200                          INC     R0
```

```
6318  034670  020027  000144          CMP     R0,#100.        ;ALL SEEKS DONE?
6319  034674  001265                  BNE     1$              ;BR & REPEAT IF NO TO CYL 137.
6320
6321  034676  104401  053603          TYPE    ,MSG32          ;FOWARD SEEK TIME
6322  034702  004737  043052          JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (FOWARD)
6323
6324  034706  104401  053662          TYPE    ,MSG33          ;REVERSE SEEK TIME
6325  034712  013737  001462  001456  MOV     SUM1,SUM        ;SETUP FOR
6326  034720  013737  001464  001460  MOV     SUM1+2,SUM+2    ;AVGTIM ROUTINE
6327  034726  004737  043052          JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (REVERSE)
6328
6329  034732  104401  001205          TYPE    ,$CRLF
6330  034736  104401  001205          TYPE    ,$CRLF
6331  034742  005037  001176          CLR     $ESCAPE
6332  034746  000464                  BR      TST27           ;;GO TO NEXT TEST
6333
6334  034750  005037  001176  7$:     CLR     $ESCAPE
6335
6336  034754  012765  100000  000000  MOV     #CCLR,RKCS1(R5)
6337  034762  013765  001222  000010  MOV     $UNIT,RKCS2(R5)
6338  034770  012765  000013  000000  MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
6339                                                  ;RESET CYL DIFF/OFFSET & CYL ADDR REG
6340                                                  ;IN RKMR2 & RKMR3 RESP.
6341  034776  013737  001412  007426  MOV     T10,TEMP1       ;SETUP TIMEOUT
6342  035004  004737  036542          JSR     PC,FRDY         ;FIND RDY
6343  035010  104124                  ERROR   124             ;RDY NOT SET AFTER RECAL CMD
6344
6345  035012  012765  000001  000026  MOV     #1,RKMR1(R5)    ;SELECT WORD 1
6346  035020  004737  040100          JSR     PC,GSTAT
6347  035024  032737  020000  007416  BIT     #D.RTZ,HMR2
6348  035032  001001                  BNE     64$
6349  035034  104244                  ERROR   244             ;RTZ NOT SET DURING RECAL CMD
6350  035036  013737  001412  007430  64$:    MOV     T10,TEMP2       ;SETUP TIMEOUT
6351  035044  004737  037056          JSR     PC,FATT1        ;FIND ATTN
6352  035050  104055                  ERROR   55              ;NO ATTN AFTER RECAL CMD
6353
6354  035052  012765  100000  000000  MOV     #CCLR,RKCS1(R5)
6355  035060  013765  001222  000010  MOV     $UNIT,RKCS2(R5) ;DRIVE#
6356  035066  012765  000005  000000  MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
6357  035074  013737  001412  007426  MOV     T10,TEMP1       ;SETUP TIMEOUT
6358  035102  004737  036542          JSR     PC,FRDY         ;FIND RDY
6359  035106  104151                  ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
6360  035110  004737  037024          JSR     PC,TSTATN       ;TEST FOR ATTN
6361  035114  000401                  BR      65$
6362  035116  104154                  ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
6363  035120                  65$:
6364
6365
6366
6367                          ;;*****************************************************************
6368                          ;*TEST 27       MEASURE MAX VELOCITY OF HEADS
6369                          ;*
6370                          ;*      THIS TESTS MAX VELOCITY BY DOING SEEKS BETWEEN
6371                          ;*      CYL 0 & 383 AND MEASURING THE TIME BETWEEN CYLINDERS
6372                          ;*      128 & 256.  SINCE THE DISTANCE BETWEEN CYL 128 & 256 IS KNOWN,
6373                          ;*      THE AVERAGE VELOCITY OF 100 SEEKS IS CALCULATED & TYPED
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```
                                        ;*      IF NOT WITHIN THE SPECIFIED LIMITS TO BE SUPPLIED.
                                        ;*
                                        ;;**********************************************************************
035120  000004                          TST27:  SCOPE
035122  012737  000001  001174                  MOV     #1,$TIMES       ;;DO 1 ITERATION
035130  012706  001100                          MOV     #STACK,SP       ;RESTORE STK PTR

035134  005000                          1$:     CLR     R0              ;ITERATION COUNTER
035136  005037  001456                          CLR     SUM             ;LO WORD OF FOWARD SEEK TIME
035142  005037  001460                          CLR     SUM+2           ;HI WORD OF FOWARD SEEK TIME
035146  005037  001462                          CLR     SUM1            ;LO WORD OF REVERSE SEEK TIME
035152  005037  001464                          CLR     SUM1+2          ;HI WORD OF REVERSE SEEK TIME

035156  004737  042502                          JSR     PC,VELCAL       ;CLOCK CALIB SIMILAR TO CALCLK

035162  004737  040452                          JSR     PC,SUBCLR
035166  104024                                  ERROR   24              ;CERR AFTER SCLR

035170  012737  035664  001176                  MOV     #14$,$ESCAPE

035176  012765  000577  000020                  MOV     #383.,RKDC(R5)
035204  012765  000017  000000          2$:     MOV     #SEEK,RKCS1(R5) ;SEEK CMD TO CYL 400
035212  013737  001414  007426                  MOV     T50,TEMP1
035220  004737  036542                          JSR     PC,FRDY         ;FIND RDY
035224  104131                                  ERROR   131             ;NO RDY AFTER SEEK CMD

035226  013737  001416  007426                  MOV     T500,TEMP1
035234  004737  040666                  64$:    JSR     PC,QKCYLD       ;READ CYL DIFF (NO SHIFTING)
035240  032737  004000  001362                  BIT     #BIT11,CYLDIF   ;CHECK BIT 7 (NO SHIFTING)
035246  001004                                  BNE     65$             ;BR IF SET
035250  005337  007426                          DEC     TEMP1
035254  001367                                  BNE     64$
035256  104110                                  ERROR   110             ;CANNOT FIND CYL 128

035260  005037  001452                  65$:    CLR     LPCNT
035264  004737  040666                  66$:    JSR     PC,QKCYLD
035270  032737  004000  001362                  BIT     #BIT11,CYLDIF   ;CHECK BIT 7 (NO SHIFTING)
035276  001406                                  BEQ     67$

035300  004737  042726                          JSR     PC,LOOP
035304  005737  001452                          TST     LPCNT
035310  001365                                  BNE     66$
035312  104111                                  ERROR   111             ;CANNOT FIND CYL 256
035314                                  67$:
035314  013737  001424  007426                  MOV     T50000,TEMP1
035322  004737  037152                          JSR     PC,FATT2        ;FIND ATTN
035326  104132                                  ERROR   132             ;NO ATTN AFTER SEEK CMD

035330  032737  100000  007370                  BIT     #CERR,HCS1
035336  001401                                  BEQ     7$
035340  104210                                  ERROR   210             ;CERR AFTER SEEK CMD

035342  013702  001452                  7$:     MOV     LPCNT,R2        ;FROM LOOP
035346  013703  001454                          MOV     LPTIM,R3        ;FROM VELCAL
035352  010246                                  MOV     R2,-(SP)                ;;PUT THE MULTIPLER ON THE STACK
035354  010346                                  MOV     R3,-(SP)                ;;PUT THE MULTIPLICAND ON THE STACK
```

```
6430  035356  004737  050332          JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
6431  035362  012616                  MOV     (SP)+,(SP)      ;;DISREGARD THE MSB'S
6432  035364  012603                  MOV     (SP)+,R3                ;;GET THE LSB'S OF THE PRODUCT
6433  035366  060337  001456          ADD     R3,SUM          ;SUM UP FOWARD SEEK TIMES
6434  035372  005537  001460          ADC     SUM+2
6435
6436  035376  004737  040452          JSR     PC,SUBCLR
6437  035402  104024                  ERROR   24              ;CERR AFTER SCLR
6438
6439  035404  012765  000017  000000  MOV     #SEEK,RKCS1(R5) ;SEEK TO CYL 0
6440  035412  013737  001414  007426  MOV     T50,TEMP1
6441  035420  004737  036542          JSR     PC,FRDY         ;FIND RDY
6442  035424  104131                  ERROR   131             ;NO RDY AFTER SEEK CMD
6443
6444  035426  013737  001416  007426  MOV     T500,TEMP1
6445  035434  004737  040666  68$:    JSR     PC,QKCYLD       ;READ CYL DIFF (NO SHIFTING)
6446  035440  032737  004000  001362  BIT     #BIT11,CYLDIF   ;CHECK BIT 7 (NO SHIFTING)
6447  035446  001004                  BNE     69$             ;BR IF SET
6448  035450  005337  007426          DEC     TEMP1
6449  035454  001367                  BNE     68$
6450  035456  104111                  ERROR   111             ;CANNOT FIND CYL 256
6451
6452  035460  005037  001452  69$:    CLR     LPCNT
6453  035464  004737  040666  70$:    JSR     PC,QKCYLD
6454  035470  032737  004000  001362  BIT     #BIT11,CYLDIF   ;CHECK BIT 7 (NO SHIFTING)
6455  035476  001406                  BEQ     71$
6456
6457  035500  004737  042726          JSR     PC,LOOP
6458  035504  005737  001452          TST     LPCNT
6459  035510  001365                  BNE     70$
6460  035512  104110                  ERROR   110             ;CANNOT FIND CYL 128
6461  035514                  71$:
6462  035514  013737  001424  007426  MOV     T50000,TEMP1
6463  035522  004737  037152          JSR     PC,FATT2        ;FIND ATTN
6464  035526  104132                  ERROR   132             ;NO ATTN AFTER SEEK CMD
6465
6466  035530  032737  100000  007370  BIT     #CERR,HCS1
6467  035536  001401                  BEQ     12$
6468  035540  104210                  ERROR   210             ;CERR AFTER SEEK CMD
6469
6470  035542  013702  001452  12$:    MOV     LPCNT,R2
6471  035546  013703  001454          MOV     LPTIM,R3
6472  035552  010246                  MOV     R2,-(SP)                ;;PUT THE MULTIPLER ON THE STACK
6473  035554  010346                  MOV     R3,-(SP)                ;;PUT THE MULTIPLICAND ON THE STACK
6474  035556  004737  050332          JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
6475  035562  012616                  MOV     (SP)+,(SP)      ;;DISREGARD THE MSB'S
6476  035564  012603                  MOV     (SP)+,R3                ;;GET THE LSB'S OF THE PRODUCT
6477  035566  060337  001462          ADD     R3,SUM1         ;SUM UP REVERSE SEEK TIMES
6478  035572  005537  001464          ADC     SUM1+2
6479
6480  035576  005200                  INC     R0
6481  035600  020027  000144          CMP     R0,#100.        ;DONE 100 SEEKS?
6482  035604  001402                  BEQ     13$             ;BR IF YES
6483  035606  000137  035162          JMP     1$              ;ELSE DO AGAIN
6484
6485  035612  104401  053742  13$:    TYPE    ,MSG34          ;AVG MAX FWD SPEED
```

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6486  035616  004737  043112                  JSR     PC,AVGSP        ;CALC & TYPE AVG SPEED
6487
6488  035622  104401  054030                  TYPE    ,MSG35          ;AVG MAX REV SPEED
6489  035626  013737  001462  001456          MOV     $SUM1,SUM       ;SETUP FOR
6490  035634  013737  001464  001460          MOV     SUM1+2,SUM+2    ;AVGSP ROUTINE
6491  035642  004737  043112                  JSR     PC,AVGSP
6492
6493  035646  104401  001205                  TYPE    ,$CRLF
6494  035652  104401  001205                  TYPE    ,$CRLF
6495  035656  005037  001176                  CLR     $ESCAPE
6496  035662  000464                          BR      $EOP
6497
6498  035664  005037  001176          14$:    CLR     $ESCAPE
6499
6500  035670  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
6501  035676  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
6502  035704  012765  000013  000000          MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
6503                                          ;RESET CYL DIFF/OFFSET & CYL ADDR REG
6504                                          ;IN RKMR2 & RKMR3 RESP.
6505  035712  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
6506  035720  004737  036542                  JSR     PC,FRDY         ;FIND RDY
6507  035724  104124                          ERROR   124             ;RDY NOT SET AFTER RECAL CMD
6508
6509  035726  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
6510  035734  004737  040100                  JSR     PC,GSTAT
6511  035740  032737  020000  007416          BIT     #D.RTZ,HMR2
6512  035746  001001                          BNE     72$
6513  035750  104244                          ERROR   244             ;RTZ NOT SET DURING RECAL CMD
6514  035752  013737  001412  007430  72$:    MOV     T10,TEMP2       ;SETUP TIMEOUT
6515  035760  004737  037056                  JSR     PC,FATT1        ;FIND ATTN
6516  035764  104055                          ERROR   55              ;NO ATTN AFTER RECAL CMD
6517
6518  035766  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
6519  035774  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;DRIVE#
6520  036002  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
6521  036010  013737  001412  007426          MOV     T10,TEMP1       ;SETUP TIMEOUT
6522  036016  004737  036542                  JSR     PC,FRDY         ;FIND RDY
6523  036022  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
6524  036024  004737  037024                  JSR     PC,TSTATN       ;TEST FOR ATTN
6525  036030  000401                          BR      73$
6526  036032  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
6527  036034                          73$:
6528
6529
6530
6531
```

```
                                .SBTTL  END OF PASS ROUTINE
                                ;;*****************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO ST5
                                
036034                          $EOP:
                                
036034  000004                          SCOPE
036036  012706  001100                  MOV     #STACK,SP
036042  005237  001220                  INC     $DEVCT          ;INCR COUNT FOR # DRIVES CHECKED
036046  023737  007510  001220          CMP     DRIVS,$DEVCT    ;ARE ALL DRIVES PRESENT TESTED?
036054  001403                          BEQ     $EOP1+2         ;BR IF YES
036056  000137  015154                  JMP     NUDRV           ;ELSE TEST NEXT DRIVE PRESENT
036062  000004                  $EOP1:  SCOPE
036064  005037  001102                  CLR     $TSTNM          ;;ZERO THE TEST NUMBER
036070  005037  001174                  CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
036074  005237  001216                  INC     $PASS           ;;INCREMENT THE PASS NUMBER
036100  042737  100000  001216          BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
036106  005327                          DEC     (PC)+           ;;LOOP?
036110  000001                  $EOPCT: .WORD   1
036112  003022                          BGT     $DOAGN          ;;YES
036114  012737                          MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
036116  000001                  $ENDCT: .WORD   1
036120  036110                          $EOPCT
036122  104401  036167                  TYPE    ,$ENDMG         ;;TYPE "END PASS #"
036126  013746  001216                  MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
036132  104405                          TYPDS                   ;;GO TYPE--[illegible]CIMAL ASCII WITH SIGN
036134  104401  036164                  TYPE    ,$ENULL         ;;TYPE A NULL CHARACTER
036140  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
036144  001405                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
036146  000005                          RESET                   ;;CLEAR THE WORLD
036150  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
036152  000240                          NOP                     ;;SAVE ROOM
036154  000240                          NOP                     ;;FOR
036156  000240                          NOP                     ;;ACT11
036160                          $DOAGN:
036160  000137                          JMP     @(PC)+          ;;RETURN
036162  013534                  $RTNAD: .WORD   ST5
036164     377     377     000  $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
036167     015  042412  042116  $ENDMG: .ASCIZ  <15><12>/END PASS #/
036174  050040  051501  020123
036202  000043
```

```
                                .SBTTL  SUBROUTINES

                                ;SUBROUTINE TO CLEAR ALL FLAGS FROM DDUMP THRU DOTIM
                                ;
036204  012700  007500          CLRFLG: MOV     #DDUMP,R0
036210  012701  177757                  MOV     #-17.,R1
036214  005020                  1$:     CLR     (R0)+
036216  005201                          INC     R1
036220  001375                          BNE     1$
036222  000207                          RTS     PC

                                ;
                                ;TYPE PROGRAM ID IF FTITLE=0
                                ;
036224  005737  001344          TITLE:  TST     FTITLE
036230  001024                          BNE     1$
036232  005237  001344                  INC     FTITLE
036236  104401  050630                  TYPE    ,MSG1                   ;PROGRAM ID
                                .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
036242  005737  000042                  TST     @#42                    ;;ARE WE RUNNING UNDER XXDP/ACT?
036246  001012                          BNE     64$                     ;;BRANCH IF YES
036250  123727  001230  000001          CMPB    $ENV,#1                 ;;ARE WE RUNNING UNDER APT?
036256  001406                          BEQ     64$                     ;;BRANCH IF YES
036260  023727  001140  000176          CMP     SWR,#SWREG              ;;SOFTWARE SWITCH REG SELECTED?
036266  001005                          BNE     65$                     ;;BRANCH IF NO
036270  104406                          GTSWR                           ;;GET SOFT-SWR SETTINGS
036272  000403                          BR      65$
036274  112737  000001  001134  64$:    MOVB    #1,$AUTOB               ;;SET AUTO-MODE INDICATOR
036302                          65$:
036302  000207                  1$:     RTS     PC

                                ;
                                ;ROUTINE TO INPUT DRIVE NOS. TYPED IN & SET
                                ;DRIVS, DRIV0-DRIV7 REGISTERS APPROPRIATELY
                                ;
036304  104411                  GDRVS:  RDLIN
036306  012600                          MOV     (SP)+,R0                ;GET STARTING ADDR OF ASCII STRING
036310  012701  177770                  MOV     #-8.,R1                 ;SET UP COUNT
036314  112002                  1$:     MOVB    (R0)+,R2                ;GET ASCII CHAR
036316  042702  177400                  BIC     #177400,R2              ;MASK HI BYTE
036322  012703  007512                  MOV     #DRIV0,R3               ;DRIVE FLAG ADDR
036326  012704  000060                  MOV     #60,R4

036332  020402                  2$:     CMP     R4,R2                   ;WAS TYPED CHAR 0 THRU 7?
036334  001415                          BEQ     3$                      ;BRANCH IF YES
036336  005723                          TST     (R3)+                   ;NO, INCREMENT DR FLAG ADDR
036340  005204                          INC     R4
036342  020427  000070                  CMP     R4,#70
036346  001371                          BNE     2$                      ;S/B 0-7 OR TERMINATOR
036350  005702                          TST     R2
036352  001022                          BNE     4$
036354  020127  177770                  CMP     R1,#-8.
036360  001426                          BEQ     6$                      ;DEFAULT ALL DRIVES
```

```
6633  036362  005037  007540          7$:     CLR     SIZFLG          ;BYPASS TEST 1 (SIZING)
6634  036366  000207                          RTS     PC              ;FOUND TERMINATOR, EXIT
6635
6636  036370  005213                  3$:     INC     @R3             ;SET UP FLAG FOR THE DRIVE
6637  036372  005237  007510                  INC     DRIVS           ;INCREMENT TOTAL # DRIVES TO BE TESTED
6638  036376  112002                          MOVB    (R0)+,R2        ;GET NEXT ASCII CHAR.
6639  036400  042702  177400                  BIC     #177400,R2      ;MASK
6640  036404  022702  000054                  CMP     #54,R2          ;IS IT A COMMA?
6641  036410  001407                          BEQ     5$              ;YES, GO TO NEXT WORD.
6642  036412  005702                          TST     R2              ;NO, IS IT A TERMINATOR?
6643  036414  001001                          BNE     4$              ;IF NOT, SOMETHING WRONG.
6644  036416  000761                          BR      7$              ;FOUND TERMINATOR, EXIT
6645
6646  036420  104401  055041          4$:     TYPE    ,EM1            ;ONLY 0-7 ALLOWED.
6647  036424  000137  012742                  JMP     PRGSRT          ;START ALL OVER
6648
6649  036430  005201                  5$:     INC     R1              ;S/B NO MORE THAN 8 DIFF
6650  036432  001330                          BNE     1$              ;DRIVES TYPED IN.
6651  036434  000771                          BR      4$              ;IF NORE, HAVE ERROR.
6652
6653  036436  005237  007540          6$:     INC     SIZFLG          ;DO TEST 1 (SIZING)
6654  036442  000207                          RTS     PC              ;EXIT.
6655
6656                                  ;
6657                                  ;ROUTINE TO INPUT RKBAS OR DEFAULT.
6658                                  ;
6659
6660  036444  104412                  GBA:    RDOCT
6661  036446  012600                          MOV     (SP)+,R0        ;GET LOW ORDER FROM STACK
6662  036450  005700                          TST     R0
6663  036452  001403                          BEQ     1$              ;BRANCH IF DEFAULT.
6664  036454  010037  001264                  MOV     R0,$BASE
6665  036460  000207                          RTS     PC
6666  036462  012737  177440  001264  1$:     MOV     #177440,$BASE   ;DEFAULT VALUE
6667  036470  000207                          RTS     PC
6668
6669                                  ;
6670                                  ;ROUTINE TO INPUT RKVEC OR DEFAULT
6671                                  ;
6672
6673  036472  104412                  GINT:   RDOCT
6674  036474  012600                          MOV     (SP)+,R0        ;GET LOW ORDER FROM STACK
6675  036476  005700                          TST     R0
6676  036500  001405                          BEQ     1$              ;BRANCH IF DEFAULT
6677  036502  010037  001314                  MOV     R0,RKVEC
6678  036506  004737  036524          2$:     JSR     PC,SETINT
6679  036512  000207                          RTS     PC
6680  036514  012737  000210  001314  1$:     MOV     #210,RKVEC      ;DEFAULT VALUE
6681  036522  000771                          BR      2$
6682
6683                                  ;
6684                                  ;ROUTINE TO SETUP INTERRUPT VECTOR & PRIORITY
6685                                  ;
6686
6687  036524  013700  001314          SETINT: MOV     RKVEC,R0
6688  036530  012720  044130                  MOV     #INTER,(R0)+    ;INTER ADDR TO RKVEC
```

```
 6689  036534  013710  001316                  MOV     RKPRI,(R0)      ;PR5 TO RKVEC+2
 6690  036540  000207                          RTS     PC
 6691
 6692
 6693                                  ;
 6694                                  ;ROUTINE TO FIND CONTROLLER READY (RDY) DURING A DELAY
 6695                                  ;ENTER WITH A COUNT IN TEMP1
 6696                                  ;RETURN IF RDY NOT PRESENT (ERROR CONDITION)
 6697                                  ;RETURN +2 IF RDY PRESENT (SKIP OVER ERROR)
 6698                                  ;STATUS IS OBTAINED BEFORE THE RETURN FOR EITHER CASE
 6699                                  ;
 6700  036542  032765  000200  000000  FRDY:   BIT     #RDY,RKCS1(R5)
 6701  036550  001010                          BNE     1$
 6702  036552  005337  007426                  DEC     TEMP1
 6703  036556  001371                          BNE     FRDY
 6704  036560  004737  036676                  JSR     PC,HOLD         ;STORE ALL RK611 REGS IN HOLDING REGS.
 6705  036564  004737  040016                  JSR     PC,CKCERR       ;CHECK FOR SPECIAL CERR
 6706  036570  000207                          RTS     PC              ;NO RDY, EXIT
 6707  036572  062716  000002          1$:     ADD     #2,(SP)         ;SKIP OVER ERROR
 6708  036576  004737  036676                  JSR     PC,HOLD
 6709  036602  004737  040016                  JSR     PC,CKCERR       ;CHECK FOR SPECIAL CERR
 6710  036606  000207                          RTS     PC
 6711                                  ;
 6712                                  ;ROUTINE TO FIND CONTROLLER READY AND STORE DRIVE REGS ONLY
 6713                                  ;
 6714  036610  032765  000200  000000  FRDY1:  BIT     #RDY,RKCS1(R5)
 6715  036616  001014                          BNE     1$
 6716  036620  005337  007426                  DEC     TEMP1
 6717  036624  001371                          BNE     FRDY1
 6718  036626  016537  000034  007416          MOV     RKMR2(R5),HMR2
 6719  036634  016537  000036  007420          MOV     RKMR3(R5),HMR3
 6720  036642  004737  040016                  JSR     PC,CKCERR       ;CHECK FOR SPECIAL CERR CONDITIONS
 6721  036646  000207                          RTS     PC              ;NO RDY, EXIT
 6722  036650  062716  000002          1$:     ADD     #2,(SP)         ;SKIP OVER ERROR
 6723  036654  016537  000034  007416          MOV     RKMR2(R5),HMR2
 6724  036662  016537  000036  007420          MOV     RKMR3(R5),HMR3
 6725  036670  004737  040016                  JSR     PC,CKCERR       ;CHECK FOR SPECIAL CERR CONDITIONS
 6726  036674  000207                          RTS     PC
 6727
 6728                                  ;
 6729                                  ;STORE ALL RK611 REGISTERS IN HOLDING REGS
 6730                                  ;
 6731
 6732  036676  016537  000000  007370  HOLD:   MOV     RKCS1(R5),HCS1
 6733  036704  016537  000010  007372          MOV     RKCS2(R5),HCS2
 6734  036712  016537  000002  007374          MOV     RKWC(R5),HWC
 6735  036720  016537  000004  007376          MOV     RKBA(R5),HBA
 6736  036726  016537  000006  007400          MOV     RKDA(R5),HDA
 6737  036734  016537  000012  007402          MOV     RKDS(R5),HDS
 6738  036742  016537  000014  007404          MOV     RKER(R5),HER
 6739  036750  016537  000016  007406          MOV     RKASOF(R5),HASOF
 6740  036756  016537  000020  007410          MOV     RKDC(R5),HDC
 6741  036764  016537  000026  007414          MOV     RKMR1(R5),HMR1
 6742  036772  016537  000034  007416          MOV     RKMR2(R5),HMR2
 6743  037000  016537  000036  007420          MOV     RKMR3(R5),HMR3
 6744  037006  016537  000030  007422          MOV     RKECPS(R5),HPOS
```

```
  6745  037014  016537  000032  007424          MOV     RKECPT(R5),HPAT
  6746  037022  000207                          RTS     PC
  6747
  6748                                  ;
  6749                                  ;ROUTINE TO CHECK FOR CORRECT ATTN
  6750                                  ;RETURN IF ATTN NOT PRESENT (ERROR CONDITION)
  6751                                  ;RETURN +2 IF ATTN PRESENT (SKIP OVER ERROR)
  6752                                  ;
  6753  037024  010446                  ?STATN: MOV     R4,-(SP)        ;SAV R4
  6754  037026  013704  001222                  MOV     $UNIT,R4
  6755  037032  136437  007360  007407          BITB    ATTN(R4),HASOF+1
  6756  037040  001404                          BEQ     1$              ;BRANCH IF ATTN NOT PRESENT
  6757  037042  012604                          MOV     (SP)+,R4        ;RESTOR R4
  6758  037044  062716  000002                  ADD     #2,(SP)         ;INCR RET ADDR TO JUMP OVER ERROR.
  6759  037050  000207                          RTS     PC
  6760  037052  012604                  1$:     MOV     (SP)+,R4        ;RESTOR R4
  6761  037054  000207                          RTS     PC
  6762
  6763                                  ;
  6764                                  ;ROUTINE TO FIND ATTN WITHIN TIMES GREATER THAN 1 SEC
  6765                                  ;ENTER WITH TIME IN SECONDS IN TEMP2
  6766                                  ;RETURN IF NO ATTN (ERROR CONDITION)
  6767                                  ;RETURN +2 IF ATTN FOUND
  6768                                  ;STATUS IS OBTAINED BEFORE THE RETURN FOR EITHER CASE
  6769                                  ;
  6770
  6771  037056  010446                  FATT1:  MOV     R4,-(SP)        ;SAV R4
  6772  037060  012737  177777  007426  3$:     MOV     #-1,TEMP1
  6773  037066  013704  001222                  MOV     $UNIT,R4
  6774  037072  136465  007360  000017  1$:     BITB    ATTN(R4),RKASOF+1(R5) ;FIND CORRECT ATTN
  6775  037100  001014                          BNE     2$
  6776  037102  005337  007426                  DEC     TEMP1
  6777  037106  001371                          BNE     1$
  6778  037110  005337  007430                  DEC     TEMP2
  6779  037114  001361                          BNE     3$
  6780  037116  005065  000026                  CLR     RKMR1(R5)       ;SELECT WORD 0
  6781  037122  004737  040100                  JSR     PC,GSTAT        ;GET LATEST STATUS
  6782  037126  012604                          MOV     (SP)+,R4        ;RESTOR R4
  6783  037130  000207                          RTS     PC
  6784  037132  005065  000026          2$:     CLR     RKMR1(R5)
  6785  037136  004737  040100                  JSR     PC,GSTAT        ;GET STATUS AFTER ATTN SEEN
  6786  037142  012604                          MOV     (SP)+,R4        ;RESTOR R4
  6787  037144  062716  000002                  ADD     #2,(SP)         ;SKIP OVER ERROR
  6788  037150  000207                          RTS     PC
  6789
  6790                                  ;
  6791                                  ;ROUTINE TO FIND ATTN WITHIN 1 SEC
  6792                                  ;ENTER WITH COUNT IN TEMP1
  6793                                  ;RETURN IF NO ATTN (ERROR)
  6794                                  ;RETURN +2 IF ATTN FOUND
  6795                                  ;STATUS IS OBTAINED BEFORE THE RETURN FOR EITHER CASE
  6796                                  ;
  6797
  6798  037152  010446                  FATT2:  MOV     R4,-(SP)        ;SAV R4
  6799  037154  013704  001222          2$:     MOV     $UNIT,R4
  6800  037160  136465  007360  000017          BITB    ATTN(R4),RKASOF+1(R5)  ;FIND CORRECT ATTN
```

```
                        001011          BNE     1$
                        005337  007426  DEC     TEMP1
                        001367          BNE     2$
                        005065  000026  CLR     RKMR1(R5)       ;SELECT WORD 0
                        004737  040100  JSR     PC,GSTAT        ;GET LATEST STATUS.
                        012604          MOV     (SP)+,R4        ;RESTOR R4
                        000207          RTS     PC
                        005065  000026  1$:     CLR     RKMR1(R5)
                        004737  040100          JSR     PC,GSTAT
                        012604          MOV     (SP)+,R4        ;RESTOR R4
                        062716  000002          ADD     #2,(SP)         ;SKIP OVER ERROR
                        000207          RTS     PC
                                        ;
                                        ;ENTER WITH A COUNT IN TEMP1
                                        ;THE DELAY IS APPROX 17 US/ITERATION + 12 US TO EXIT
                                        ;WHEN COUNT IS 0. BASED ON AN 11/05
                                        ;
                        005737  007426  DLY:    TST     TEMP1           ;5.6 US
                        001403          BEQ     1$              ;1.9 US
                        005337  007426          DEC     TEMP1           ;6.8 US
                        000772          BR      DLY             ;2.5 US
                        000207          1$:     RTS     PC              ;3.8 US
                                        ;
                                        ;THIS ROUTINE TYPES BYPASSED DRIVE#.  ENTER WITH DRIVE# IN R0
                                        ;
                        104401  052300  BYP:    TYPE    ,MSG14          ;BYPASS DRIVE
                        010046          MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
                                                                ;;TYPE DR#
                        104403          TYPOS                   ;;GO TYPE--OCTAL ASCII
                           001          .BYTE   1               ;;TYPE 1 DIGIT(S)
                           000          .BYTE   0               ;;SUPPRESS LEADING ZEROS
                        000207          RTS     PC
                                        ;
                                        ;THIS ROUTINE READS ALL MSG A & B WORDS & CHECKS THEM AS REQ'D.
                                        ;
                        017637  000000  001534  CHKMSG: MOV     @(SP),CHKFLG    ;PASS MSGS TO BE TESTED
                        062716  000002          ADD     #2,(SP)         ;BUMP RETURN ADDR TO 1ST ERROR
                        004737  040142          JSR     PC,GSTAT1       ;GET ALL ACTUAL DRIVE & CONTR STATUS
                                                                        ;
                        053737  001222  007460  BIS     $UNIT,E.A0      ;SET UNIT #
                        053737  001222  007464  BIS     $UNIT,E.A1
                        053737  001222  007470  BIS     $UNIT,E.A2
                        053737  001222  007474  BIS     $UNIT,E.A3
                                                                        ;
                        013746  007426          MOV     TEMP1,-(SP)     ;SAVE TEMP1
                                                                        ;
                        013737  007460  007426  MOV     E.A0,TEMP1
                        004737  043354          JSR     PC,SBPAR        ;GET PARITY FOR MSG A0
                        013737  007426  007460  MOV     TEMP1,E.A0
                                                                        ;
                        013737  007464  007426  MOV     E.A1,TEMP1
                        004737  043354          JSR     PC,SBPAR        ;GET PARITY FOR MSG A1
                        013737  007426  007464  MOV     TEMP1,E.A1
                                                                        ;
                        013737  007470  007426  MOV     E.A2,TEMP1
```

```
6857  037404  004737  043354          JSR     PC,SBPAR        ;GET PARITY FOR MSG A2
6858  037410  013737  007426  007470  MOV     TEMP1,E.A2
6859
6860  037416  013737  007462  007426  MOV     E.B0,TEMP1
6861  037424  004737  043354          JSR     PC,SBPAR        ;GET PARITY FOR MSG B0
6862  037430  013737  007426  007462  MOV     TEMP1,E.B0
6863
6864  037436  013737  007466  007426  MOV     E.B1,TEMP1
6865  037444  004737  043354          JSR     PC,SBPAR        ;GET PARITY FOR MSG B1
6866  037450  013737  007426  007466  MOV     TEMP1,E.B1
6867
6868  037456  013737  007472  007426  MOV     E.B2,TEMP1
6869  037464  004737  043354          JSR     PC,SBPAR        ;GET PARITY FOR MSG B2
6870  037470  013737  007426  007472  MOV     TEMP1,E.B2
6871
6872  037476  013737  007476  007426  MOV     E.B3,TEMP1
6873  037504  004737  043354          JSR     PC,SBPAR        ;GET PARITY FOR MSG B3
6874  037510  013737  007426  007476  MOV     TEMP1,E.B3
6875
6876  037516  012637  007426          MOV     (SP)+,TEMP1     ;RESTORE TEMP1
6877  037522  013737  001176  001172  MOV     $ESCAPE,$TMP5   ;SAVE ESCAPE
6878
6879  037530  023737  007440  007460  CMP     H.A0,E.A0       ;TEST MSG A0
6880  037536  001411                  BEQ     2$              ;BR IF OK
6881  037540  012737  037552  001176  MOV     #1$,$ESCAPE     ;ELSE SETUP ESCAPE
6882  037546  011646                  MOV     (SP),-(SP)      ;COPY RET ADDR.
6883  037550  000207                  RTS     PC              ;& RETURN TO MAINLINE ERROR
6884
6885  037552  032777  001000  141360  1$:     BIT     #SW9,@SWR       ;RET HERE FROM MAINLINE ERROR
6886  037560  001107                  BNE     20$             ;& BR IF LOOP ON ERROR
6887  037562  062716  000002          2$:     ADD     #2,(SP)         ;BUMP RET ADDR TO NEXT ERROR
6888
6889  037566  023737  007442  007462          CMP     H.B0,E.B0       ;TEST MSG B0
6890  037574  001411                          BEQ     5$              ;BR IF OK
6891  037576  012737  037610  001176          MOV     #4$,$ESCAPE     ;ELSE SETUP ESCAPE
6892  037604  011646                          MOV     (SP),-(SP)      ;COPY RET ADDR
6893  037606  000207                          RTS     PC              ;& RETURN TO MAINLINE ERROR
6894
6895  037610  032777  001000  141322  4$:     BIT     #SW9,@SWR       ;RETURN HERE FROM MAINLINE ERROR
6896  037616  001070                          BNE     20$             ;& BR IF LOOP ON ERROR
6897  037620  062716  000002          5$:     ADD     #2,(SP)         ;BUMP RET ADDR TO NEXT ERROR
6898
6899  037624  023737  007444  007464          CMP     H.A1,E.A1       ;TEST MSG A1
6900  037632  001411                          BEQ     8$              ;BR IF OK
6901  037634  012737  037646  001176          MOV     #7$,$ESCAPE
6902  037642  011646                          MOV     (SP),-(SP)
6903  037644  000207                          RTS     PC
6904
6905  037646  032777  001000  141264  7$:     BIT     #SW9,@SWR
6906  037654  001051                          BNE     20$
6907  037656  062716  000002          8$:     ADD     #2,(SP)
6908
6909  037662  023737  007446  007466          CMP     H.B1,E.B1       ;TEST MSG B1
6910  037670  001411                          BEQ     11$             ;BR IF OK
6911  037672  012737  037704  001176          MOV     #10$,$ESCAPE
6912  037700  011646                          MOV     (SP),-(SP)
```

```
6913  037702  000207                          RTS     PC
6914
6915  037704  032777  001000  141226  10$:    BIT     #SW9,@SWR
6916  037712  001032                          BNE     20$
6917  037714  062716  000002          11$:    ADD     #2,(SP)
6918
6919  037720  032737  000001  001534  12$:    BIT     #T.A2,CHKFLG    ;TEST MSG A2?
6920  037726  001402                          BEQ     13$             ;BR IF NO
6921  037730  004737  041026                  JSR     PC,RCYLD        ;PUT INFO CYLDIF, DO NOT CHECK
6922  037734  032737  000002  001534  13$:    BIT     #T.B2,CHKFLG    ;TEST MSG B2?
6923  037742  001402                          BEQ     14$             ;BR IF NO
6924  037744  004737  041100                  JSR     PC,RCYLA        ;PUT INFO IN CYLADD, DO NOT CHECK
6925
6926  037750  032737  000004  001534  14$:    BIT     #T.B3,CHKFLG    ;TEST MSG B3?
6927  037756  001404                          BEQ     15$
6928  037760  004737  041136                  JSR     PC,RSEC         ;PUT INFO IN SECTOR, DO NOT CHECK
6929  037764  004737  041174                  JSR     PC,RHEAD        ;PUT INFO IN HEADA, DO NOT CHECK
6930
6931  037770  013737  001172  001176  15$:    MOV     $TMP5,$ESCAPE   ;RESTORE ESCAPE
6932  037776  000207                          RTS     PC
6933
6934  040000  012706  001100          20$:    MOV     #STACK,SP       ;RESET STACK PTR
6935  040004  013737  001172  001176          MOV     $TMP5,$ESCAPE   ;RESTORE ESCAPE
6936  040012  000177  141072                  JMP     @$LPERR
6937                                  ;
6938                                  ;THIS ROUTINE CHECKS FOR CERTAIN ERROR CONDITIONS ONLY
6939                                  ;I.E.: IF NED, CTO OR MDS SET MESSAGE A & B ARE INVALID
6940                                  ;
6941  040016  005737  001532          CKCERR: TST     BYPCERR
6942  040022  001025                          BNE     4$
6943  040024  032737  100000  007370          BIT     #CERR,HCS1
6944  040032  001001                          BNE     1$              ;BR IF CERR
6945  040034  000207                          RTS     PC
6946
6947  040036  032737  004000  007370  1$:     BIT     #CTO,HCS1
6948  040044  001402                          BEQ     2$              ;BR IF NOT CTO
6949  040046  104125                          ERROR   125             ;CTO ERROR, MSG A & B INVALID
6950  040050  000207                          RTS     PC
6951
6952  040052  032737  010000  007372  2$:     BIT     #NED,HCS2
6953  040060  001401                          BEQ     3$              ;BR IF NOT NED
6954  040062  104126                          ERROR   126             ;NED ERROR, MSG A & B INVALID
6955
6956  040064  032737  001000  007372  3$:     BIT     #MDS,HCS2
6957  040072  001401                          BEQ     4$
6958  040074  104127                          ERROR   127             ;MDS ERROR, MSG A & B INVALID
6959
6960  040076  000207                  4$:     RTS     PC
6961
6962                                  ;
6963                                  ;THIS ROUTINE DOES THE SELECT DRIVE COMMAND TO GET STATUS
6964                                  ;IT THEN WAITS FOR CONTROLLER READY
6965                                  ;IF RDY NOT RECEIVED BY THE TIMEOUT, AN ERROR IS FLAGGED
6966                                  ;
6967
6968  040100  013746  007426          GSTAT:  MOV     TEMP1,-(SP)     ;SAVE TEMP1
```

```
 6969  040104  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;CURRENT DRIVE #
 6970  040112  012765  000001  000000          MOV     #SELDRV,RKCS1(R5)  ;GET STATUS WITH SELECT DRIVE CMD
 6971  040120  013737  001412  007426          MOV     T10,TEMP1
 6972  040126  004737  036542                  JSR     PC,FRDY         ;FIND RDY
 6973  040132  104117                          ERROR   117             ;RDY NOT SET BY END OF SELECT DRIVE CMD
 6974  040134  012637  007426                  MOV     (SP)+,TEMP1     ;RESTOR TEMP1.
 6975  040140  000207                          RTS     PC
 6976
 6977                                  ;THIS ROUTINE GETS STATUS OF ALL DRIVE REGISTERS (MSG A0-A3, B0-B3)
 6978                                  ;& ALL CONTROLLER REGISTERS.
 6979                                  ;
 6980  040142  013746  007426          GSTAT1: MOV     TEMP1,-(SP)     ;SAVE TEMP1
 6981  040146  004737  036676                  JSR     PC,HOLD         ;GET ALL CONTR REG
 6982  040152  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CLEAR CONTR
 6983  040160  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;CURRENT DRIVE #
 6984  040166  012765  000003  000026          MOV     #3,RKMR1(R5)    ;SELECT WORD 3
 6985  040174  012765  000001  000000          MOV     #SELDRV,RKCS1(R5)  ;GET STATUS
 6986  040202  013737  001412  007426          MOV     T10,TEMP1
 6987  040210  004737  036610                  JSR     PC,FRDY1                ;FIND RDY & STORE DRIVE REGS ONLY
 6988  040214  104117                          ERROR   117             ;RDY NOT SET BY END OF SELECT DRV CMD
 6989  040216  013737  007416  007454          MOV     HMR2,H.A3       ;STORE MSG A3
 6990  040224  013737  007420  007456          MOV     HMR3,H.B3       ;STORE MSG B3
 6991
 6992  040232  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
 6993  040240  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
 6994  040246  012765  000002  000026          MOV     #2,RKMR1(R5)    ;SELECT WORD 2
 6995  040254  012765  000001  000000          MOV     #SELDRV,RKCS1(R5)
 6996  040262  013737  001412  007426          MOV     T10,TEMP1
 6997  040270  004737  036610                  JSR     PC,FRDY1        ;FIND RDY & STORE DRIVE REGS ONLY
 6998  040274  104117                          ERROR   117             ;RDY NOT SET BY END OF SELECT DRV CMD
 6999  040276  013737  007416  007450          MOV     HMR2,H.A2       ;STORE MSG A2
 7000  040304  013737  007420  007452          MOV     HMR3,H.B2       ;STORE MSG B2
 7001
 7002  040312  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
 7003  040320  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
 7004  040326  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
 7005  040334  012765  000001  000000          MOV     #SELDRV,RKCS1(R5)
 7006  040342  013737  001412  007426          MOV     T10,TEMP1
 7007  040350  004737  036610                  JSR     PC,FRDY1        ;FIND RDY & STORE DRIVE REGS ONLY
 7008  040354  104117                          ERROR   117             ;RDY NOT SET BY END OF SELECT DRV CMD
 7009  040356  013737  007416  007444          MOV     HMR2,H.A1       ;STORE MSG A1
 7010  040364  013737  007420  007446          MOV     HMR3,H.B1       ;STORE MSG B1
 7011
 7012  040372  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
 7013  040400  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
 7014  040406  012765  000001  000000          MOV     #SELDRV,RKCS1(R5)  ;SELECT WORD 0
 7015  040414  013737  001412  007426          MOV     T10,TEMP1
 7016  040422  004737  036610                  JSR     PC,FRDY1        ;FIND RDY & STORE DRIVE REGS ONLY
 7017  040426  104117                          ERROR   117             ;RDY NOT SET BY END OF SEL DRV CMD
 7018  040430  013737  007416  007440          MOV     HMR2,H.A0       ;STORE MSG A0
 7019  040436  013737  007420  007442          MOV     HMR3,H.B0       ;STORE MSG B0
 7020
 7021  040444  012637  007426                  MOV     (SP)+,TEMP1     ;RESTORE TEMP1
 7022  040450  000207                          RTS     PC
 7023
 7024                                  ;
```

```
                                        ;THIS ROUTINE DOES A SUBSYSTEM CLEAR & WAITS FOR CONTROLLER READY
                                        ;IF RDY IS NOT RECEIVED BY THE END OF THE TIMEOUT, AN ERROR IS FLAGGED.
                                        ;THE ROUTINE THEN GETS CURRENT STATUS & CHECKS FOR CONTROLLER ERROR (CERR)
                                        ;RETURN IF CERR SET
                                        ;RETURN +2 IF CERR CLEAR
                                        ;
040452  012765  000040  000010  $SUBCLR: MOV     #SCLR,RKCS2(R5) ;SUBSYS CLEAR
040460  013737  001412  007426          MOV     T10,TEMP1
040466  004737  036542                  JSR     PC,FRDY         ;FIND RDY
040472  104120                          ERROR   120             ;RDY NOT SET BY END OF SCLR
040474  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;CURRENT DRIVE #
040502  005065  000026                  CLR     RKMR1(R5)       ;SELECT WORD 0
```

```
 7037  040506  004737  040100              JSR     PC,GSTAT        ;GET STATUS
 7038  040512  032737  100000  007370      BIT     #CERR,HCS1      ;CHECK FOR CONT ERROR
 7039  040520  001401                      BEQ     1$
 7040  040522  000207                      RTS     PC
 7041  040524  062716  000002      1$:     ADD     #2,(SP)         ;SKIP OVER ERROR
 7042  040530  000207                      RTS     PC
 7043
 7044                              ;
```

```
                        ;READ THE SECTOR COUNT IN RKMR3, RIGHT JUSTIFY IT & STORE IT IN 'SECTOR'
                        ;
```

```
 7047  040532  012765  000003  000026  RDSEC:  MOV     #3,RKMR1(R5)    ;WORD 3
 7048  040540  004737  040100          JSR     PC,GSTAT
 7049  040544  013737  007420  001406          MOV     HMR3,SECTOR
 7050  040552  042737  177017  001406          BIC     #↑C<M.SECT>,SECTOR
 7051  040560  006237  001406          ASR     SECTOR          ;RIGHT JUSTIFY
 7052  040564  006237  001406          ASR     SECTOR          ;SECTOR
 7053  040570  006237  001406          ASR     SECTOR          ;INFO
 7054  040574  006237  001406          ASR     SECTOR
 7055  040600  000207                  RTS     PC
 7056                                  ;
 7057                                  ;READ THE CYL DIFF/OFFSET IN RKMR2, RIGHT JUSTIFY IT & STORE IT IN 'CYLDIF'
 7058                                  ;
 7059  040602  012765  000002  000026  RDCYLD: MOV     #2,RKMR1(R5)    ;WORD 2
 7060  040610  004737  040100          JSR     PC,GSTAT
 7061  040614  013737  007416  001362          MOV     HMR2,CYLDIF
 7062  040622  042737  160017  001362          BIC     #↑C<M.CDIF>,CYLDIF
 7063  040630  006237  001362          ASR     CYLDIF          ;RIGHT JUSTIFY
 7064  040634  006237  001362          ASR     CYLDIF          ;CYL DIFF/OFFSET
 7065  040640  006237  001362          ASR     CYLDIF          ;INFO
 7066  040644  006237  001362          ASR     CYLDIF
 7067  040650  023727  001362  000777          CMP     CYLDIF,#777     ;CHK TO SEE IF RET IN COMPL. FORM
 7068  040656  001002                  BNE     1$              ;BR IF NOT
 7069  040660  005037  001362          CLR     CYLDIF          ;CLR IF YES
 7070  040664  000207                  1$:     RTS     PC
 7071
 7072                                  ;
 7073                                  ;QUICK SELECT DRIVE COMMAND TO OBTAIN CYL DIFF
 7074                                  ;
 7075  040666  013746  007426          QKCYLD: MOV     TEMP1,-(SP)     ;SAVE TEMP1
 7076  040672  012765  000002  000026          MOV     #2,RKMR1(R5)    ;SELECT WORD 2
 7077  040700  012765  000001  000000          MOV     #SELDRV,RKCS1(R5)       ;SELECT DRIVE CMD
 7078  040706  013737  001412  007426          MOV     T10,TEMP1
 7079  040714  032765  000200  000000  1$:     BIT     #RDY,RKCS1(R5)  ;TEST FOR CONT RDY
 7080  040722  001004                  BNE     2$              ;BR IF THERE
 7081  040724  005337  007426          DEC     TEMP1
 7082  040730  001371                  BNE     1$
 7083  040732  104117                  ERROR   117             ;NO RDY AFTER SEL DRV CMD
 7084
 7085  040734  016537  000034  001362  2$:     MOV     RKMR2(R5),CYLDIF
 7086  040742  042737  160017  001362          BIC     #↑C<M.CDIF>,CYLDIF      ;GET CYL DIFF ONLY (NO SHIFTING)
 7087  040750  012637  007426          MOV     (SP)+,TEMP1     ;RESTORE TEMP1
 7088  040754  000207                  RTS     PC
 7089                                  ;
 7090                                  ;READ THE CYL ADDR IN RKMR3, RIGHT JUSTIFY IT & STORE IT IN  'CYLADD'
 7091                                  ;
 7092  040756  012765  000002  000026  RDCYLA: MOV     #2,RKMR1(R5)    ;WORD 2
 7093  040764  004737  040100          JSR     PC,GSTAT
 7094  040770  013737  007420  001364          MOV     HMR3,CYLADD
 7095  040776  042737  160017  001364          BIC     #↑C<M.CADD>,CYLADD
 7096  041004  006237  001364          ASR     CYLADD          ;RIGHT JUSTIFY
 7097  041010  006237  001364          ASR     CYLADD          ;CYL ADDR
 7098  041014  006237  001364          ASR     CYLADD          ;INFO
 7099  041020  006237  001364          ASR     CYLADD
 7100  041024  000207                  RTS     PC
 7101                                  ;
 7102                                  ;READ THE CYL DIFF/OFFSET IN H.A2, RIGHT JUSTIFY IT & STORE IT IN 'CYLDIF'
```

```
                                        ;
041026  013737  007450  001362  RCYLD:  MOV     H.A2,CYLDIF
041034  042737  160017  001362          BIC     #↑C<M.CDIF>,CYLDIF  ;CLEAR UNWANTED INFO
041042  006237  001362                  ASR     CYLDIF  ;RIGHT JUSTIFY
041046  006237  001362                  ASR     CYLDIF
041052  006237  001362                  ASR     CYLDIF
041056  006237  001362                  ASR     CYLDIF
041062  023727  001362  000777          CMP     CYLDIF,#777     ;CHK TO SEE IF RET IN COMPL. FORM
041070  001002                          BNE     1$              ;BR IF NO
041072  005037  001362                  CLR     CYLDIF          ;ELSE CLEAR
041076  000207                  1$:     RTS     PC
                                        ;
                                        ;READ THE CYL ADDR IN H.B2, RIGHT JUSTIFY IT & STORE IT IN 'CYLADD'
                                        ;
041100  013737  007452  001364  RCYLA:  MOV     H.B2,CYLADD
041106  042737  160017  001364          BIC     #↑C<M.CADD>,CYLADD  ;CLEAR UNWANTED INFO
041114  006237  001364                  ASR     CYLADD          ;RIGHT JUSTIFY
041120  006237  001364                  ASR     CYLADD
041124  006237  001364                  ASR     CYLADD
041130  006237  001364                  ASR     CYLADD
041134  000207                          RTS     PC
                                        ;
                                        ;READ THE SECTOR COUNT IN H.B3, RIGHT JUSTIFY IT & STORE IT IN 'SECTOR'
                                        ;
041136  013737  007456  001406  RSEC:   MOV     H.B3,SECTOR
041144  042737  177017  001406          BIC     #↑C<M.SECT>,SECTOR  ;CLEAR UNWANTED INFO
041152  006237  001406                  ASR     SECTOR          ;RIGHT JUSTIFY
041156  006237  001406                  ASR     SECTOR
041162  006237  001406                  ASR     SECTOR
041166  006237  001406                  ASR     SECTOR
041172  000207                          RTS     PC
                                        ;
                                        ;READ THE HEAD ADDR IN H.B3, RIGHT IT & STORE IT IN 'HEADA'
                                        ;
041174  013737  007456  001476  RHEAD:  MOV     H.B3,HEADA
041202  042737  170777  001476          BIC     #↑C<M.HEAD>,HEADA  ;CLEAR UNWANTED INFO
041210  006237  001476                  ASR     HEADA           ;RIGHT JUSTIFY IT
041214  000337  001476                  SWAB    HEADA
041220  000207                          RTS     PC
                                        ;
                                        ;FIND SECTOR 23
                                        ;RETURN IF NOT FOUND
                                        ;RETURN +4 IF FOUND
                                        ;
041222  013737  001422  007426  FSEC23: MOV     T5000,TEMP1     ;SETUP TIMEOUT
041230  004737  040532          1$:     JSR     PC,RDSEC        ;READ SECTOR
041234  023727  001406  000023          CMP     SECTOR,#23      ;TEST FOR SECTOR 23
041242  001014                          BNE     2$              ;BR IF NOT 23
                                        ;
041244  004737  040532                  JSR     PC,RDSEC
041250  023727  001406  000023          CMP     SECTOR,#23
041256  001412                          BEQ     3$              ;BR IF READ SAME TWICE
041260  004737  040532                  JSR     PC,RDSEC        ;ELSE TRY 1 MORE TIME
041264  023727  001406  000023          CMP     SECTOR,#23
041272  001404                          BEQ     3$              ;BR IF 17
```

```
7158
7159  041274  005337  007426          2$:     DEC     TEMP1
7160  041300  001353                          BNE     1$              ;TRY AGAIN
7161  041302  000207                          RTS     PC
7162
7163  041304  062716  000004          3$:     ADD     #4,(SP)         ;SKIP OVER ERROR
7164  041310  000207                          RTS     PC
7165                                  ;
7166                                  ;ROUTINE TO FIND HEADS HOME IN RKMR2 WORD 1 BEFORE SPECIFIED DELAY
7167                                  ;ENTER WITH TIME IN SECONDS IN TEMP2
7168                                  ;RETURN IF NOT FOUND
7169                                  ;RETURN+2 IF FOUND - SKIP OVER ERROR
7170                                  ;
7171  041312  012737  177777  007426  FHDHM:  MOV     #-1,TEMP1       ;ALL 1'S
7172  041320  012765  000001  000026          MOV     #1,RKMR1(R5)    ;WORD 1
7173  041326  004737  040100          1$:     JSR     PC,GSTAT
7174  041332  032737  000040  007416          BIT     #D.HDHM,HMR2
7175  041340  001007                          BNE     2$
7176  041342  005337  007426                  DEC     TEMP1
7177  041346  001367                          BNE     1$
7178  041350  005337  007430                  DEC     TEMP2
7179  041354  001356                          BNE     FHDHM
7180  041356  000207                          RTS     PC
7181  041360  062716  000002          2$:     ADD     #2,(SP)         ;SKIP OVER ERROR
7182  041364  000207                          RTS     PC
7183
7184                                  ;
7185                                  ;ROUTINE TO FIND LOAD HEADS IN RKMR2 WORD 1 BEFORE THE TIMEOUT
7186                                  ;RETURN IF NOT FOUND
7187                                  ;RETURN+2 IF FOUND: SKIP OVER ERROR
7188  041366  012737  000372  007426  FLOAD:  MOV     #250,TEMP1
7189  041374  012765  000001  000026          MOV     #1,RKMR1(R5)    ;WORD 1
7190  041402  004737  040100          1$:     JSR     PC,GSTAT
7191  041406  032737  010000  007416          BIT     #D.LOAD,HMR2
7192  041414  001004                          BNE     2$
7193  041416  005337  007426                  DEC     TEMP1
7194  041422  001367                          BNE     1$
7195  041424  000207                          RTS     PC
7196  041426  062716  000002          2$:     ADD     #2,(SP)         ;SKIP OVER ERROR
7197  041432  000207                          RTS     PC
7198
7199                                  ;
7200                                  ;FILL HEADER TABLE WITH 66 WORDS OF VALID HEADERS
7201                                  ;ENTER WITH CYL # IN 'CALADD'
7202                                  ;ENTER WITH HEAD # IN 'HEAD'
7203                                  ;ENTER WITH FORMAT IN 'FORMAT'
7204                                  ;
7204  041434  010046                  FHDTAB: MOV     R0,-(SP)        ;SAV R0
7205  041436  010146                          MOV     R1,-(SP)        ;SAV R1
7206  041440  012700  001536                  MOV     #HDTAB,R0       ;HEADER WORD TABLE ADDR
7207  041444  005001                          CLR     R1              ;SECTOR COUNTER
7208  041446  013737  001474  001500          MOV     HEAD,HD1
7209  041454  006337  001500                  ASL     HD1
7210  041460  006337  001500                  ASL     HD1
7211  041464  006337  001500                  ASL     HD1
7212  041470  006337  001500                  ASL     HD1
7213  041474  006337  001500                  ASL     HD1             ;SETUP HEAD # FOR WORD 2 OF HEADER
```

```
7214  041500  013737  001502  001504          MOV     FORMAT,FMT1
7215  041506  000337  001504                  SWAB    FMT1
7216  041512  006337  001504                  ASL     FMT1            ;SETUP FORMAT FOR WORD 2 OF HEADER
7217
7218  041516  013720  001366          1$:     MOV     CALADD,(R0)+    ;HEADER WORD 1-CYL ADDR
7219  041522  010110                          MOV     R1,(R0)         ;HEADER WORD 2-SECTOR NO
7220  041524  053710  001500                  BIS     HD1,(R0)        ;               -HEAD NO
7221  041530  053710  001504                  BIS     FMT1,(R0)       ;               -FORMAT
7222  041534  004737  041614                  JSR     PC,SECFLG
7223
7224  041540  013737  001366  007426          MOV     CALADD,TEMP1
7225  041546  011037  007430                  MOV     (R0),TEMP2
7226  041552  043737  001366  007430          BIC     CALADD,TEMP2
7227  041560  042037  007426                  BIC     (R0)+,TEMP1
7228  041564  053737  007426  007430          BIS     TEMP1,TEMP2
7229  041572  013720  007430                  MOV     TEMP2,(R0)+     ;HEADER WORD 3-HEADER CHECK
7230
7231  041576  005201                          INC     R1              ;SECTOR CTR
7232  041600  020127  000026                  CMP     R1,#22.         ;ALL 22 SECTORS DONE? (66 WORDS)
7233  041604  001344                          BNE     1$              ;BR IF NO
7234
7235  041606  012601                          MOV     (SP)+,R1        ;RESTOR R1
7236  041610  012600                          MOV     (SP)+,R0        ;RESTOR R0
7237  041612  000207                          RTS     PC
7238
7239                                  ;
7240                                  ;THIS ROUTINE GETS INFORMATION FROM THE BAD SECTOR TABLE FILLED BY A PREVIOUS
7241                                  ;TEST & SETS BITS 14 & 15 APPROPRIATLY.
7242  041614  010246                  ;
7243  041616  005737  001502          SECFLG: MOV     R2,-(SP)        ;SAVE R2
7244  041622  001016                          TST     FORMAT
7245  041624  012702  003362                  BNE     1$              ;BR IF 20 SECTOR FORMAT
7246  041630  004737  041714                  MOV     #BSE22H+8.,R2
7247  041634  052710  100000                  JSR     PC,FLGTST       ;GET HARDWARE DETECTED FLAG
7248                                          BIS     #BIT15,(R0)     ;RETURN HERE IF GOOD SECTOR
7249  041640  012702  005362                  MOV     #BSE22S+8.,R2   ;ELSE RETURN HERE
7250  041644  004737  041714                  JSR     PC,FLGTST       ;GET SOFTWARE DETECTED FLAG
7251  041650  052710  040000                  BIS     #BIT14,(R0)     ;RETURN HERE IF GOOD SECTOR
7252
7253  041654  012602                          MOV     (SP)+,R2        ;ELSE RETURN HERE
7254  041656  000207                          RTS     PC
7255
7256  041660  012702  002362          1$:     MOV     #BSE20H+8.,R2
7257  041664  004737  041714                  JSR     PC,FLGTST       ;GET HARDWARE DETECTED FLAG
7258  041670  052710  100C00                  BIS     #BIT15,(R0)     ;RETURN HERE IF GOOD SECTOR
7259
7260  041674  012702  004362                  MOV     #BSE20S+8.,R2
7261  041700  004737  041714                  JSR     PC,FLGTST       ;GET SOFTWARE DETECTED FLAG
7262  041704  052710  040000                  BIS     #BIT14,(R0)     ;RETURN HERE IF GOOD SECTOR
7263
7264  041710  012602                          MOV     (SP)+,R2        ;RESTO   2
7265  041712  000207                          RTS     PC
7266
7267
7268                                  ;
7269                                  ;THIS ROUTINE DOES THE ACTUAL SCANNING OF THE BAD SECTOR TABLES
                                      ;ENTER WITH THE ADDRESS OF TABLE (BSE22H, BSE22S, ETC.) IN TEMP1
```

```
                                        ;RETURN IF NO COMPARE
                                        ;RETURN+4 IF COMPARE
                                        ;
041714  010346                  FLGTST: MOV     R3,-(SP)        ;SAVE R3
                                        
041716  021227  177777          1$:     CMP     (R2),#-1        ;SEE IF ALL 1'S
041722  001002                          BNE     2$              ;BR IF NO
041724  012603                          MOV     (SP)+,R3        ;RESTORE R3
041726  000207                          RTS     PC
                                        
041730  022237  001366          2$:     CMP     (R2)+,CALADD    ;SEE IF=CYL # & ADR PTR TO TRK/SECTOR WORD
041734  001403                          BEQ     3$
041736  062702  000002                  ADD     #2,R2           ;GO TO NEXT CYL WORD IN TABLE
041742  000765                          BR      1$
                                        
041744  013703  001474          3$:     MOV     HEAD,R3         ;GET HEAD # FROM FHDTAB ROUTINE
041750  000303                          SWAB    R3
041752  050103                          BIS     R1,R3           ;ADD SECTOR # FROM FHDTAB ROUTINE
041754  022203                          CMP     (R2)+,R3        ;SEE IF SECTOR/HEAD COMPARE
                                                                ;& INCR PTR TO NEXT CYL WORD
041756  001401                          BEQ     4$              ;BR IF COMPARE
041760  000756                          BR      1$              ;ELSE TRY NEXT CYL
                                        
041762  012603                  4$:     MOV     (SP)+,R3        ;RESTORE R3
041764  062716  000004                  ADD     #4,(SP)         ;INCREMENT RET ADDR
041770  000207                          RTS     PC
                                        
                                        ;
                                        ;THIS ROUTINE SORTS THE RHTAB TABLE FROM WHATEVER SECTOR IT BEGINS
                                        ;WITH AND RE-WRITES THE INFO IN SRTTAB TABLE TO BEGIN WITH SECTOR 0
                                        ;
041772  010046                  SORT:   MOV     R0,-(SP)        ;SAVE R0
041774  010146                          MOV     R1,-(SP)        ;SAVE R1
041776  004737  040532                  JSR     PC,RDSEC
042002  062737  000001  001406          ADD     #1,SECTOR
042010  004737  042100                  JSR     PC,MULT6        ;MULT SECTOR BY 6
                                        
042014  012700  000204                  MOV     #132.,R0
042020  163700  001406                  SUB     SECTOR,R0       ;R0-SECTOR TO R0 = INDEX
042024  010037  001406                  MOV     R0,SECTOR
042030  062737  001742  001406          ADD     #RHTAB,SECTOR   ;SAVE INDEX
                                        
042036  062700  001742                  ADD     #RHTAB,R0       ;INDEX TO BOT HALF OF RHTAB
042042  012701  002146                  MOV     #SRTTAB,R1      ;INDEX TO TOP HALF OF SRTTAB
                                        
042046  012021                  1$:     MOV     (R0)+,(R1)+     ;PUT BOTTOM OF RHTAB TO TOP OF SRTTAB
042050  020027  002146                  CMP     R0,#RHTAB+132.
042054  001374                          BNE     1$
                                        
042056  012700  001742                  MOV     #RHTAB,R0       ;PUT TOP OF RHTAB TO BOT OF SRTTAB
042062  012021                  2$:     MOV     (R0)+,(R1)+
042064  020037  001406                  CMP     R0,SECTOR
042070  001374                          BNE     2$
                                        
042072  012601                          MOV     (SP)+,R1        ;RESTOR R1
042074  012600                          MOV     (SP)+,R0        ;RESTOR R0
```

```
7326  042076  000207                          RTS     PC
7327
7328                                          ;
7329                                          ;MULT BY 6. ENTER WITH DESIRED # IN 'SECTOR'
7330                                          ;
7331  042100  006337  001406          MULT6:  ASL     SECTOR                  ;2 X SECTOR
7332  042104  013746  001406                  MOV     SECTOR,-(SP)
7333  042110  006337  001406                  ASL     SECTOR                  ;4 X SECTOR
7334  042114  062637  001406                  ADD     (SP)+,SECTOR            ;(4 X S)+(2 X S) = 6 X SECTOR
7335  042120  000207                          RTS     PC
7336
7337                                          ;
7338                                          ;THIS ROUTINE IS ENTERED ONLY IF THERE IS A BSE ERROR AFTER A WRITE DATA
7339                                          ;CMD.  IT VERIFIES THAT THE BAD SECTOR IS LISTED IN THE BSE INFORMATION
7340                                          ;CYLINDER AT CYL 410, TRACK 2.
7341                                          ;
7342                                          ;RETURN IF SECTOR NOT LISTED IN BSE TABLE, ERROR CONDITION.
7343                                          ;RETURN+2 IF LISTED, SKIP OVER ERROR
7344                                          ;
7345  042122  010446                  TRUERR: MOV     R4,-(SP)                ;SAVE R4
7346
7347  042124  032737  010000  007370          BIT     #CFMT,HCS1              ;CHECK FORMAT
7348  042132  001014                          BNE     2$                      ;BR FOR 20 SECTOR FORMAT
7349
7350  042134  012704  003362                  MOV     #BSE22H+8.,R4
7351  042140  004737  042222                  JSR     PC,TERR1                ;SEE IF ON HARDWARE DETECTED TABLE
7352  042144  000422                          BR      3$                      ;RETURN HERE IF YES
7353
7354  042146  012704  005362                  MOV     #BSE22S+8.,R4           ;ELSE RETURN HERE
7355  042152  004737  042222                  JSR     PC,TERR1                ;& SEE IF ON SOFTWARE DETECTED TABLE
7356  042156  000415                          BR      3$                      ;RETURN HERE IF YES
7357
7358  042160  012604                  1$:     MOV     (SP)+,R4                ;RESTORE R4
7359  042162  000207                          RTS     PC                      ;RETURN WITHOUT JUMPING OVER ERROR
7360
7361  042164  012704  002362          2$:     MOV     #BSE20H+8.,R4
7362  042170  004737  042222                  JSR     PC,TERR1                ;SEE IF ON HARDWARE DETECTED TABLE
7363  042174  000406                          BR      3$                      ;RETURN HERE IF YES
7364
7365  042176  012704  004362                  MOV     #BSE20S+8.,R4           ;ELSE RETURN HERE
7366  042202  004737  042222                  JSR     PC,TERR1                ;SEE IF ON SOFTWARE DETECTED TABLE
7367  042206  000401                          BR      3$                      ;RETURN HERE IF YES
7368  042210  000763                          BR      1$                      ;RETURN HERE IF NO
7369
7370  042212  012604                  3$:     MOV     (SP)+,R4                ;RESTORE R4
7371  042214  062716  000002                  ADD     #2,(SP)                 ;SKIP OVER ERROR ON RETURN
7372  042220  000207                          RTS     PC
7373
7374                                          ;
7375                                          ;THIS ROUTINE DOES THE ACTUAL COMPARING OF CYLINDER, HEAD & TRACK AGAINST
7376                                          ;THE BSE TABLE FOR THE ABOVE SUBROUTINE.
7377                                          ;RETURN IF FOUND ON TABLE
7378                                          ;RETURN+2 IF NOT FOUND
7379                                          ;
7380  042222  021427  177777          TERR1:  CMP     (R4),#-1                ;SEE IF ALL 1'S
7381  042226  001405                          BEQ     1$                      ;BR IF YES, NOT ON TABLE
```

```
 7382  042230  022437  001354          CMP     (R4)+,CCYL      ;SEE IF CYL MATCH
 7383  042234  001405                  BEQ     2$              ;BR IF YES
 7384  042236  005724                  TST     (R4)+           ;ELSE ADV TO NEXT CYL WORD
 7385  042240  000770                  BR      TERR1           ;& TRY AGAIN.
 7386
 7387  042242  062716  000002  1$:     ADD     #2,(SP)
 7388  042246  000207                  RTS     PC
 7389
 7390  042250  022437  007400  2$:     CMP     (R4)+,HDA       ;SEE IF SECTOR & TRACK MATCH
 7391  042254  001401                  BEQ     3$              ;BR IF YES
 7392  042256  000761                  BR      TERR1           ;OR TRY AGAIN
 7393
 7394  042260  000207  3$:     RTS     PC
```

```
                                        ;
                                        ;THIS ROUTINE CALIBRATES ANY PDP-11 AGAINST 2 CONSECUTIVE 16MS TICKS FROM AN L OR [illegible]C
                                        ;
                                        ;THE 1ST TICK CLEARS A COUNTER 'LPCNT'. THE PROGRAM THEN GOES THRU A LOOP.
                                        ;EACH TIME IT GOES THRU THE LOOP,LPCNT IS INCREMENTED BY 1.
                                        ;THE 2ND TICK STOPS INCREMENTING LPCNT AND THE CLOCK INTERRUPT IS TURNED OFF.
                                        ;NOW, FOR THIS PARTICULAR PDP-11, THE TIME TO GO THRU THE ABOVE LOOP ONE IS
                                        ;16.6MS DIVIDED BY THE CONTENTS OF LPCNT.
                                        ;
                                        ;AN APPROX VALUE FOR A PDP11-05 MAY BE 0.4MS TO GO THRU THE LOOP ONCE
                                        ;
                                        ;FROM THIS POINT ON, WHENEVER ACCURACIES GREATER THAN WHAT THE L CLOCK
                                        ;CAN PROVIDE ARE NECESSARY, THE EVENT TO BE TIMED IS COMPARED AGAINST
                                        ;THE NUMBER OF TIMES THE LOOP IS PASSED THRU AND MULT. BY THE ABOVE
                                        ;CALCULATED FIGURE
                                        ;
042262  104413                  CALCLK: SAVREG
042264  005000                          CLR     R0              ;ITERATION CTR
042266  005037  001456                  CLR     SUM             ;SUM OF 256 ITERATIONS
042272  005037  001460                  CLR     SUM+2
                                        
042276  012737  000001  001372  5$:     MOV     #1,COUNT        ;GO THRU CLOCK HANDLER
042304  012737  000001  001374          MOV     #1,SEC          ;ONLY ONCE
042312  012737  177777  007426          MOV     #-1,TEMP1       ;ALL 1'S FOR TIMEOUT
042320  004737  043236                  JSR     PC,CLKON
                                        
                                        
042324  005737  001376          1$:     TST     TIMUP
042330  001007                          BNE     2$              ;BR IF GOT 1'ST TICK
042332  005337  007426                  DEC     TEMP1
042336  001372                          BNE     1$              ;BR IF TIMEOUT NOT DONE
042340  104401  053022                  TYPE    ,MSG23          ;NO CLOCK INTR PRESENT, ABORT TIMING TEST
042344  000137  036034                  JMP     $EOP            ;ABORT DRIVE
                                        
042350  012737  000001  001372  2$:     MOV     #1,COUNT        ;GOT 1'ST TICK
042356  012737  000001  001374          MOV     #1,SEC
042364  005037  001452                  CLR     LPCNT           ;LOOP COUNTER
042370  005037  001376                  CLR     TIMUP           ;CLEAR BEFORE 2'ND TICK
                                        
042374  005737  001376          3$:     TST     TIMUP
042400  001003                          BNE     4$              ;BR IF GOT 2'ND TICK
042402  004737  042726                  JSR     PC,LOOP
042406  000772                          BR      3$
                                        
042410  004737  043332          4$:     JSR     PC,CLKOF        ;GOT 2'ND TICK, TURN OFF CLOCK
042414  063737  001452  001456          ADD     LPCNT,SUM
042422  005537  001460                  ADC     SUM+2           ;ADD POSSIBLE OVERFLOW
                                        
042426  005200                          INC     R0
042430  020027  000400                  CMP     R0,#256.        ;ALL ITERATIONS DONE?
042434  001320                          BNE     5$              ;BR IF NO
                                        
042436  000337  001456                  SWAB    SUM             ;DIVIDE BY 256
042442  105037  001457                  CLRB    SUM+1           ;TO GET AVERAGE
                                        
```

```
7451  042446  005000                          CLR     R0              ;CLEAR FOR DIV
7452  042450  005001                          CLR     R1
7453  042452  005002                          CLR     R2
7454  042454  005004                          CLR     R4
7455  042456  012703  040432                  MOV     #16666.,R3      ;LSB DIVIDEND (16666 US)
7456  042462  013705  001456                  MOV     SUM,R5          ;DIVISOR (AVERAGE OF 256)
7457  042466  004737  044252                  JSR     PC,$.DPID       ;DO DIVIDE
7458  042472  010337  001454                  MOV     R3,LPTIM        ;STORE QUOTIENT
7459                                                                  ;THIS EQUALS THE TIME IN USEC
7460                                                                  ;TO GO THRU THE LOOP ONCE
7461  042476  104414                          RESREG
7462  042500  000207                          RTS     PC
7463
7464                                  ;
7465                                  ;THIS ROUTINE IS EXACTLY THE SAME AS THE ABOVE EXCEPT THAT
7466                                  ;A JSR PC QKCYLD HAS BEEN INSERTED TO TAKE UP SOME TIME
7467                                  ;TO MATCH THE TIME TAKEN BY THE ROUTINE THAT USES THIS ROUTINE
7468                                  ;
7469  042502  104413                  VELCAL: SAVREG
7470  042504  005000                          CLR     R0              ;ITERATION CTR
7471  042506  005037  001456                  CLR     SUM             ;SUM OF 256 ITERATIONS
7472  042512  005037  001460                  CLR     SUM+2
7473
7474  042516  012737  000001  001372  5$:     MOV     #1,COUNT        ;SEE ABOVE CALCLK FOR COMMENTS
7475  042524  012737  000001  001374          MOV     #1,SEC
7476  042532  012737  177777  007426          MOV     #-1,TEMP1
7477  042540  004737  043236                  JSR     PC,CLKON
7478
7479  042544  005737  001376          1$:     TST     TIMUP
7480  042550  001007                          BNE     2$
7481  042552  005337  007426                  DEC     TEMP1
7482  042556  001372                          BNE     1$
7483  042560  104401  053022                  TYPE    ,MSG23          ;NO CLOCK
7484  042564  000137  036034                  JMP     $EOP
7485
7486  042570  012737  000001  001372  2$:     MOV     #1,COUNT
7487  042576  012737  000001  001374          MOV     #1,SEC
7488  042604  005037  001452                  CLR     LPCNT
7489  042610  005037  001376                  CLR     TIMUP
7490
7491  042614  005737  001376          3$:     TST     TIMUP
7492  042620  001005                          BNE     4$
7493  042622  004737  040666                  JSR     PC,QKCYLD       ;THIS IS ONLY DIFFERENCE BETWEEN
7494                                                                  ;PRECEEDING SUBROUTINE
7495  042626  004737  042726                  JSR     PC,LOOP
7496  042632  000770                          BR      3$
7497
7498  042634  004737  043332          4$:     JSR     PC,CLKOF
7499  042640  063737  001452  001456          ADD     LPCNT,SUM
7500  042646  005537  001460                  ADC     SUM+2           ;ADD POSSIBLE OVERFLOW
7501
7502  042652  005200                          INC     R0
7503  042654  020027  000400                  CMP     R0,#256.
7504  042660  001316                          BNE     5$
7505
7506  042662  000337  001456                  SWAB    SUM
```

```
7507  042666  105037  001457          CLRB    SUM+1
7508
7509  042672  005000                  CLR     R0
7510  042674  005001                  CLR     R1
7511  042676  005002                  CLR     R2
7512  042700  005004                  CLR     R4
7513  042702  012703  040432          MOV     #16666.,R3
7514  042706  013705  001456          MOV     SUM,R5
7515  042712  004737  044252          JSR     PC,M.DPID
7516  042716  010337  001454          MOV     R3,LPTIM
7517  042722  104414                  RESREG
7518  042724  000207                  RTS     PC
7519
7520
7521                                  ;
7522                                  ;WITH 50 IN R0, IT TAKES APPROX 400 US FOR AN 11/05 TO GO THRU THIS
7523                                  ;LOOP AND INCREMENT 'LPCNT' ONCE.
7524                                  ;THIS 400 US IS APPROX 2.5% OF 16MS GIVING A RESOLUTION OF 0.4MS
7525                                  ;PER COUNT IN 'LPCNT'.
7526                                  ;WHEN USED BY THE 'CALCLK' ROUTINE, LPCLK SHOULD BE APPROX 40(10)=50(8)
7527                                  ;WITH AN 11/05 TO 200(10)=264(8) FOR AN 11/70
7528                                  ;
7529  042726  010046                  LOOP:   MOV     R0,-(SP)        ;SAVE R0
7530  042730  012700  000400                  MOV     #400,R0
7531  042734  005300                  1$:     DEC     R0
7532  042736  001401                          BEQ     2$
7533  042740  000775                          BR      1$
7534  042742  005237  001452          2$:     INC     LPCNT
7535  042746  012600                          MOV     (SP)+,R0        ;RESTORE R0
7536  042750  000207                          RTS     PC
7537
7538                                  ;
7539                                  ;THIS ROUTINE FINDS ATTN FROM A SEEK AND RETURNS
7540  042752  136465  007360  000017  FATT3:  BITB    ATTN(R4),RKASOF+1(R5)   ;TEST FOR ATTN
7541  042760  001006                          BNE     1$              ;EXIT IF THERE
7542  042762  004737  042726                  JSR     PC,LOOP         ;ELSE GO THRU LOOP
7543  042766  005737  001452                  TST     LPCNT           ;TEST FOR OVERFLOW
7544  042772  001367                          BNE     FATT3           ;BR IF NO AND TRY AGAIN
7545  042774  000207                          RTS     PC
7546  042776  062716  000002          1$:     ADD     #2,(SP)         ;JUMP OVER ERROR
7547  043002  000207                          RTS     PC
7548
7549                                  ;
7550                                  ;ROUTINE TO MULT & TYPE A 2 WORD PRODUCT
7551                                  ;ENTER WITH LPCNT IN $TMP0
7552                                  ;USED FOR LOW VEL TIMES IN UNLD & LOADING
7553  043004                          ;
7554  043004  013746  001454  TYPTIM:
7555  043010  013746  001160          MOV     LPTIM,-(SP)             ;;PUT THE MULTIPLER ON THE STACK
7556  043014  004737  050332          MOV     $TMP0,-(SP)             ;;PUT THE MULTIPLICAND ON THE STACK
7557  043020  012637  001160          JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
7558  043024  012637  001162          MOV     (SP)+,$TMP0             ;;GET THE LSB'S OF THE PRODUCT
7559  043030  012746  001160          MOV     (SP)+,$TMP0+2   ;;GET THE MSB'S OF THE PRODUCT
7560                                  MOV     #$TMP0,-(SP)    ;PUSH LSB ONTO STACK
7561  043034  004737  050042                                  ;MSB IN $TMP1 FROM MULT MACRO
7562  043040  004737  050272          JSR     PC,$DB2D        ;CONVERT TO ASCII STRING
                                      JSR     PC,$SUPRS       ;TYPE TIMES
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                        GET VALUE FOR SOFTWARE SWITCH REGISTER

7563  043044  104401  053151            TYPE    ,MSG25          ;MICRO SEC
7564  043050  000207                    RTS     PC
7565
7566
7567                                    ;ROUTINE USED BY TIMING TO OBTAIN THE AVERAGE OF 100 TIMES IN MICRO SECONDS
7568                                    ;
7569  043052  104413            AVGTIM: SAVREG
7570  043054  005000                    CLR     R0              ;CLEAR FOR DIV
7571  043056  005001                    CLR     R1
7572  043060  005004                    CLR     R4
7573  043062  013703  001456            MOV     SUM,R3  ;LSB DIVIDEND
7574  043066  013702  001460            MOV     SUM+2,R2        ;MSB DIVIDEND
7575  043072  012705  000144            MOV     #100.,R5        ;DIVISOR
7576  043076  004737  043204            JSR     PC,DIVTYP
7577  043102  104401  053151            TYPE    ,MSG25          ;USEC
7578  043106  104414                    RESREG
7579  043110  000207                    RTS     PC
7580
7581                                    ;ROUTINE TO CALC & TYPE AVERAGE SPEED
7582                                    ;
7583  043112  104413            AVGSP:  SAVREG
7584  043114  005000                    CLR     R0              ;CLEAR FOR DIV
7585  043116  005001                    CLR     R1
7586  043120  013703  001456            MOV     SUM,R3          ;LSB DIVIDEND
7587  043124  013702  001460            MOV     SUM+2,R2        ;MSB DIVIDEND
7588  043130  012705  103240            MOV     #103240,R5      ;LSB DIVISOR
7589  043134  012704  000001            MOV     #1,R4           ;MSB DIVISOR
7590                                                            ;TO DIVIDE BY 100000(10)
7591                                                            ;100000(10)=303240(8)
7592  043140  004737  044252            JSR     PC,M.DPID       ;GO DIVIDE
7593  043144  010337  001162            MOV     R3,$TMP1        ;SAVE QUOTIENT
7594
7595  043150  005000                    CLR     R0              ;CLEAR FOR DIV
7596  043152  005001                    CLR     R1
7597  043154  005002                    CLR     R2
7598  043156  005004                    CLR     R4
7599  043160  012703  001231            MOV     #665.,R3        ;LSB DIVIDEND
7600  043164  013705  001162            MOV     $TMP1,R5        ;DIVISOR
7601  043170  004737  043204            JSR     PC,DIVTYP
7602  043174  104401  054117            TYPE    ,MSG36          ;INCHES/SEC
7603  043200  104414                    RESREG
7604  043202  000207                    RTS     PC
7605                                    ;
7606                                    ;ROUTINE TO DIVIDE  & TYPE WITH SUPPRESSED 0'S
7607                                    ;
7608  043204  004737  044252    DIVTYP: JSR     PC,M.DPID       ;GO DIVIDE
7609  043210  010337  001160            MOV     R3,$TMP0        ;STORE LSB QUOTIENT
7610  043214  010237  001162            MOV     R2,$TMP1        ;STORE MSB QUOTIENT
7611  043220  012746  001160            MOV     #$TMP0,-(SP)    ;PUSH LSB ON STACK
7612  043224  004737  050042            JSR     PC,$DB2D        ;CONVERT TO ASCII
7613  043230  004737  050272            JSR     PC,$SUPRS       ;TYPE IT
7614  043234  000207                    RTS     PC
7615                                    ;
7616                                    ;ROUTINE TO TURN L OR P CLOCK INTERRUPT ON
7617                                    ;
7618
```

```
 7619  043236  005037  001376          CLKON:  CLR     TIMUP
 7620  043242  005737  007534                  TST     PCLKF
 7621  043246  001004                          BNE     1$              ;BRANCH IF P-CLOCK PRESENT
 7622  043250  012777  000100  136050          MOV     #100,@LKS       ;L-CLOCK, ENABLE INT
 7623  043256  000207                          RTS     PC
 7624  043260  012777  177777  136034  1$:     MOV     #-1,@PKSB       ;P-CLOCK, ALL 1'S
 7625  043266  012777  000135  136024          MOV     #135,@PKS       ;ENABLE INT, CT UP, REP INT
 7626  043274  000207                          RTS     PC              ;LINE FREQ & RUN
 7627                                  ;
 7628                                  ;KW11-L & KW11-P INTERRUPT HANDLER
 7629                                  ;
 7630  043276  005037  001376          CLOCK:  CLR     TIMUP
 7631  043302  005337  001372                  DEC     COUNT
 7632  043306  001010                          BNE     1$
 7633  043310  013737  001370  001372          MOV     HZ,COUNT
 7634  043316  005337  001374                  DEC     SEC
 7635  043322  001002                          BNE     1$
 7636  043324  005237  001376                  INC     TIMUP           ;SORRY, TIME IS UP
 7637  043330  000002                  1$:     RTI
 7638                                  ;
 7639                                  ;ROUTINE TO TURN L OR P CLOCK INTERRUPT OFF
 7640                                  ;
 7641  043332  005737  007534          CLKOF:  TST     PCLKF
 7642  043336  001003                          BNE     1$              ;BRACH IF P-CLOCK PRESENT
 7643  043340  005077  135762                  CLR     @LKS            ;L-CLOCK, CLEAR INTERRUPT
 7644  043344  000207                          RTS     PC
 7645  043346  005077  135746          1$:     CLR     @PKS            ;P-CLOCK, CLEAR INTERRUPT
 7646  043352  000207                          RTS     PC
 7647
 7648                                  ;
 7649                                  ;THIS ROUTINE GENERATES PARITY FOR THE EXPECTED MESSAGE
 7650                                  ;ENTER WITH THE EXPECTED WORD IN TEMP1
 7651                                  ; TEMP1 IS ROTATED LEFT 17 TIMES. EACH TIME THE CARRY BIT IS SET,
 7652                                  ;R1 IS INCREMENTED. AT THE END OF 17 ROTATES ( TEMP1 BACK TO ORIG),
 7653                                  ;R1 BIT 0 IS EXAMINED. IF IT IS SET, INDICATING AN ODD # OF 1'S,
 7654                                  ; THE PARITY BIT IS NOT SET IN B .
 7655                                  ;IF IT IS NOT SET, INDICATING AN EVEN # OF 1'S ,THE PARITY BIT IS
 7656                                  ;SET IN TEMP1
 7657                                  ;
 7658  043354  010046          SBPAR:  MOV     R0,-(SP)        ;SAVE R0
 7659  043356  010146                  MOV     R1,-(SP)        ;SAVE R1
 7660  043360  012700  000021          MOV     #17.,R0         ;SHIFT COUNTER
 7661  043364  005001                  CLR     R1              ;COUNT # OF 1'S IN TEMP1
 7662  043366  000241                  CLC                     ;CLEAR CARRY
 7663
 7664  043370  006137  007426  1$:     ROL     TEMP1
 7665  043374  103001                  BCC     2$              ;BR IF CARRY CLEAR
 7666  043376  005201                  INC     R1              ;COUNT # OF 1'S
 7667  043400  005300          2$:     DEC     R0              ;SHIFT COUNTER
 7668  043402  001372                  BNE     1$
 7669
 7670  043404  032701  000001          BIT     #BIT0,R1
 7671  043410  001003                  BNE     3$              ;BR IF ODD # IN R0
 7672  043412  052737  100000  007426  BIS     #M.PAR,TEMP1    ;SET PARITY BIT
 7673  043420  012601          3$:     MOV     (SP)+,R1        ;RESTORE R1
 7674  043422  012600                  MOV     (SP)+,R0        ;RESTORE R0
```

```
 7675  043424  000207                          RTS     PC
 7676
 7677                                  ;
 7678                                  ;ROUTINE TO ENABLE LOOPING ON INTERMITTANT ERRORS
 7679                                  ;WHEN $LPERR SET BY OTHER THAN SCOPE ROUTINE
 7680                                  ; IE: MY LOOP MACRO
 7681                                  ;
 7682  043426  032777  001000  135504  SCOP1$: BIT     #SW9,@SWR       ;LOOP ON ERROR?
 7683  043434  001406                          BEQ     1$              ;BR IF NO
 7684  043436  105737  001103                  TSTB    $ERFLG          ;HAD ERROR?
 7685  043442  001403                          BEQ     1$              ;BR IF NO
 7686  043444  013716  001110                  MOV     $LPERR,(SP)
 7687  043450  000002                          RTI
 7688
 7689  043452  011637  001110          1$:     MOV     (SP),$LPERR     ;SET LOOP ADDR FOR TIGHT SCOPE LOOP
 7690  043456  000002                          RTI
 7691                                  ;
 7692                                  ;THIS ROUTINE IS ENTERED BY TYPING A CONTROL-C.
 7693                                  ;IT IS USED TO ALLOW THE OPERATOR TO HLAT THE CPU WHILE INSURING
 7694                                  ;THAT HEADS ARE LOADED & FORMATTING IS VALID BEFORE ACTUALLY HALTING
 7695                                  ;THE CPU.
 7696                                  ;
 7697  043460  022626                  STOP:   CMP     (SP)+,(SP)+     ;RESTORE STACK FROM INTERRUPT
 7698
 7699  043462  004737  040452                  JSR     PC,SUBCLR
 7700  043466  104024                          ERROR   24              ;CERR AFTER
 7701
 7702  043470  005737  007352                  TST     UNLD            ;SEE IF HEADS UNLOADED
 7703  043474  001432                          BEQ     3$              ;BR IF NO
 7704  043476  005737  000042                  TST     42              ;SEE IF MANUAL OR AUTO MODE
 7705  043502  001403                          BEQ     1$              ;BR IF MANUAL MODE
 7706  043504  104401  054677                  TYPE    ,MSG74          ;PGM ABORT PENDING
 7707  043510  000402                          BR      2$
 7708  043512  104401  054745          1$:     TYPE    ,MSG75          ;HALT PENDING
 7709  043516                          2$:
 7710
 7711  043516  004737  040452                  JSR     PC,SUBCLR
 7712  043522  104024                          ERROR   24              ;CERR AFTER SCLR
 7713
 7714  043524  012765  000011  000000          MOV     #SRTSPL,RKCS1(R5)  ;START SPINDLE CMD
 7715  043532  013737  001412  007426          MOV     T10,TEMP1       ;SET TIMEOUT
 7716  043540  004737  036542                  JSR     PC,FRDY         ;FIND RDY
 7717  043544  104121                          ERROR   121             ;RDY NOT SET AFTER ST SPIN CMD.
 7718
 7719  043546  013737  001420  007430          MOV     T100,TEMP2      ;SETUP TIMEOUT
 7720  043554  004737  037056                  JSR     PC,FATT1        ;FIND ATTN
 7721  043560  104074                          ERROR   74              ;NO ATTN AFTER ST SPIN CMD.
 7722
 7723
 7724  043562  005737  007354          3$:     TST     BADHDR          ;SEE IF HEADERS VALID
 7725  043566  001466                          BEQ     4$              ;BR IF YES
 7726  043570  005237  007356                  INC     HPEND
 7727
 7728  043574  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
 7729  043602  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
 7730  043610  012765  000013  000000          MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
```

```
7731                                                                    ;RESET CYL DIFF/OFFSET & CYL ADDR REG
7732                                                                    ;IN RKMR2 & RKMR3 RESP.
7733  043616  013737  001412  007426          MOV     T10,TEMP1         ;SETUP TIMEOUT
7734  043624  004737  036542                  JSR     PC,FRDY           ;FIND RDY
7735  043630  104124                          ERROR   124               ;RDY NOT SET AFTER RECAL CMD
7736
7737  043632  012765  000001  000026          MOV     #1,RKMR1(R5)      ;SELECT WORD 1
7738  043640  004737  040100                  JSR     PC,GSTAT
7739  043644  032737  020000  007416          BIT     #D.RTZ,HMR2
7740  043652  001001                          BNE     64$
7741  043654  104244                          ERROR   244               ;RTZ NOT SET DURING RECAL CMD
7742  043656  013737  001412  007430  64$:    MOV     T10,TEMP2         ;SETUP TIMEOUT
7743  043664  004737  037056                  JSR     PC,FATT1          ;FIND ATTN
7744  043670  104055                          ERROR   55                ;NO ATTN AFTER RECAL CMD
7745
7746  043672  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
7747  043700  013765  001222  000010          MOV     $UNIT,RKCS2(R5)   ;DRIVE#
7748  043706  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)          ;DRIVE CLEAR CMD
7749  043714  013737  001412  007426          MOV     T10,TEMP1         ;SETUP TIMEOUT
7750  043722  004737  036542                  JSR     PC,FRDY           ;FIND RDY
7751  043726  104151                          ERROR   151               ;NO RDY AFTER DRIVE CLEAR CMD
7752  043730  004737  037024                  JSR     PC,TSTATN         ;TEST FOR ATTN
7753  043734  000401                          BR      65$
7754  043736  104154                          ERROR   154               ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
7755  043740                          65$:
7756
7757
7758  043740  000137  031420                  JMP     FORM              ;WRITE VALID FORMATS
7759
7760  043744  005737  000042          4$:     TST     42                ;SEE IF MANUAL OR AUTO MODE
7761  043750  001406                          BEQ     5$                ;BR IF MANUAL MODE
7762  043752  104401  055002                  TYPE    ,MSG76            ;PGM ABORTED
7763  043756  005037  036110                  CLR     $EOPCT            ;SET UP EOP TO EXIT TO MONITOR
7764  043762  000137  036034                  JMP     $EOP
7765
7766  043766  104401  055024          5$:     TYPE    ,MSG77            ;CPU HALTED
7767  043772  000000                          HALT
7768  043774  000137  013534                  JMP     ST5               ;START OVER IF CONTINUE PRESSED
7769
7770
7771
7772                                  .SBTTL  UNEXPECTED TIMEOUT HANDLER
7773
7774                                  ;
7775                                  ;THIS ROUTINE IS ENTERED IF THERE IS
7776                                  ;       A.  NON EXISTANT MEMORY (NO SSYN)
7777                                  ;       B.  BOUNDRY ERROR
7778                                  ;       C.  STACK OVERFLOW
7779                                  ;
7780
7781  044000  011600          BADTMO: MOV     (SP),R0           ;SAVE PC WHERE TIMEOUT OCCURRED.
7782  044002  005740                  TST     -(R0)             ;GET PC BEFORE UPDATE
7783  044004  032777  020000  135126  BIT     #SW13,@SWR        ;INHIBIT ERR TYPOUT?
7784  044012  001005                  BNE     1$                ;YES, DON'T TYPE
7785  044014  104401  055205          TYPE    ,EM3              ;ABORT TESTS,UNEXP T.O. @ PC=
7786  044020  010046                  MOV     R0,-(SP)          ;;SAVE R0 FOR TYPEOUT
```

```
7787
7788  044022  104403                        TYPOS                   ;;TYPE PC
7789  044024     006                        .BYTE   6               ;;GO TYPE--OCTAL ASCII
7790  044025     000                        .BYTE   0               ;;TYPE 6 DIGIT(S)
7791  044026  032777  001000  135104  1$:   BIT    #SW9,@SWR       ;;SUPPRESS LEADING ZEROS
7792  044034  001403                        BEQ    2$              ;LOOP ON ERROR?
7793  044036  022626                        CMP    (SP)+,(SP)+     ;NO, BRANCH
7794  044040  000177  135042                JMP    @$LPADR         ;YES, RESTORE STACK
7795                                                                ;GO TO STARTING ADDR OF TEST
7796  044044  032777  040000  135066  2$:   BIT    #SW14,@SWR      ;THAT GAVE BAD TIMEOUT
7797  044052  001401                        BEQ    3$              ;LOOP ON TEST?
7798  044054  000002                        RTI                    ;NO BRANCH
7799                                                                ;YES
7800  044056  000000                3$:     HALT                   ;UNEXPECTED TIME OUT OCCURRED
7801                                                                ;AS INDICATED. YOU CAN LOOP ON
7802                                                                ;ERROR, LOOP ON TEST OR INHIBIT
7803                                                                ;ERROR TYPEOUT BY SETTING THOSE
7804                                                                ;SWITCHES.
7805                                                                ;
7806  044060  022626                        CMP    (SP)+,(SP)+     ;RESTORE STACK
7807  044062  000137  036062                JMP    $EOP1           ;ABORT TESTS
7808
7809                                .SBTTL  MEMORY CHECK ENABLE TRAP
7810
7811  044066  012737  044102  001176  MEMERR: MOV    #1$,$ESCAPE
7812  044074  011637  001334                MOV    (SP),TRAPPC     ;STORE PC
7813  044100  104041                        ERROR  41              ;UNEXP MEM PARITY TRAP
7814  044102  005037  001176          1$:   CLR    $ESCAPE
7815  044106  032777  001000  135024        BIT    #SW9,@SWR       ;CHECK IF LOOP ON ERROR
7816  044114  001001                        BNE    2$              ;YES, FORCE STACK AND TRY AGAIN
7817  044116  000002                        RTI                    ;ELSE RETURN
7818
7819  044120  012706  001100          2$:   MOV    #STACK,SP       ;INIT STACK
7820  044124  000177  134760                JMP    @$LPERR         ;LOOP ON ERROR
7821
7822
7823                                .SBTTL  RK06 INTERRUPT HANDLER
7824
7825  044130  000240                INTER:  NOP
7826  044132  000240                        NOP
7827  044134  000240                        NOP
7828  044136  011600                        MOV    (SP),R0         ;SAVE PC WHERE INT OCCURRED.
7829  044140  005740                        TST    -(R0)           ;GET PC BEFORE UPDATE.
7830  044142  104401  051762                TYPE   ,MSG6           ;INT AT PC=
7831  044146  010046                        MOV    R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
7832                                                                ;;TYPE PC
7833  044150  104403                        TYPOS                  ;;GO TYPE--OCTAL ASCII
7834  044152     006                        .BYTE   6              ;;TYPE 6 DIGIT(S)
7835  044153     000                        .BYTE   0              ;;SUPPRESS LEADING ZEROS
7836  044154  000000                        HALT
7837  044156  000240                        NOP
7838  044160  000240                        NOP
7839  044162  000002                        RTI
7840
7841                                .SBTTL  POWER DOWN AND UP ROUTINES
7842
```

```
                                        ;POWER DOWN ROUTINE
                                        ;
044164  012737  044176  000024  $PWRDN: MOV     #$PWRUP,PWRVEC  ;SET UP VECTOR
044172  000000                  HALT
044174  000776                  BR      .-2             ;HANG UP.
                                        ;
                                        ;POWER UP ROUTINE
                                        ;
044176  005037  044250          $PWRUP: CLR     $PWRCT          ;WAIT LOOP FOR TTY
044202  005237  044250          1$:     INC     $PWRCT          ;WAIT FOR THE INCR
044206  001375                  BNE     1$              ;OF WORD
044210  012737  044164  000024          MOV     #$PWRDN,PWRVEC  ;SET POWER DOWN VECTOR
044216  012737  000340  000026          MOV     #PR7,PWRVEC+2   ;PRIORITY 7
044224  012737  000340  000036          MOV     #PR7,TRAPVEC+2  ;LOCKOUT ALL INTERRUPTS FOR TRAPS
044232  012706  001100                  MOV     #STACK,SP       ;INITIALIZE STACK
044236  104401  052152                  TYPE    ,MSG11          ;REPORT POWER FAIL
044242  000005                  RESET
044244  000137  015312                  JMP     PFSRT
                                        ;
044250  000000          $PWRCT: 0                       ;WAIT COUNT FOR TTY
                                        ;
                                        ;
                                        ;DIVISION UTILITY ROUTINE
                                        ;
                                        ;R0-R1-R2-R3=DIVIDEND
                                        ;R4-R5=DIVISOR
                                        ;R0-R1=REMAINDER AFTER DIVISION
                                        ;R2-R3=QUOTIENT AFTER DIVISION
                                        ;ENTER WITH JSR PC,M.DPID
                                        ;
044252  012746  000040  M.DPID: MOV     #40,-(SP)       ;COUNTER FOR DIVISION CYCLES
044256  010446                  MOV     R4,-(SP)        ;HI ORDER
044260  010546                  MOV     R5,-(SP)        ;LO ORDER TO THE STACK
044262  005466  000002          NEG     2(SP)           ;FORM NEGATIVE
044266  005416                  NEG     @SP             ;VERSION OF DIVISOR
044270  005666  000002          SBC     2(SP)
044274  061601                  ADD     @SP,R1
044276  005500                  ADC     R0              ;PERFORM INIT SUBT.
044300  066600  000002          ADD     2(SP),R0
044304  103445                  BCS     M.DP50          ;IF CARRY THEN OVERFLOW HAS OCCURRED
044306  005046                  CLR     -(SP)           ;THIS IS A LONGER LASTING CARRY BIT
044310  006103          M.DP40: ROL     R3
044312  006102                  ROL     R2
044314  006101                  ROL     R1
044316  006100                  ROL     R0
044320  005716                  TST     @SP             ;TEST CARRY INDICATOR
044322  001410                  BEQ     M.DP41          ;IF TO CARRY THEN ADD, ELSE SUBT.
044324  005016                  CLR     @SP             ;CLEAR UP FOR NEXT TIME
044326  066601  000002          ADD     2(SP),R1
044332  005500                  ADC     R0              ;ADD -(DIVISOR)
044334  005516                  ADC     @SP             ;SET CARRY
044336  066600  000004          ADD     4(SP),R0
044342  000404                  BR      M.DP42
                                        ;
044344  060501          M.DP41: ADD     R5,R1
044346  005500                  ADC     R0              ;ADD +(DIVISOR)
```

```
 7899  044350  005516                        ADC     @SP             ;SET CARRY
 7900  044352  060400                        ADD     R4,R0
 7901  044354  005516                M.DP42: ADC     @SP             ;SET CARRY
 7902  044356  005716                        TST     @SP             ;TEST THE UPDATE INDICATOR
 7903  044360  001401                        BEQ     .+4             ;IF 0,FORGET IT
 7904  044362  005203                        INC     R3              ;NO CARRY POSSIBLE HERE
 7905  044364  005366  000006                DEC     6(SP)           ;DECREMENT CTR
 7906  044370  003347                        BGT     M.DP40          ;BR IF MORE TO DO
 7907  044372  006003                        ROR     R3
 7908  044374  103404                        BCS     M.DP44
 7909  044376  060501                        ADD     R5,R1
 7910  044400  005500                        ADC     R0
 7911  044402  060400                        ADD     R4,R0
 7912  044404  000241                        CLC
 7913
 7914  044406  006103                M.DP44: ROL     R3
 7915  044410  062706  000010                ADD     #10,SP          ;ADJUST STACK BY 4 WORDS
 7916  044414  000242                        CLV
 7917  044416  000207                        RTS     PC
 7918
 7919  044420  062706  000006        M.DP50: ADD     #6,SP
 7920  044424  000262                        SEV
 7921  044426  000207                        RTS     PC
 7922
```

```
                                .SBTTL  SCOPE HANDLER ROUTINE

                                ;;**************************************************************
                                ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                                ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
                                ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW14=1         LOOP ON TEST
                                ;*SW11=1         INHIBIT ITERATIONS
                                ;*SW09=1         LOOP ON ERROR
                                ;*SW08=1         LOOP ON TEST IN SWR<7:0>
                                ;*CALL
                                ;*      SCOPE           ;;SCOPE=IOT

044430                          $SCOPE:
044430  104407                         CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
044432  032777  040000  134500  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
044440  001114                         BNE     $OVER           ;;YES IF SW14=1
                                ;#####START OF CODE FOR THE XOR TESTER#####
044442  000416                 $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                                ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
044444  013746  000004                 MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
044450  012737  044470  000004         MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
044456  005737  177060                 TST     @#177060        ;;TIME OUT ON XOR?
044462  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
044466  000463                         BR      $SVLAD          ;;GO TO THE NEXT TEST
044470  022626                 5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
044472  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
044476  000423                         BR      7$              ;;LOOP ON THE PRESENT TEST
044500                          6$:;#####END OF CODE FOR THE XOR TESTER#####
044500  032777  000400  134432         BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
044506  001404                         BEQ     2$              ;;BR IF NO
044510  127737  134424  001102         CMPB    @SWR,$TSTNM     ;;ON THE RIGHT TEST?    SWR<7:0>
044516  001465                         BEQ     $OVER           ;;BR IF YES
044520  105737  001103         2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
044524  001421                         BEQ     3$              ;;BR IF NO
044526  123737  001115  001103         CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
044534  101015                         BHI     3$              ;;BR IF NO
044536  032777  001000  134374         BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
044544  001404                         BEQ     4$              ;;BR IF NO
044546  013737  001110  001106  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
044554  000446                         BR      $OVER
044556  105037  001103         4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
044562  005037  001174                 CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
044566  000415                         BR      1$              ;;ESCAPE TO THE NEXT TEST
044570  032777  004000  134342  3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
044576  001011                         BNE     1$              ;;BR IF YES
044600  005737  001216                 TST     $PASS           ;;IF FIRST PASS OF PROGRAM
044604  001406                         BEQ     1$              ;;      INHIBIT ITERATIONS
044606  005237  001104                 INC     $ICNT           ;;INCREMENT ITERATION COUNT
044612  023737  001174  001104         CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
044620  002024                         BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
044622  012737  000001  001104  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
044630  013737  044706  001174         MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
044636  105237  001102         $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
044642  113737  001102  001214         MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
```

```
 7979  044650  011637  001106                 MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
 7980  044654  011637  001110                 MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
 7981  044660  005037  001176                 CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
 7982  044664  112737  000001  001115         MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
 7983  044672  013777  001102  134242 $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
 7984  044700  013716  001106                 MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
 7985  044704  000002                         RTI                     ;;FIXES PS
 7986  044706  003720                 $MXCNT: 2000.                   ;;MAX. NUMBER OF ITERATIONS
 7987                                  .SBTTL  ERROR HANDLER ROUTINE
 7988
 7989                                  ;;**************************************************************
 7990                                  ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
 7991                                  ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
 7992                                  ;*AND GO TO TYPERR ON ERROR
 7993                                  ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
 7994                                  ;*SW15=1        HALT ON ERROR
 7995                                  ;*SW13=1        INHIBIT ERROR TYPEOUTS
 7996                                  ;*SW10=1        BELL ON ERROR
 7997                                  ;*SW09=1        LOOP ON ERROR
 7998                                  ;*CALL
 7999                                  ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
 8000
 8001  044710                  $ERROR:
 8002  044710  104407                         CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
 8003  044712  105237  001103         7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
 8004  044716  001775                         BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
 8005  044720  013777  001102  134214         MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
 8006  044726  032777  002000  134204         BIT     #BIT10,@SWR     ;;BELL ON ERROR?
 8007  044734  001402                         BEQ     1$              ;;NO - SKIP
 8008  044736  104401  001200                 TYPE    ,$BELL          ;;RING BELL
 8009  044742  005237  001112         1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
 8010  044746  011637  001116                 MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
 8011  044752  162737  000002  001116         SUB     #2,$ERRPC
 8012  044760  117737  134132  001114         MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
 8013  044766  032777  020000  134144         BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
 8014  044774  001004                         BNE     20$             ;;SKIP TYPEOUTS
 8015  044776  004737  064710                 JSR     PC,TYPERR       ;;GO TO USER ERROR ROUTINE
 8016  045002  104401  001205                 TYPE    ,$CRLF
 8017  045006                         20$:
 8018  045006  122737  000001  001230         CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
 8019  045014  001007                         BNE     2$              ;;NO,SKIP APT ERROR REPORT
 8020  045016  113737  001114  045030         MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
 8021  045024  004737  045634                 JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
 8022  045030     000                 21$:    .BYTE   0
 8023  045031     000                         .BYTE   0
 8024  045032  000777                 22$:    BR      22$             ;;APT ERROR LOOP
 8025  045034  005777  134100          2$:    TST     @SWR            ;;HALT ON ERROR
 8026  045040  100002                         BPL     3$              ;;SKIP IF CONTINUE
 8027  045042  000000                         HALT                    ;;HALT ON ERROR!
 8028  045044  104407                         CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
 8029  045046  032777  001000  134064  3$:    BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
 8030  045054  001402                         BEQ     4$              ;;BR IF NO
 8031  045056  013716  001110                 MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
 8032  045062  005737  001176          4$:    TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
 8033  045066  001402                         BEQ     5$              ;;BR IF NONE
 8034  045070  013716  001176                 MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
```

```
 8035  045074
 8036  045074  022737  036150  000042  5$:     CMP     @$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
 8037  045102  001001                          BNE     6$              ;;BRANCH IF NO
 8038  045104  000000                          HALT                    ;;YES
 8039  045106                              6$:
 8040  045106  000002                          RTI                     ;;RETURN
 8041                                      .SBTTL  TYPE ROUTINE
 8042
 8043                                      ;;**************************************************************
 8044                                      ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
 8045                                      ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
 8046                                      ;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
 8047                                      ;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
 8048                                      ;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
 8049                                      ;*
 8050                                      ;*CALL:
 8051                                      ;*1) USING A TRAP INSTRUCTION
 8052                                      ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
 8053                                      ;*OR
 8054                                      ;*      TYPE
 8055                                      ;*      MESADR
 8056                                      ;*
 8057
 8058  045110  105737  001157          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
 8059  045114  100002                          BPL     1$              ;;BR IF YES
 8060  045116  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
 8061  045120  000430                          BR      3$              ;;LEAVE
 8062  045122  010046                      1$: MOV     R0,-(SP)        ;;SAVE R0
 8063  045124  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
 8064  045130  122737  000001  001230          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
 8065  045136  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
 8066  045140  132737  000100  001231          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
 8067  045146  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
 8068  045150  010037  045160                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
 8069  045154  004737  045624                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
 8070  045160  000000                      61$:.WORD   0               ;;MESSAGE ADDRESS
 8071  045162  132737  000040  001231  62$:  BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
 8072  045170  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
 8073  045172  112046                      2$: MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
 8074  045174  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
 8075  045176  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
 8076  045200  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
 8077  045202  062716  000002              3$: ADD     #2,(SP)         ;;ADJUST RETURN PC
 8078  045206  000002                          RTI                     ;;RETURN
 8079  045210  122716  000011              4$: CMPB    #HT,(SP)        ;;BRANCH IF <HT>
 8080  045214  001430                          BEQ     8$
 8081  045216  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
 8082  045222  001006                          BNE     5$
 8083  045224  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
 8084  045226  104401                          TYPE                    ;;TYPE A CR AND LF
 8085  045230  001205                          $CRLF
 8086  045232  105037  045366                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
 8087  045236  000755                          BR      2$              ;;GET NEXT CHARACTER
 8088  045240  004737  045322              5$: JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
 8089  045244  123726  001156              6$: CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
 8090  045250  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
```

```
8091  045252  013746  001154            MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
8092                                                              ;;AND THE NULL CHAR.
8093  045256  105366  000001    7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
8094  045262  002770                    BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
8095  045264  004737  045322            JSR     PC,$TYPEC       ;;GO TYPE A NULL
8096  045270  105337  045366            DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
8097  045274  000770                    BR      7$              ;;LOOP
8098
8099                                    ;HORIZONTAL TAB PROCESSOR
8100
8101  045276  112716  000040    8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
8102  045302  004737  045322    9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
8103  045306  132737  000007  045366    BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
8104  045314  001372                    BNE     9$              ;;TAB STOP
8105  045316  005726                    TST     (SP)+           ;;POP SPACE OFF STACK
8106  045320  000724                    BR      2$              ;;GET NEXT CHARACTER
8107  045322  105777  133622    $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
8108  045326  100375                    BPL     $TYPEC
8109  045330  116677  000002  133614    MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
8110  045336  122766  000015  000002    CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
8111  045344  001003                    BNE     1$              ;;BRANCH IF NO
8112  045346  105037  045366            CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
8113  045352  000406                    BR      $TYPEX          ;;EXIT
8114  045354  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
8115  045362  001402                    BEQ     $TYPEX          ;;BRANCH IF YES
8116  045364  105227                    INCB    (PC)+           ;;COUNT THE CHARACTER
8117  045366  000000    $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
8118  045370  000207    $TYPEX: RTS     PC
8119
8120                                    .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
8121
8122                                    ;;**************************************************************
8123                                    ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
8124                                    ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
8125                                    ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
8126                                    ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
8127                                    ;*REPLACED WITH SPACES.
8128                                    ;*CALL:
8129                                    ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
8130                                    ;*      TYPDS                   ;;GO TO THE ROUTINE
8131
8132  045372                    $TYPDS:
8133  045372  010046                    MOV     R0,-(SP)        ;;PUSH R0 ON STACK
8134  045374  010146                    MOV     R1,-(SP)        ;;PUSH R1 ON STACK
8135  045376  010246                    MOV     R2,-(SP)        ;;PUSH R2 ON STACK
8136  045400  010346                    MOV     R3,-(SP)        ;;PUSH R3 ON STACK
8137  045402  010546                    MOV     R5,-(SP)        ;;PUSH R5 ON STACK
8138  045404  012746  020200            MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
8139  045410  016605  000020            MOV     20(SP),R5       ;;GET THE INPUT NUMBER
8140  045414  100004                    BPL     1$              ;;BR IF INPUT IS POS.
8141  045416  005405                    NEG     R5              ;;MAKE THE BINARY NUMBER POS.
8142  045420  112766  000055  000001    MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
8143  045426  005000            1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
8144  045430  012703  045606            MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
8145  045434  112723  000040            MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
8146  045440  005002            2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
```

```
8147   045442  016001  045576          MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
8148   045446  160105          3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
8149   045450  002402                  BLT     4$              ;;BR IF DONE
8150   045452  005202                  INC     R2              ;;INCREASE THE BCD DIGIT BY 1
8151   045454  000774                  BR      3$
8152   045456  060105          4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
8153   045460  005702                  TST     R2              ;;CHECK IF BCD DIGIT=0
8154   045462  001002                  BNE     5$              ;;FALL THROUGH IF 0
8155   045464  105716                  TSTB    (SP)            ;;STILL DOING LEADING 0'S?
8156   045466  100407                  BMI     7$              ;;BR IF YES
8157   045470  106316          5$:     ASLB    (SP)            ;;MSD?
8158   045472  103003                  BCC     6$              ;;BR IF NO
8159   045474  116663  000001  177777  MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
8160   045502  052702  000060          6$:     BIS     #'0,R2  ;;MAKE THE BCD DIGIT ASCII
8161   045506  052702  000040          7$:     BIS     #' ,R2  ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
8162   045512  110223                  MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
8163   045514  005720                  TST     (R0)+           ;;JUST INCREMENTING
8164   045516  020027  000010          CMP     R0,#10          ;;CHECK THE TABLE INDEX
8165   045522  002746                  BLT     2$              ;;GO DO THE NEXT DIGIT
8166   045524  003002                  BGT     8$              ;;GO TO EXIT
8167   045526  010502                  MOV     R5,R2           ;;GET THE LSD
8168   045530  000764                  BR      6$              ;;GO CHANGE TO ASCII
8169   045532  105726          8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
8170   045534  100003                  BPL     9$              ;;BR IF NO
8171   045536  116663  177777  177776  MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
8172   045544  105013          9$:     CLRB    (R3)            ;;SET THE TERMINATOR
8173   045546  012605                  MOV     (SP)+,R5        ;;POP STACK INTO R5
8174   045550  012603                  MOV     (SP)+,R3        ;;POP STACK INTO R3
8175   045552  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
8176   045554  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
8177   045556  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
8178   045560  104401  045606          TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
8179   045564  016666  000002  000004  MOV     2(SP),4(SP)     ;;ADJUST THE STACK
8180   045572  012616                  MOV     (SP)+,(SP)
8181   045574  000002                  RTI                     ;;RETURN TO USER
8182   045576  023420          $DTBL:  10000.
8183   045600  001750                  1000.
8184   045602  000144                  100.
8185   045604  000012                  10.
8186   045606  000004          $DBLK:  .BLKW   4
8187                           .SBTTL  APT COMMUNICATIONS ROUTINE
8188
8189                           ;;**************************************************************
8190   045616  112737  000001  046062  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
8191   045624  112737  000001  046060  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
8192   045632  000403                  BR      $ATYC
8193   045634  112737  000001  046062  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
8194   045642          $ATYC:
8195   045642  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
8196   045644  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
8197   045646  105737  046060          TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
8198   045652  001450                  BEQ     5$              ;;IF NOT:  BR
8199   045654  122737  000001  001230  CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
8200   045662  001031                  BNE     3$              ;;IF NOT:  BR
8201   045664  132737  000100  001231  BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
8202   045672  001425                  BEQ     3$              ;;IF NOT:  BR
```

```
8203  045674  017600  000004          MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
8204  045700  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
8205  045706  005737  001210  1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
8206  045712  001375          BNE     1$              ;;IF NOT:  WAIT
8207  045714  010037  001224          MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
8208  045720  105720          2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
8209  045722  001376          BNE     2$
8210  045724  163700  001224          SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
8211  045730  006200          ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
8212  045732  010037  001226          MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
8213  045736  012737  000004  001210  MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
8214  045744  000413          BR      5$
8215  045746  017637  000004  045772  3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
8216  045754  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
8217  045762  013746  177776          MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
8218  045766  004737  045110          JSR     PC,$TYPE        ;;CALL TYPE MACRO
8219  045772  000000          4$:     .WORD   0
8220  045774                  5$:
8221  045774  105737  046062  10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
8222  046000  001416          BEQ     12$             ;;IF NOT:  BR
8223  046002  005737  001230          TST     $ENV            ;;RUNNING UNDER APT?
8224  046006  001413          BEQ     12$             ;;IF NOT:  BR
8225  046010  005737  001210  11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
8226  046014  001375          BNE     11$             ;;IF NOT:  WAIT
8227  046016  017637  000004  001212  MOV     @4(SP),$FATAL   ;;GET ERROR #
8228  046024  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
8229  046032  005237  001210          INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
8230  046036  105037  046062  12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
8231  046042  105037  046061          CLRB    $LFLG           ;;CLEAR LOG FLAG
8232  046046  105037  046060          CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
8233  046052  012601          MOV     (SP)+,R1        ;;POP STACK INTO R1
8234  046054  012600          MOV     (SP)+,R0        ;;POP STACK INTO R0
8235  046056  000207          RTS     PC              ;;RETURN
8236  046060     000  $MFLG:   .BYTE   0               ;;MESSG. FLAG
8237  046061     000  $LFLG:   .BYTE   0               ;;LOG FLAG
8238  046062     000  $FFLG:   .BYTE   0               ;;FATAL FLAG
8239          046064          .EVEN
8240          000200  APTSIZE=200
8241          000001  APTENV=001
8242          000100  APTSPOOL=100
8243          000040  APTCSUP=040
8244                  .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
8245
8246                  ;;**************************************************************
8247                  ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
8248                  ;*OCTAL (ASCII) NUMBER AND TYPE IT.
8249                  ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
8250                  ;*CALL:
8251                  ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
8252                  ;*      TYPOS                   ;;CALL FOR TYPEOUT
8253                  ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
8254                  ;*      .BYTE   M               ;;M=1 OR 0
8255                  ;*                                      ;;1=TYPE LEADING ZEROS
8256                  ;*                                      ;;0=SUPPRESS LEADING ZEROS
8257                  ;*
8258                  ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
```

```
                                        ;*$TYPOS OR $TYPOC
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                        ;*      TYPON                   ;;CALL FOR TYPEOUT
                                        ;*
                                        ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                        ;*      TYPOC                   ;;CALL FOR TYPEOUT

046064  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
046070  116637  000001  046307          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
046076  112637  046311                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
046102  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
046106  000406                          BR      $TYPON
046110  112737  000001  046307  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
046116  112737  000006  046311          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
046124  112737  000005  046306  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
046132  010346                          MOV     R3,-(SP)        ;;SAVE R3
046134  010446                          MOV     R4,-(SP)        ;;SAVE R4
046136  010546                          MOV     R5,-(SP)        ;;SAVE R5
046140  113704  046311                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
046144  005404                          NEG     R4
046146  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
046152  110437  046310                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
046156  113704  046307                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
046162  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
046166  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
046170  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
046172  000404                          BR      3$              ;;GO DO MSB
046174  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
046176  006105                          ROL     R5
046200  006105                          ROL     R5
046202  010503                          MOV     R5,R3
046204  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
046206  105337  046310                  DECB    $OMODE          ;;TYPE THIS DIGIT?
046212  100016                          BPL     7$              ;;BR IF NO
046214  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
046220  001002                          BNE     4$              ;;TEST FOR 0
046222  005704                          TST     R4              ;;SUPPRESS THIS 0?
046224  001403                          BEQ     5$              ;;BR IF YES
046226  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
046230  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
046234  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
046240  110337  046304                  MOVB    R3,8$           ;;SAVE FOR TYPING
046244  104401  046304                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
046250  105337  046306          7$:     DECB    $OCNT           ;;COUNT BY 1
046254  003347                          BGT     2$              ;;BR IF MORE TO DO
046256  002402                          BLT     6$              ;;BR IF DONE
046260  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
046262  000744                          BR      2$              ;;GO DO THE LAST DIGIT
046264  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
046266  012604                          MOV     (SP)+,R4        ;;RESTORE R4
046270  012603                          MOV     (SP)+,R3        ;;RESTORE R3
046272  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
046300  012616                          MOV     (SP)+,(SP)
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                                RTI                             ;;RETURN
046304  000                     8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
046305  000                             .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
046306  000                     $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
046307  000                     $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
046310  000000                  $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
                                .SBTTL  TTY INPUT ROUTINE

                                ;;******************************************************************
                                .ENABL  LSB
046312  000000                  $TKCNT: .WORD   0               ;;NUMBER OF ITEMS IN QUEUE
046314  000000                  $TKQIN: .WORD   0               ;;INPUT POINTER
046316  000000                  $TKQOUT: .WORD  0               ;;OUTPUT POINTER
046320  000001                  $TKQSRT: .BLKB  1               ;;TTY KEYBOARD QUEUE
046321                          $TKQEND=.
046322                          .EVEN

                                ;*TK INITIALIZE ROUTINE
                                ;*THIS ROUTINE WILL INITIALIZE THE TTY KEYBOARD INPUT QUEUE
                                ;*SETUP THE INTERRUPT VECTOR AND TURN ON THE KEYBOARD INTERRUPT
                                ;
                                ;*CALL:
                                ;*      JSR     PC,$TKINT
                                ;*      RETURN
                                ;
046322  005037  046312          $TKINT: CLR     $TKCNT          ;;CLEAR COUNT OF ITEMS IN QUEUE
046326  012737  046320  046314          MOV     #$TKQSRT,$TKQIN ;;MOVE THE STARTING ADDRESS OF THE
046334  013737  046314  046316          MOV     $TKQIN,@#$TKQOUT ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
046342  012737  046372  000060          MOV     #$TKSRV,@#TKVEC ;;INITIALIZE THE KEYBOARD VECTOR
046350  012737  000200  000062          MOV     #200,@#TKVEC+2  ;;"BR" LEVEL 4
046356  005777  132564                  TST     @$TKB           ;;CLEAR DONE FLAG
046362  012777  000100  132554          MOV     #100,@$TKS      ;;ENABLE TTY KEYBOARD INTERRUPT
046370  000207                          RTS     PC              ;;RETURN TO CALLER

                                ;*TK SERVICE ROUTINE
                                ;*THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT
                                ;*BY READING THE CHARACTER FROM THE INPUT BUFFER AND PUTTING
                                ;*IT IN THE QUEUE.
                                ;*IF THE CHARACTER IS A "CONTROL-C" (^C) $TKINT IS CALLED AND
                                ;*UPON RETURN EXIT IS MADE TO THE "CONTROL-C" RESTART ADDRESS (STOP)
                                ;
046372  117746  132550          $TKSRV: MOVB    @$TKB,-(SP)     ;;PICKUP THE CHARACTER
046376  042716  177600                  BIC     #^C177,(SP)     ;;STRIP THE JUNK
046402  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL C?
046406  001007                          BNE     1$              ;;BRANCH IF NO
046410  104401  047520                  TYPE    ,$CNTLC         ;;TYPE A CONTROL-C (^C)
046414  004737  046322                  JSR     PC,$TKINT       ;;INIT THE KEYBOARD
046420  005726                          TST     (SP)+           ;;CLEAN UP STACK
046422  000137  043460                  JMP     STOP            ;;CONTROL C RESTART
046426  021627  000007          1$:     CMP     (SP),#7         ;;IS IT A CONTROL G?
046432  001004                          BNE     2$              ;;BRANCH IF NO
046434  022737  000176  001140          CMP     #SWREG,SWR      ;;IS SOFT-SWR SELECTED?
046442  001500                          BEQ     6$              ;;GO TO SWR CHANGE

046444                          2$:
046444  022737  000001  046312          CMP     #1,$TKCNT       ;;IS THE QUEUE FULL?
```

```
8371  046452  001004                        BNE     3$              ;;BRANCH IF NO
8372  046454  104401  001200                TYPE    ,$BELL          ;;RING THE TTY BELL
8373  046460  005726                        TST     (SP)+           ;;CLEAN CHARACTER OFF OF STACK
8374  046462  000451                        BR      5$              ;;EXIT
8375  046464  021627  000023        3$:     CMP     (SP),#23        ;;IS IT A CONTROL-S?
8376  046470  001021                        BNE     32$             ;;BRANCH IF NO
8377  046472  005077  132446                CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
8378  046476  005726                        TST     (SP)+           ;;CLEAN CHAR OFF STACK
8379  046500  105777  132440        31$:    TSTB    @$TKS           ;;WAIT FOR A CHAR
8380  046504  100375                        BPL     31$             ;;LOOP UNTIL ITS THERE
8381  046506  117746  132434                MOVB    @$TKB,-(SP)     ;;GET THE CHARACTER
8382  046512  042716  177600                BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
8383  046516  022627  000021                CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
8384  046522  001366                        BNE     31$             ;;BRANCH IF NO
8385  046524  012777  000100  132412        MOV     #100,@$TKS      ;;REENABLE TTY KEYBOARD INTERRUPTS
8386  046532  000002                        RTI                     ;;RETURN
8387  046534  005237  046312        32$:    INC     $TKCNT          ;;COUNT THIS CHARACTER
8388  046540  021627  000140                CMP     (SP),#140       ;;IS IT UPPER CASE?
8389  046544  002405                        BLT     4$              ;;BRANCH IF YES
8390  046546  021627  000175                CMP     (SP),#175       ;;IS IT A SPECIAL CHAR?
8391  046552  003002                        BGT     4$              ;;BRANCH IF YES
8392  046554  042716  000040                BIC     #40,(SP)        ;;MAKE IT UPPER CASE
8393  046560  112677  177530        4$:     MOVB    (SP)+,@$TKQIN   ;;AND PUT IT IN QUEUE
8394  046564  005237  046314                INC     $TKQIN          ;;UPDATE THE POINTER
8395  046570  023727  046314  046321        CMP     $TKQIN,#$TKQEND ;;GO OFF THE END?
8396  046576  001003                        BNE     5$              ;;BRANCH IF NO
8397  046600  012737  046320  046314        MOV     #$TKQSRT,$TKQIN ;;RESET THE POINTER
8398  046606  000002                5$:     RTI                     ;;RETURN
8399
8400                                ;;**********************************************************************
8401                                ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
8402                                ;*ROUTINE IS ENTERED  FROM THE TRAP HANDLER, AND WILL
8403                                ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP
8404                                ;*CALL WHEN OPERATING IN TTY INTERRUPT MODE.
8405  046610  022737  000176  001140 $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED
8406  046616  001124                        BNE     15$             ;;EXIT IF NOT
8407  046620  105777  132320                TSTB    @$TKS           ;;IS A CHAR WAITING?
8408  046624  100121                        BPL     15$             ;;IF NOT, EXIT
8409  046626  117746  132314                MOVB    @$TKB,-(SP)     ;;YES
8410  046632  042716  177600                BIC     #^C177,(SP)     ;;MAKE IT  7-BIT ASCII
8411  046636  021627  000007                CMP     (SP),#7         ;;IS IT A CONTROL-G?
8412  046642  001300                        BNE     2$              ;;IF NOT, PUT IT IN THE TTY QUEUE
8413                                                                ;;AND EXIT
8414
8415                                ;;**********************************************************************
8416                                ;*CONTROL IS PASSED TO THIS POINT FROM EITHER THE TTY INTERRUPT SERVICE
8417                                ;*ROUTINE OR FROM THE SOFTWARE SWITCH REGISTER TRAP CALL, AS A RESULT OF A
8418                                ;*CONTROL-G BEING TYPED, AND THE SOFTWARE SWITCH REGISTER BEING SELECTED.
8419  046644  123727  001134  000001 6$:     CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
8420  046652  001674                        BEQ     2$              ;;BRANCH IF YES
8421  046654  005726                        TST     (SP)+           ;;CLEAR CONTROL-G OFF STACK
8422  046656  004737  046322                JSR     PC,$TKINT       ;;FLUSH THE TTY INPUT QUEUE
8423  046662  005077  132256                CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
8424  046666  112737  000001  001135        MOVB    #1,$INTAG       ;;SET INTERRUPT MODE INDICATOR
8425
8426  046674  104401  047532                TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
```

```
8427  046700  104401  047537          $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
8428  046704  013746  000176                  MOV     $SWREG,-(SP)    ;;SAVE SWREG FOR TYPEOUT
8429  046710  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
8430  046712  104401  047550                  TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
8431  046716  005046                  19$:    CLR     -(SP)           ;;CLEAR COUNTER
8432  046720  005046                          CLR     -(SP)           ;;THE NEW SWR
8433  046722  105777  132216          7$:     TSTB    @$TKS           ;;CHAR THERE?
8434  046726  100375                          BPL     7$              ;;IF NOT TRY AGAIN
8435
8436  046730  117746  132212                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
8437  046734  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
8438
8439  046740  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL-C?
8440  046744  001015                          BNE     9$              ;;BRANCH IF NOT
8441  046746  104401  047520                  TYPE    ,$CNTLC         ;;YES, ECHO CONTROL-C (^C)
8442  046752  062706  000006                  ADD     #6,SP           ;;CLEAN UP STACK
8443  046756  123727  001135  000001          CMPB    $INTAG,#1       ;;REENABLE TTY KEYBOARD INTERRUPTS?
8444  046764  001003                          BNE     8$              ;;BRANCH IF NO
8445  046766  012777  000100  132150          MOV     #100,@$TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
8446  046774  000137  043460          8$:     JMP     STOP            ;;CONTROL-C RESTART
8447
8448
8449  047000  021627  000025          9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
8450  047004  001005                          BNE     10$             ;;BRANCH IF NOT
8451  047006  104401  047525                  TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
8452  047012  062706  000006          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
8453  047016  000737                          BR      19$             ;;LET'S TRY IT AGAIN
8454
8455
8456  047020  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
8457  047024  001022                          BNE     16$             ;;BRANCH IF NO
8458  047026  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
8459  047032  001403                          BEQ     11$             ;;BRANCH IF YES
8460  047034  016677  000002  132076          MOV     2(SP),@SWR      ;;SAVE NEW SWR
8461  047042  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
8462  047046  104401  001205          14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
8463  047052  123727  001135  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
8464  047060  001003                          BNE     15$             ;;BRANCH IF NOT
8465  047062  012777  000100  132054          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
8466  047070  000002                  15$:    RTI                     ;;RETURN
8467  047072  004737  045322          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
8468  047076  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
8469  047102  002420                          BLT     18$             ;;BRANCH IF YES
8470  047104  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
8471  047110  003015                          BGT     18$             ;;BRANCH IF YES
8472  047112  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
8473  047116  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
8474  047122  001403                          BEQ     17$             ;;BRANCH IF YES
8475  047124  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
8476  047126  006316                          ASL     (SP)            ;;   CHAR OVER TO MAKE
8477  047130  006316                          ASL     (SP)            ;;   ROOM FOR NEW ONE.
8478  047132  005266  000002          17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
8479  047136  056616  177776                  BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
8480  047142  000667                          BR      7$              ;;GET THE NEXT ONE
8481  047144  104401  001204          18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
8482  047150  000720                          BR      20$             ;;SIMULATE CONTROL-U
```

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                                .DSABL  LSB


                                ;;*****************************************************************
                                ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                ;*CALL:
                                ;*      RDCHR                   ;;GET A CHARACTER FROM THE QUEUE
                                ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
                                ;*                              ;;WITH PARITY BIT STRIPPED OFF
                                ;
047152  011646                  $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC AND
047154  016666  000004  000002          MOV     4(SP),2(SP)     ;;THE PS
047162  005066  000004                  CLR     4(SP)           ;;GET READY FOR A CHARACTER
047166  005046                          CLR     -(SP)           ;;PUT NEW PS ON STACK
047170  012746  047176                  MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
047174  000002                          RTI                     ;;POP NEW PC AND PS
047176                          64$:
047176  005737  046312          1$:     TST     $TKCNT          ;;WAIT ON A CHARACTER
047202  001775                          BEQ     1$
047204  005337  046312                  DEC     $TKCNT          ;;DECREMENT THE COUNTER
047210  117766  177102  000004          MOVB    @$TKQOUT,4(SP)  ;;GET ONE CHARACTER
047216  005237  046316                  INC     $TKQOUT         ;;UPDATE THE POINTER
047222  023727  046316  046321          CMP     $TKQOUT,#$TKQEND ;;DID IT GO OFF OF THE END?
047230  001003                          BNE     2$              ;;BRANCH IF NO
047232  012737  046320  046316          MOV     #$TKQSRT,$TKQOUT ;;RESET THE POINTER
047240  000002                  2$:     RTI                     ;;RETURN
                                ;;*****************************************************************
                                ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                                ;*CALL:
                                ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
                                ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                                ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S

047242  010346                  $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
047244  005046                          CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
047246  012703  047476          1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
047252  022703  047520          2$:     CMP     #$TTYIN+22,R3   ;;BUFFER FULL?
047256  101456                          BLOS    4$              ;;BR IF YES
047260  104410                          RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
047262  112613                          MOVB    (SP)+,(R3)      ;;GET CHARACTER
047264  122713  000177          10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
047270  001022                          BNE     5$              ;;BR IF NO
047272  005716                          TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
047274  001007                          BNE     6$              ;;BR IF NO
047276  112737  000134  047474          MOVB    #'\,9$          ;;TYPE A BACK SLASH
047304  104401  047474                  TYPE    ,9$
047310  012716  177777                  MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
047314  005303                  6$:     DEC     R3              ;;BACKUP BY ONE
047316  020327  047476                  CMP     R3,#$TTYIN      ;;STACK EMPTY?
047322  103434                          BLO     4$              ;;BR IF YES
047324  111337  047474                  MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
047330  104401  047474                  TYPE    ,9$             ;;GO TYPE
047334  000746                          BR      2$              ;;GO READ ANOTHER CHAR.
047336  005716                  5$:     TST     (SP)            ;;RUBOUT KEY SET?
047340  001406                          BEQ     7$              ;;BR IF NO
```

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 8539  047342  112737  000134  047474          MOVB    #'\,9$          ;;TYPE A BACK SLASH
 8540  047350  104401  047474                  TYPE    ,9$
 8541  047354  005016                          CLR     (SP)            ;;CLEAR THE RUBOUT KEY
 8542  047356  122713  000025          7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
 8543  047362  001003                          BNE     8$              ;;BR IF NO
 8544  047364  104401  047525                  TYPE    ,$CNTLU         ;;TYPE A CONTROL "U"
 8545  047370  000726                          BR      1$              ;;GO START OVER
 8546  047372  122713  000022          8$:     CMPB    #22,(R3)        ;;IS CHARACTER A "↑R"?
 8547  047376  001011                          BNE     3$              ;;BRANCH IF NO
 8548  047400  105013                          CLRB    (R3)            ;;CLEAR THE CHARACTER
 8549  047402  104401  001205                  TYPE    ,$CRLF          ;;TYPE A "CR" & "LF"
 8550  047406  104401  047476                  TYPE    ,$TTYIN         ;;TYPE THE INPUT STRING
 8551  047412  000717                          BR      2$              ;;GO PICKUP ANOTHER CHACTER
 8552  047414  104401  001204          4$:     TYPE    ,$QUES          ;;TYPE A '?'
 8553  047420  000712                          BR      1$              ;;CLEAR THE BUFFER AND LOOP
 8554  047422  111337  047474          3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
 8555  047426  104401  047474                  TYPE    ,9$
 8556  047432  122723  000015                  CMPB    #15,(R3)+       ;;CHECK FOR RETURN
 8557  047436  001305                          BNE     2$              ;;LOOP IF NOT RETURN
 8558  047440  105063  177777                  CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
 8559  047444  104401  001206                  TYPE    ,$LF            ;;TYPE A LINE FEED
 8560  047450  005726                          TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
 8561  047452  012603                          MOV     (SP)+,R3        ;;RESTORE R3
 8562  047454  011646                          MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
 8563  047456  016666  000004  000002          MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
 8564  047464  012766  047476  000004          MOV     #$TTYIN,4(SP)
 8565  047472  000002                          RTI                     ;;RETURN
 8566  047474     000          9$:     .BYTE   0                       ;;STORAGE FOR ASCII CHAR. TO TYPE
 8567  047475     000                  .BYTE   0                       ;;TERMINATOR
 8568  047476  000022          $TTYIN: .BLKB   22                      ;;RESERVE 22 BYTES FOR TTY INPUT
 8569  047520  041536  005015     000  $CNTLC: .ASCIZ  /↑C/<15><12>    ;;CONTROL "C"
 8570  047525     136  006525  000012  $CNTLU: .ASCIZ  /↑U/<15><12>    ;;CONTROL "U"
 8571  047532  043536  005015     000  $CNTLG: .ASCIZ  /↑G/<15><12>    ;;CONTROL "G"
 8572  047537     015  051412  051127  $MSWR:  .ASCIZ  <15><12>/SWR = /
 8573  047544  036440  000040
 8574  047550  020040  042516  020127  $MNEW:  .ASCIZ  /  NEW = /
 8575  047556  020075     000
 8576          047562                  .EVEN
 8577                                  .SBTTL  READ AN OCTAL NUMBER FROM THE TTY
 8578
 8579                                  ;;*****************************************************************
 8580                                  ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
 8581                                  ;*CHANGE IT TO BINARY.
 8582                                  ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
 8583                                  ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
 8584                                  ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
 8585                                  ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
 8586                                  ;*CALL:
 8587                                  ;*      RDOCT                   ;;READ AN OCTAL NUMBER
 8588                                  ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
 8589                                  ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT
 8590
 8591  047562  011646          $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
 8592  047564  016666  000004  000002          MOV     4(SP),2(SP)     ;;INPUT NUMBER
 8593  047572  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 8594  047574  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
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 8595  047576  010246                 MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 8596  047600  104411           1$:   RDLIN                   ;;READ AN ASCIZ LINE
 8597  047602  012600                 MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
 8598  047604  010037  047710         MOV     R0,5$           ;;AND SAVE IT
 8599  047610  005001                 CLR     R1              ;;CLEAR DATA WORD
 8600  047612  005002                 CLR     R2
 8601  047614  112046           2$:   MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
 8602  047616  001420                 BEQ     3$              ;;IF ZERO GET OUT
 8603  047620  122716  000060         CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
 8604  047624  003026                 BGT     4$              ;;IS AN OCTAL DIGIT
 8605  047626  122716  000067         CMPB    #'7,(SP)
 8606  047632  002423                 BLT     4$
 8607  047634  006301                 ASL     R1              ;;*2
 8608  047636  006102                 ROL     R2
 8609  047640  006301                 ASL     R1              ;;*4
 8610  047642  006102                 ROL     R2
 8611  047644  006301                 ASL     R1              ;;*8
 8612  047646  006102                 ROL     R2
 8613  047650  042716  177770         BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
 8614  047654  062601                 ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
 8615  047656  000756                 BR      2$              ;;LOOP
 8616  047660  005726           3$:   TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
 8617  047662  010166  000012         MOV     R1,12(SP)       ;;SAVE THE RESULT
 8618  047666  010237  047720         MOV     R2,$HIOCT
 8619  047672  012602                 MOV     (SP)+,R2        ;;POP STACK INTO R2
 8620  047674  012601                 MOV     (SP)+,R1        ;;POP STACK INTO R1
 8621  047676  012600                 MOV     (SP)+,R0        ;;POP STACK INTO R0
 8622  047700  000002                 RTI                     ;;RETURN
 8623  047702  005726           4$:   TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
 8624  047704  105010                 CLRB    (R0)            ;;SET A TERMINATOR
 8625  047706  104401                 TYPE                    ;;TYPE UP THRU THE BAD CHAR.
 8626  047710  000000           5$:   .WORD   0
 8627  047712  104401  001204         TYPE    ,$QUES          ;;"?" "CR" & "LF"
 8628  047716  000730                 BR      1$              ;;TRY AGAIN
 8629  047720  000000           $HIOCT: .WORD 0               ;;HIGH ORDER BITS GO HERE
 8630                          .SBTTL  DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT ROUTINE
 8631
 8632                          ;;**************************************************************
 8633                          ;*THIS ROUTINE WILL CONVERT A 32-BIT UNSIGNED BINARY NUMBER TO AN
 8634                          ;*UNSIGNED OCTAL ASCIZ NUMBER.
 8635                          ;*CALL
 8636                          ;*      MOV     #PNTR,-(SP)     ;;POINTER TO LOW WORD OF BINARY NUMBER
 8637                          ;*      JSR     PC,@#$DB20      ;;CALL THE ROUTINE
 8638                          ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK
 8639
 8640
 8641  047722  104413           $DB20:  SAVREG                ;;SAVE ALL REGISTERS
 8642  047724  016601  000002         MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
 8643  047730  012705  050041         MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
 8644  047734  012704  000014         MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
 8645  047740  012703  177770         MOV     #^C7,R3         ;;MASK
 8646  047744  012100                 MOV     (R1)+,R0        ;;LOWER WORD
 8647  047746  012101                 MOV     (R1)+,R1        ;;HIGH WORD
 8648  047750  005002                 CLR     R2              ;;TERMINATOR
 8649  047752  110245           1$:   MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
 8650  047754  010002                 MOV     R0,R2           ;;GET THIS DIGIT
```

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 8651  047756  005304                          DEC     R4              ;;COUNT THIS CHARACTER
 8652  047760  003007                          BGT     3$              ;;BR IF NOT THE LAST DIGIT
 8653  047762  001405                          BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
 8654  047764  005205                          INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
 8655  047766  010566  000002                  MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
 8656  047772  104414                          RESREG                  ;;RESTORE ALL REGISTERS
 8657  047774  000207                          RTS     PC              ;;RETURN TO USER
 8658  047776  006203                  2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
 8659  050000  006001                  3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
 8660  050002  006000                          ROR     R0              ;;      THE NEXT OCTAL DIGIT
 8661  050004  006001                          ROR     R1
 8662  050006  006000                          ROR     R0
 8663  050010  006001                          ROR     R1
 8664  050012  006000                          ROR     R0
 8665  050014  040302                          BIC     R3,R2           ;;MASK OUT ALL JUNK
 8666  050016  062702  000060                  ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
 8667  050022  000753                          BR      1$              ;;GO PUT IT IN THE DATA TABLE
 8668  050024  000016                  $OCTVL: .BLKB   14.             ;;RESERVE DATA TABLE
 8669                                  .SBTTL  DOUBLE LENGTH BINARY TO DECIMAL ASCII CONVERT ROUTINE
 8670
 8671                                  ;;*****************************************************************
 8672                                  ;*THIS ROUTINE WILL CONVERT A 32-BIT BINARY NUMBER TO AN UNSIGNED
 8673                                  ;*DECIMAL (ASCII) NUMBER. THE SIGN OF THE BINARY NUMBER MUST BE
 8674                                  ;*POSITIVE.
 8675                                  ;*CALL
 8676                                  ;*      MOV     #PNTR,-(SP)     ;;POINTER TO LOW WORD OF BINARY NUMBER
 8677                                  ;*      JSR     PC,@#$DB2D
 8678                                  ;*      RETURN                  ;;THE FIRST ADDRESS OF ASCIZ
 8679                                                                  ;;IS ON THE STACK
 8680
 8681
 8682  050042  104413                  $DB2D:  SAVREG
 8683  050044  016602  000002                  MOV     2(SP),R2        ;;PICKUP THE DATA POINTER
 8684  050050  012700  050222                  MOV     #$DECVL,R0      ;;GET ADDRESS OF "$DECVL" STRING
 8685  050054  010066  000002                  MOV     R0,2(SP)        ;;PUT ADDRESS OF ASCIZ STRING ON STACK
 8686  050060  012201                          MOV     (R2)+,R1        ;;PICKUP THE BINARY NUMBER
 8687  050062  012202                          MOV     (R2)+,R2
 8688  050064  012737  000012  050140          MOV     #10.,4$         ;;SET UP TO DO 10 CONVERSIONS
 8689  050072  012704  050152                  MOV     #$TNPWR,R4      ;;ADDRESS OF TEN POWER
 8690  050076  012705  050154                  MOV     #$TNPWR+2,R5
 8691  050102  005003                  1$:     CLR     R3              ;;CLEAR PARTIAL
 8692  050104  161401                  2$:     SUB     (R4),R1         ;;SUBTRACT TEN POWER
 8693  050106  005602                          SBC     R2
 8694  050110  161502                          SUB     (R5),R2
 8695  050112  002402                          BLT     3$              ;;BR IF TEN POWER TO LARGE
 8696  050114  005203                          INC     R3              ;;ADD 1 TO PARTIAL
 8697  050116  000772                          BR      2$              ;;LOOP
 8698  050120  062401                  3$:     ADD     (R4)+,R1        ;;RESTORE SUBTRACTED VALUE
 8699  050122  005502                          ADC     R2
 8700  050124  062402                          ADD     (R4)+,R2
 8701  050126  022525                          CMP     (R5)+,(R5)+     ;;MOVE TO NEXT TEN POWER
 8702  050130  052703  000060                  BIS     #'0,R3          ;;CHANGE PARTIAL TO ASCII
 8703  050134  110320                          MOVB    R3,(R0)+        ;;SAVE IT
 8704  050136  005327                          DEC     (PC)+           ;;DONE?
 8705  050140  000000                  4$:     .WORD   0
 8706  050142  001357                          BNE     1$              ;;BR IF NO
```

```
8707   050144  105020                          CLRB    (R0)+           ;;TERMINATOR
8708   050146  104414                          RESREG                  ;;RESTORE REGISTERS
8709   050150  000207                          RTS     PC              ;;RETURN
8710   050152  145000                  $TNPWR: 145000                  ;;1.0E09
8711   050154  035632                          35632
8712   050156  160400                          160400                  ;;1.0E08
8713   050160  002765                          2765
8714   050162  113200                          113200                  ;;1.0E07
8715   050164  000230                          230
8716   050166  041100                          041100                  ;;1.0E06
8717   050170  000017                          17
8718   050172  103240                          103240                  ;;1.0E05
8719   050174  000001                          1
8720   050176  023420                          23420                   ;;1.0E04
8721   050200  000000                          0
8722   050202  001750                          1750                    ;;1.0E03
8723   050204  000000                          0
8724   050206  000144                          144                     ;;1.0E02
8725   050210  000000                          0
8726   050212  000012                          12                      ;;1.0E01
8727   050214  000000                          0
8728   050216  000001                          1                       ;;1.0E00
8729   050220  000000                          0
8730   050222  000014                  $DECVL: .BLKB   12.              ;;RESERVE STORAGE FOR ASCIZ STRING
8731                                   .SBTTL  SINGLE LENGTH BINARY TO DECIMAL ASCIZ ROUTINE
8732
8733                                   ;;**********************************************************************
8734                                   ;*THIS ROUTINE WILL CONVERT A 16-BIT UNSIGNED BINARY NUMBER TO AN
8735                                   ;*UNSIGNED DECIMAL ASCIZ NUMBER.
8736                                   ;*CALL
8737                                   ;*      MOV     NUMBER,-(SP)    ;;PUT BINARY NUMBER ON THE STACK
8738                                   ;*      JSR     PC,@#$$B2D      ;;CALL
8739                                   ;*      RETURN                  ;;ADDRESS OF THE 1ST ASCIZ CHAR.IS ON THE STACK
8740
8741
8742   050236  016637  000002  050266  $$B2D:  MOV     2(SP),1$        ;;SAVE BINARY NUMBER
8743   050244  012746  050266          MOV     #1$,-(SP)       ;;SET POINTER
8744   050250  004737  050042          JSR     PC,@#$DB2D      ;;CALL DOUBLE LENGTH CONVERT
8745   050254  062716  000005          ADD     #5,(SP)         ;;ONLY ALLOW FIVE CHARACTERS
8746   050260  012666  000002          MOV     (SP)+,2(SP)     ;;PICKUP POINTER
8747   050264  000207                  RTS     PC              ;;RETURN
8748   050266  000000  000000          1$:     .WORD   0,0
8749                                   .SBTTL  TYPE NUMERICAL ASCIZ STRING SUPPRESS LEADING ZEROS
8750
8751                                   ;;**********************************************************************
8752                                   ;*THIS ROUTINE IS USED TO TYPE AN ASCIZ NUMBER SUPPRESSING THE
8753                                   ;*LEADING NUMBERS.
8754                                   ;*CALL
8755                                   ;*      MOV     #NUMADR,-(SP)   ;;FIRST ADDRESS OF ASCIZ STRING
8756                                   ;*      JSR     PC,@#$$UPRS
8757
8758
8759   050272  010046                  $$UPRS: MOV     R0,-(SP)        ;;SAVE R0
8760   050274  016600  000004                  MOV     4(SP),R0        ;;PICKUP THE POINTER
8761   050300  105710                  1$:     TSTB    (R0)            ;;TERMINATEOR?
8762   050302  001403                          BEQ     2$              ;;BR IF YES
```

```
8763  050304  122720  000060          CMPB    #'0,(R0)+       ;;IS THIS AN ASCII "0" ?
8764  050310  001773                  BEQ     1$              ;;BR IF YES
8765  050312  005300                  DEC     R0              ;;BACKUP BY "1"
8766  050314  010037  050322          MOV     R0,3$           ;;SAVE FOR TYPING
8767  050320  104401                  TYPE                    ;;GO TYPE
8768  050322  000000          3$:     .WORD   0               ;;ASCIZ POINTER GOES HERE
8769  050324  012600                  MOV     (SP)+,R0        ;;RESTORE R0
8770  050326  012616                  MOV     (SP)+,(SP)      ;;RESTORE THE STACK
8771  050330  000207                  RTS     PC              ;;RETURN
8772                          .SBTTL  INTEGER MULTIPLY ROUTINE
8773
8774                          ;;**************************************************************************
8775                          ;*CALL
8776                          ;*      MOV     MULTIPLER,-(SP)
8777                          ;*      MOV     MULTIPLICAND,-(SP)
8778                          ;*      JSR     PC,@#$MULT
8779                          ;*      RETURN  ;;PRODUCT IS ON THE STACK
8780                          ;*
8781                          ;*      STACK   PRODUCT
8782                          ;*      -----   -------
8783                          ;*      TOP     LSB'S
8784                          ;*      +2      MSB'S
8785
8786  050332                  $MULT:
8787  050332  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
8788  050334  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
8789  050336  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
8790  050340  005046                  CLR     -(SP)           ;;CLEAR THE SIGN KEY
8791  050342  016601  000012          MOV     12(SP),R1       ;;GET THE MULTIPLICAND
8792  050346  100002                  BPL     1$              ;;BR IF PLUS
8793  050350  005216                  INC     (SP)            ;;SET THE SIGN KEY
8794  050352  005401                  NEG     R1              ;;MAKE THE MULTIPLICAND POSTIVE
8795  050354  016602  000014  1$:     MOV     14(SP),R2       ;;GET THE MULTIPLIER
8796  050360  100002                  BPL     2$              ;;BR IF PLUS
8797  050362  005316                  DEC     (SP)            ;;UPDATE THE SIGN KEY
8798  050364  005402                  NEG     R2              ;;MAKE THE MULTIPLIER POSTIVE
8799  050366  012746  000021  2$:     MOV     #17.,-(SP)      ;;SET THE LOOP COUNT
8800  050372  005000                  CLR     R0              ;;SETUP FOR THE MULTIPLY LOOP
8801  050374  103002                  BCC     4$              ;;DON'T ADD IF MULTIPLICAND = 0
8802  050376  060200          3$:     ADD     R2,R0
8803  050400  006000          4$:     ROR     R0              ;;POSITION THE PARITIAL PRODUCT AND
8804  050402  006001                  ROR     R1              ;;THE MULTIPLICAND
8805  050404  005316                  DEC     (SP)            ;;HAS ALL BITS OF THE MULTIPLICAND BEEN DONE?
8806  050406  001372                  BNE     3$              ;;BR IF NO
8807  050410  022616                  CMP     (SP)+,(SP)      ;;SHOULD PRODUCT BE NEGATIVE?
8808  050412  001403                  BEQ     5$              ;;GO TO EXIT IF NO
8809  050414  005400                  NEG     R0              ;;YES--SO MAKE IT SO
8810  050416  005401                  NEG     R1
8811  050420  005600                  SBC     R0
8812  050422  005726          5$:     TST     (SP)+           ;;CLEAR SIGN INFO. OFF OF STACK
8813  050424  010066  000012          MOV     R0,12(SP)       ;;PUT THE PRODUCT ON THE STACK (MSB'S)
8814  050430  010166  000010          MOV     R1,10(SP)       ;;LSB'S
8815  050434  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
8816  050436  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
8817  050440  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
8818  050442  000207                  RTS     PC
```

```
                                .SBTTL  SAVE AND RESTORE R0-R5 ROUTINES

                                ;;*******************************************************************
                                ;*SAVE R0-R5
                                ;*CALL:
                                ;*      SAVREG
                                ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
                                ;*
                                ;*TOP---(+16)
                                ;* +2---(+18)
                                ;* +4---R5
                                ;* +6---R4
                                ;* +8---R3
                                ;*+10---R2
                                ;*+12---R1
                                ;*+14---R0

050444                          $SAVREG:
050444  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
050446  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
050450  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
050452  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
050454  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
050456  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
050460  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
050464  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
050470  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
050474  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
050500  000002                          RTI

                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      RESREG
050502                          $RESREG:
050502  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
050506  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
050512  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
050516  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
050522  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
050524  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
050526  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
050530  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
050532  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
050534  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
050536  000002                          RTI
                                .SBTTL  TRAP DECODER

                                ;;*******************************************************************
                                ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
                                ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                ;*GO TO THAT ROUTINE.

050540  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
050542  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
050546  005740                          TST     -(R0)           ;;BACKUP BY 2
```

```
8875  050550  111000                  MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
8876  050552  006300                  ASL     R0              ;;POSITION FOR INDEXING
8877  050554  016000  050574          MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
8878  050560  000200                  RTS     R0              ;;GO TO ROUTINE
8879
8880
8881                                  ;;THIS IS USE TO HANDLE THE "GETPRI" MACRO
8882
8883  050562  011646          $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
8884  050564  016666  000004  000002  MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
8885  050572  000002                  RTI                     ;;RESTORE THE PSW
8886
8887                                  .SBTTL  TRAP TABLE
8888
8889                                  ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
8890                                  ;*BY THE "TRAP" INSTRUCTION.
8891
8892                                  ;       ROUTINE
8893                                  ;       -------
8894  050574  050562          $TRPAD: .WORD   $TRAP2
8895  050576  045110                  $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
8896  050600  046110                  $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
8897  050602  046064                  $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
8898  050604  046124                  $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
8899  050606  045372                  $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
8900
8901  050610  046700                  $GTSWR  ;;CALL=GTSWR    TRAP+6(104406)  GET SOFT-SWR SETTING
8902
8903  050612  046610                  $CKSWR  ;;CALL=CKSWR    TRAP+7(104407)  TEST FOR CHANGE IN SOFT-SWR
8904  050614  047152                  $RDCHR  ;;CALL=RDCHR    TRAP+10(104410) TTY TYPEIN CHARACTER ROUTINE
8905  050616  047242                  $RDLIN  ;;CALL=RDLIN    TRAP+11(104411) TTY TYPEIN STRING ROUTINE
8906  050620  047562                  $RDOCT  ;;CALL=RDOCT    TRAP+12(104412) READ AN OCTAL NUMBER FROM TTY
8907  050622  050444                  $SAVREG ;;CALL=SAVREG   TRAP+13(104413) SAVE R0-R5 ROUTINE
8908  050624  050502                  $RESREG ;;CALL=RESREG   TRAP+14(104414) RESTORE R0-R5 ROUTINE
8909  050626  043426                  SCOP1$  ;;CALL=SCOP1    TRAP+15(104415) INTERNAL LOOP ON ERROR
8910
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8911
8912                                    .SBTTL  SERVICE MESSAGES
8913
8914
8915  050630  005015  047125  041111  MSG1:   .ASCII  <CR><LF>/UNIBUS RK06 DRIVE DIAGNOSTIC/
8916  050636  051525  051040  030113
8917  050644  020066  051104  053111
8918  050652  020105  044504  043501
8919  050660  047516  052123  041511
8920  050666  005015  050011  051101          .ASCII  <CR><LF>/       PART 2/
8921  050674  020124     062
8922  050677     015  046412  044501          .ASCII  <CR><LF>/MAINDEC-11-DZR6I-C-PB/<CR><LF>
8923  050704  042116  041505  030455
8924  050712  026461  055104  033122
8925  050720  026511  026503  041120
8926  050726  005015
8927  050730  005015  025011  025052          .ASCII  <CR><LF>/       ***** CAUTION *****/<CR><LF>
8928  050736  025052  041440  052501
8929  050744  044524  047117  025040
8930  050752  025052  025052  005015
8931  050760  005015  044124  051511          .ASCII  <CR><LF>/THIS PROGRAM SHOULD  BE HALTED ONLY BY TYPING CONTROL-C/
8932  050766  050040  047522  051107
8933  050774  046501  051440  047510
8934  051002  046125  020104  041040
8935  051010  020105  040510  052114
8936  051016  042105  047440  046116
8937  051024  020131  054502  052040
8938  051032  050131  047111  020107
8939  051040  047503  052116  047522
8940  051046  026514     103
8941  051051     015  047412  044124          .ASCII  <CR><LF>/OTHERWISE, CARTRIDGE FORMATTING AND, OR THE DRIVE/
8942  051056  051105  044527  042523
8943  051064  020054  040503  052122
8944  051072  044522  043504  020105
8945  051100  047506  046522  052101
8946  051106  044524  043516  040440
8947  051114  042116  020054  051117
8948  051122  052040  042510  042040
8949  051130  044522  042526
8950  051134  005015  040515  020131          .ASCII  <CR><LF>/MAY BE LEFT IN AN UNDETERMINED STATE/
8951  051142  042502  046040  043105
8952  051150  020124  047111  040440
8953  051156  020116  047125  042504
8954  051164  042524  046522  047111
8955  051172  042105  051440  040524
8956  051200  042524
8957  051202  005015  047111  052111          .ASCII  <CR><LF>/INITIALLY, DRIVES TO BE TESTED SHOULD HAVE:/<CR><LF>
8958  051210  040511  046114  026131
8959  051216  042040  044522  042526
8960  051224  020123  047524  041040
8961  051232  020105  042524  052123
8962  051240  042105  051440  047510
8963  051246  046125  020104  040510
8964  051254  042526  006472     012
8965  051261     015  040412  020056          .ASCII  <CR><LF>/A. HEADS MANUALLY LOADED/
8966  051266  042510  042101  020123
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8967  051274  040515  052516  046101
8968  051302  054514  046040  040517
8969  051310  042504     104
8970  051313     015  041012  020056          .ASCII  <CR><LF>/B. CORRECT PORT SELECTED/
8971  051320  047503  051122  041505
8972  051326  020124  047520  052122
8973  051334  051440  046105  041505
8974  051342  042524     104
8975  051345     015  041412  020056          .ASCII  <CR><LF>/C. WRITE LOCK DISABLED/
8976  051352  051127  052111  020105
8977  051360  047514  045503  042040
8978  051366  051511  041101  042514
8979  051374     104
8980  051375     015  042012  020056          .ASCII  <CR><LF>/D. DRIVE READY INDICATOR ON/<CR><LF>
8981  051402  051104  053111  020105
8982  051410  042522  042101  020131
8983  051416  047111  044504  040503
8984  051424  047524  020122  047117
8985  051432  005015
8986  051434  005015  051104  053111          .ASCII  <CR><LF>/DRIVES NOT TO BE TESTED MUST HAVE/
8987  051442  051505  047040  052117
8988  051450  052040  020117  042502
8989  051456  052040  051505  042524
8990  051464  020104  052515  052123
8991  051472  044040  053101     105
8992  051477     015  041012  052117          .ASCIZ  <CR><LF>/BOTH PORTS DESELECTED/<CR><LF>
8993  051504  020110  047520  052122
8994  051512  020123  042504  042523
8995  051520  042514  052103  042105
8996  051526  005015     000
8997
8998
8999  051531     015  041012  020105  MSG2:   .ASCIZ  <CR><LF>/BE SURE TO PUT SCRATCH PACK IN DRIVE 0/
9000  051536  052523  042522  052040
9001  051544  020117  052520  020124
9002  051552  041523  040522  041524
9003  051560  020110  040520  045503
9004  051566  044440  020116  051104
9005  051574  053111  020105  000060
9006  051602  005015  051104  053111  MSG3:   .ASCIZ  <CR><LF>/DRIVE(S) TO BE TESTED: /
9007  051610  024105  024523  052040
9008  051616  020117  042502  052040
9009  051624  051505  042524  035104
9010  051632  000040
9011  051634  005015  054524  042520  MSG4:   .ASCIZ  <CR><LF>/TYPE BUSS ADDRESS IF NOT 177440:  /
9012  051642  041040  051525  020123
9013  051650  042101  051104  051505
9014  051656  020123  043111  047040
9015  051664  052117  030440  033467
9016  051672  032064  035060  020040
9017  051700     000
9018  051701     015  052012  050131  MSG5:   .ASCIZ  <CR><LF>/TYPE CONTROLLER INTERRUPT VECTOR IF NOT 210:  /
9019  051706  020105  047503  052116
9020  051714  047522  046114  051105
9021  051722  044440  052116  051105
9022  051730  052522  052120  053040
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9023  051736  041505  047524  020122
9024  051744  043111  047040  052117
9025  051752  031040  030061  020072
9026  051760  000040
9027  051762  005015  047111  042524  MSG6:   .ASCIZ  <CR><LF>/INTERRUPT OCCURRED AT PC=/
9028  051770  051122  050125  020124
9029  051776  041517  052503  051122
9030  052004  042105  040440  020124
9031  052012  041520  000075
9032  052016  005015  051104  053111  MSG7:   .ASCIZ  <CR><LF>/DRIVE 0 WILL NOT BE TESTED/
9033  052024  020105  020060  044527
9034  052032  046114  047040  052117
9035  052040  041040  020105  042524
9036  052046  052123  042105     000
9037  052053     015  051012  040505  MSG8:   .ASCIZ  <CR><LF>/READ DATA WITH OFFSET TEST/<CR><LF>
9038  052060  020104  040504  040524
9039  052066  053440  052111  020110
9040  052074  043117  051506  052105
9041  052102  052040  051505  006524
9042  052110  000012
9043  052112  005015  042516  042101  MSG9:   .ASCIZ  <CR><LF>/HEAD NO./
9044  052120  047040  027117     000
9045  052125     015  005012  044527  MSG10:  .ASCIZ  <CR><LF><LF>/WILL TEST DRIVES:/
9046  052132  046114  052040  051505
9047  052140  020124  051104  053111
9048  052146  051505  000072
9049  052152  005015  050012  053517  MSG11:  .ASCIZ  <CR><LF><LF>/POWER UP RESTART TO TEST 1/<CR><LF>
9050  052160  051105  052440  020120
9051  052166  042522  052123  051101
9052  052174  020124  047524  052040
9053  052202  051505  020124  006461
9054  052210  000012
9055  052212  005015  047516  046040  MSG13:  .ASCII  <CR><LF>/NO L OR P CLOCKS PRESENT/
9056  052220  047440  020122  020120
9057  052226  046103  041517  051513
9058  052234  050040  042522  042523
9059  052242  052116
9060  052244  005015  046101  020114          .ASCIZ  <CR><LF>/ALL TIMING TESTS BYPASSED/
9061  052252  044524  044515  043516
9062  052260  052040  051505  051524
9063  052266  041040  050131  051501
9064  052274  042523  000104
9065  052300  005015  054502  040520  MSG14:  .ASCIZ  <CR><LF>/BYPASSING DRIVE /
9066  052306  051523  047111  020107
9067  052314  051104  053111  020105
9068  052322     000
9069  052323     015  005012  051104  MSG15:  .ASCIZ  <CR><LF><LF>/DRIVE /
9070  052330  053111  020105     000
9071  052335     015  042012  044522  MSG16:  .ASCIZ  <CR><LF>/DRIVE SERIAL NO. /
9072  052342  042526  051440  051105
9073  052350  040511  020114  047516
9074  052356  020056     000
9075  052361     015  041412  051101  MSG17:  .ASCIZ  <CR><LF>/CARTRIDGE SERIAL NO. /
9076  052366  051124  042111  042507
9077  052374  051440  051105  040511
9078  052402  020114  047516  020056
```

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 9079  052410     000
 9080  052411     015  052012  046511  MSG18:  .ASCIZ  <CR><LF>/TIME BETWEEN OUTER LIMIT & HEADS HOME DURING UNLOADING: /
 9081  052416  020105  042502  053524
 9082  052424  042505  020116  052517
 9083  052432  042524  020122  044514
 9084  052440  044515  020124  020046
 9085  052446  042510  042101  020123
 9086  052454  047510  042515  042040
 9087  052462  051125  047111  020107
 9088  052470  047125  047514  042101
 9089  052476  047111  035107  000040
 9090  052504  005015  054502  040520  MSG19:  .ASCIZ  <CR><LF>/BYPASSING ALL WRITE TESTS/<CR><LF>
 9091  052512  051523  047111  020107
 9092  052520  046101  020114  051127
 9093  052526  052111  020105  042524
 9094  052534  052123  006523  000012
 9095  052542  005015  044524  042515  MSG20:  .ASCIZ  <CR><LF>/TIME BETWEEN HEADS HOME & SERVO SIG PRES DURING LOADING: /
 9096  052550  041040  052105  042527
 9097  052556  047105  044040  040505
 9098  052564  051504  044040  046517
 9099  052572  020105  020046  042523
 9100  052600  053122  020117  044523
 9101  052606  020107  051120  051505
 9102  052614  042040  051125  047111
 9103  052622  020107  047514  042101
 9104  052630  047111  035107  000040
 9105  052636  005015  044524  042515  MSG21:  .ASCIZ  <CR><LF>/TIME BETWEEN OUTER LIMIT & INNER LIMIT DURING LOADING: /
 9106  052644  041040  052105  042527
 9107  052652  047105  047440  052125
 9108  052660  051105  046040  046511
 9109  052666  052111  023040  044440
 9110  052674  047116  051105  046040
 9111  052702  046511  052111  042040
 9112  052710  051125  047111  020107
 9113  052716  047514  042101  047111
 9114  052724  035107  000040
 9115  052730  005015  044524  042515  MSG22:  .ASCIZ  <CR><LF>/TIME BETWEEN INNER LIMIT & OUTER LIMIT DURING LOADING: /
 9116  052736  041040  052105  042527
 9117  052744  047105  044440  047116
 9118  052752  051105  046040  046511
 9119  052760  052111  023040  047440
 9120  052766  052125  051105  046040
 9121  052774  046511  052111  042040
 9122  053002  051125  047111  020107
 9123  053010  047514  042101  047111
 9124  053016  035107  000040
 9125  053022  005015  047516  041440  MSG23:  .ASCIZ  <CR><LF>/NO CLOCK INTERRUPTS PRESENT, ABORTING TIMING TESTS/
 9126  053030  047514  045503  044440
 9127  053036  052116  051105  052522
 9128  053044  052120  020123  051120
 9129  053052  051505  047105  026124
 9130  053060  040440  047502  052122
 9131  053066  047111  020107  044524
 9132  053074  044515  043516  052040
 9133  053102  051505  051524     000
 9134  053107     015  040412  042526  MSG24:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 1 REVOLUTION: /
```

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 9135  053114  040522  042507  052040
 9136  053122  046511  020105  047506
 9137  053130  020122  020061  042522
 9138  053136  047526  052514  044524
 9139  053144  047117  020072     000
 9140  053151     040  051525     000  MSG25:  .ASCIZ  / US/
 9141  053155     015  005012  041101  MSG26:  .ASCIZ  <CR><LF><LF>/ABORTING DATA TESTS & GOING TO TIMING TESTS/<CR><LF><LF>
 9142  053162  051117  044524  043516
 9143  053170  042040  052101  020101
 9144  053176  042524  052123  020123
 9145  053204  020046  047507  047111
 9146  053212  020107  047524  052040
 9147  053220  046511  047111  020107
 9148  053226  042524  052123  006523
 9149  053234  005012     000
 9150  053237     015  005012  046101  MSG27:  .ASCIZ  <CR><LF><LF>/ALL DRIVES TESTED/<CR><LF><LF>
 9151  053244  020114  051104  053111
 9152  053252  051505  052040  051505
 9153  053260  042524  006504  005012
 9154  053266     000
 9155  053267     015  040412  042526  MSG28:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 410 CYLINDER FOWARD SEEK:  /
 9156  053274  040522  042507  052040
 9157  053302  046511  020105  047506
 9158  053310  020122  030464  020060
 9159  053316  054503  044514  042116
 9160  053324  051105  043040  053517
 9161  053332  051101  020104  042523
 9162  053340  045505  020072  000040
 9163  053346  005015  053101  051105  MSG29:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 410 CYLINDER REVERSE SEEK:  /
 9164  053354  043501  020105  044524
 9165  053362  042515  043040  051117
 9166  053370  032040  030061  041440
 9167  053376  046131  047111  042504
 9168  053404  020122  042522  042526
 9169  053412  051522  020105  042523
 9170  053420  045505  020072  000040
 9171  053426  005015  053101  051105  MSG30:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 1 CYLINDER (0 TO 1) FOWARD SEEK:  /
 9172  053434  043501  020105  044524
 9173  053442  042515  043040  051117
 9174  053450  030440  041440  046131
 9175  053456  047111  042504  020122
 9176  053464  030050  052040  020117
 9177  053472  024461  043040  053517
 9178  053500  051101  020104  042523
 9179  053506  045505  020072  000040
 9180  053514  005015  053101  051105  MSG31:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 1 CYLINDER (0 TO 1) REVERSE SEEK:  /
 9181  053522  043501  020105  044524
 9182  053530  042515  043040  051117
 9183  053536  030440  041440  046131
 9184  053544  047111  042504  020122
 9185  053552  030050  052040  020117
 9186  053560  024461  051040  053105
 9187  053566  051105  042523  051440
 9188  053574  042505  035113  020040
 9189  053602     000
 9190  053603     015  040412  042526  MSG32:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 137 CYLINDER FOWARD SEEK:  /
```

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9191  053610  040522  042507  052040
9192  053616  046511  020105  047506
9193  053624  020122  031461  020067
9194  053632  054503  044514  042116
9195  053640  051105  043040  053517
9196  053646  051101  020104  042523
9197  053654  045505  020072  000040
9198  053662  005015  053101  051105  MSG33:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 137 CYLINDER REVERSE SEEK:  /
9199  053670  043501  020105  044524
9200  053676  042515  043040  051117
9201  053704  030440  033463  041440
9202  053712  046131  047111  042504
9203  053720  020122  042522  042526
9204  053726  051522  020105  042523
9205  053734  045505  020072  000040
9206  053742  005015  053101  051105  MSG34:  .ASCIZ  <CR><LF>/AVERAGE FOWARD SPEED BETWEEN CYLINDERS 128 & 256:  /
9207  053750  043501  020105  047506
9208  053756  040527  042122  051440
9209  053764  042520  042105  041040
9210  053772  052105  042527  047105
9211  054000  041440  046131  047111
9212  054006  042504  051522  030440
9213  054014  034062  023040  031040
9214  054022  033065  020072  000040
9215  054030  005015  053101  051105  MSG35:  .ASCIZ  <CR><LF>/AVERAGE REVERSE SPEED BETWEEN CYLINDERS 128 & 256:  /
9216  054036  043501  020105  042522
9217  054044  042526  051522  020105
9218  054052  050123  042505  020104
9219  054060  042502  053524  042505
9220  054066  020116  054503  044514
9221  054074  042116  051105  020123
9222  054102  031061  020070  020046
9223  054110  032462  035066  020040
9224  054116     000
9225  054117     040  044440  041516  MSG36:  .ASCIZ  /  INCHES PER SECOND/
9226  054124  042510  020123  042520
9227  054132  020122  042523  047503
9228  054140  042116     000
9229  054143     015  047012  020117  MSG37:  .ASCIZ  <CR><LF>/NO WRITE CHECK ERROR AT MAX POSITIVE OFFSET/
9230  054150  051127  052111  020105
9231  054156  044103  041505  020113
9232  054164  051105  047522  020122
9233  054172  052101  046440  054101
9234  054200  050040  051517  052111
9235  054206  053111  020105  043117
9236  054214  051506  052105     000
9237  054221     015  047012  020117  MSG38:  .ASCIZ  <CR><LF>/NO WRITE CHECK ERROR AT MAX NEGATIVE OFFSET/<CR><LF>
9238  054226  051127  052111  020105
9239  054234  044103  041505  020113
9240  054242  051105  047522  020122
9241  054250  052101  046440  054101
9242  054256  047040  043505  052101
9243  054264  053111  020105  043117
9244  054272  051506  052105  005015
9245  054300     000
9246  054301     015  053412  044522  MSG39:  .ASCIZ  <CR><LF>/WRITE CHECK FAILURE AT OFFSET =/
```

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 9247  054306  042524  041440  042510
 9248  054314  045503  043040  044501
 9249  054322  052514  042522  040440
 9250  054330  020124  043117  051506
 9251  054336  052105  036440     000
 9252  054343     015  041412  052517  MSG40:  .ASCII  <CR><LF>/COULD NOT READ BAD SECTOR INFO ON CYL 410/
 9253  054350  042114  047040  052117
 9254  054356  051040  040505  020104
 9255  054364  040502  020104  042523
 9256  054372  052103  051117  044440
 9257  054400  043116  020117  047117
 9258  054406  041440  046131  032040
 9259  054414  030061
 9260  054416  005015  051117  040440          .ASCIZ  <CR><LF>/OR ALIGNMENT CARTRIDGE USED/<CR><LF>
 9261  054424  044514  047107  042515
 9262  054432  052116  041440  051101
 9263  054440  051124  042111  042507
 9264  054446  052440  042523  006504
 9265  054454  000012
 9266  054456  005015  054502  040520  MSG41:  .ASCIZ  <CR><LF>/BYPASSING ALL TIMING TESTS/<CR><LF>
 9267  054464  051523  047111  020107
 9268  054472  046101  020114  044524
 9269  054500  044515  043516  052040
 9270  054506  051505  051524  005015
 9271  054514     000
 9272  054515     015  040412  046114  MSG42:  .ASCIZ  <CR><LF>/ALL TIMING TESTS TEMPORARILY BYPASSED/<CR><LF>
 9273  054522  052040  046511  047111
 9274  054530  020107  042524  052123
 9275  054536  020123  042524  050115
 9276  054544  051117  051101  046111
 9277  054552  020131  054502  040520
 9278  054560  051523  042105  005015
 9279  054566     000
 9280  054567     015  051412  047510  MSG43:  .ASCIZ  <CR><LF>/SHOULD BE BETWEEN 0.140 & 0.429 SEC/
 9281  054574  046125  020104  042502
 9282  054602  041040  052105  042527
 9283  054610  047105  030040  030456
 9284  054616  030064  023040  030040
 9285  054624  032056  034462  051440
 9286  054632  041505     000
 9287  054635     015  051412  047510  MSG44:  .ASCIZ  <CR><LF>/SHOULD BE BETWEEN 1.9 & 2.6 SEC/
 9288  054642  046125  020104  042502
 9289  054650  041040  052105  042527
 9290  054656  047105  030440  034456
 9291  054664  023040  031040  033056
 9292  054672  051440  041505     000
 9293  054677     015  050012  047522  MSG74:  .ASCIZ  <CR><LF>/PROGRAM ABORT PENDING...PLEASE WAIT/
 9294  054704  051107  046501  040440
 9295  054712  047502  052122  050040
 9296  054720  047105  044504  043516
 9297  054726  027056  050056  042514
 9298  054734  051501  020105  040527
 9299  054742  052111     000
 9300  054745     015  044012  046101  MSG75:  .ASCIZ  <CR><LF>/HALT PENDING...PLEASE WAIT/
 9301  054752  020124  042520  042116
 9302  054760  047111  027107  027056
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 9303  054766  046120  040505  042523
 9304  054774  053440  044501  000124
 9305  055002  005015  051120  043517  MSG76:  .ASCIZ  <CR><LF>/PROGRAM ABORTED/
 9306  055010  040522  020115  041101
 9307  055016  051117  042524  000104
 9308  055024  005015  050103  020125  MSG77:  .ASCIZ  <CR><LF>/CPU HALTED/
 9309  055032  040510  052114  042105
 9310  055040     000
 9311
 9312                                  .SBTTL  ERROR MESSAGES
 9313
 9314  055041     015  042412  051122  EM1:    .ASCIZ  <CR><LF>/ERROR, ONLY 0 THRU 7 ALLOWED, TRY AGAIN/<CR><LF>
 9315  055046  051117  020054  047117
 9316  055054  054514  030040  052040
 9317  055062  051110  020125  020067
 9318  055070  046101  047514  042527
 9319  055076  026104  052040  054522
 9320  055104  040440  040507  047111
 9321  055112  005015     000
 9322  055115     104  044522  042526  EM2:    .ASCIZ  /DRIVE # IN RKCS2 CANNOT BE READ BACK CORRECTLY IN RKMR2/
 9323  055122  021440  044440  020116
 9324  055130  045522  051503  020062
 9325  055136  040503  047116  052117
 9326  055144  041040  020105  042522
 9327  055152  042101  041040  041501
 9328  055160  020113  047503  051122
 9329  055166  041505  046124  020131
 9330  055174  047111  051040  046513
 9331  055202  031122     000
 9332  055205     015  040412  047502  EM3:    .ASCIZ  <CR><LF>/ABORT TESTS...UNEXPECTED TIME OUT AT PC=/
 9333  055212  052122  052040  051505
 9334  055220  051524  027056  052456
 9335  055226  042516  050130  041505
 9336  055234  042524  020104  044524
 9337  055242  042515  047440  052125
 9338  055250  040440  020124  041520
 9339  055256  000075
 9340  055260  005015  041101  051117  EM4:    .ASCIZ  <CR><LF>/ABORT TESTS...UNEXPECTED INTERRUPT AT PC=/
 9341  055266  020124  042524  052123
 9342  055274  027123  027056  047125
 9343  055302  054105  042520  052103
 9344  055310  042105  044440  052116
 9345  055316  051105  052522  052120
 9346  055324  040440  020124  041520
 9347  055332  000075
 9348  055334  042115  020123  042523  EM5:    .ASCIZ  /MDS SET IN RKCS2/
 9349  055342  020124  047111  051040
 9350  055350  041513  031123     000
 9351  055355     125  042506  051440  EM6:    .ASCIZ  /UFE SET IN RKCS2/
 9352  055362  052105  044440  020116
 9353  055370  045522  051503  000062
 9354  055376  051104  020101  047111  EM7:    .ASCIZ  /DRA IN RKDS & NED IN RKCS2 RESET; WRONG PORT SELECTED?/
 9355  055404  051040  042113  020123
 9356  055412  020046  042516  020104
 9357  055420  047111  051040  041513
 9358  055426  031123  051040  051505
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 9359  055434  052105  020073  051127
 9360  055442  047117  020107  047520
 9361  055450  052122  051440  046105
 9362  055456  041505  042524  037504
 9363  055464     000
 9364  055465     104  044522  042526  EM8:    .ASCIZ  /DRIVE PRESENT BUT NOT SPECIFIED BY OPERATOR/
 9365  055472  050040  042522  042523
 9366  055500  052116  041040  052125
 9367  055506  047040  052117  051440
 9368  055514  042520  044503  044506
 9369  055522  042105  041040  020131
 9370  055530  050117  051105  052101
 9371  055536  051117     000
 9372  055541     104  044522  042526  EM9:    .ASCIZ  /DRIVE NOT PRESENT BUT SPECIFIED BY OPERATOR/
 9373  055546  047040  052117  050040
 9374  055554  042522  042523  052116
 9375  055562  041040  052125  051440
 9376  055570  042520  044503  044506
 9377  055576  042105  041040  020131
 9378  055604  050117  051105  052101
 9379  055612  051117     000
 9380  055615     101  047502  052122  EM10:   .ASCIZ  /ABORT TESTS...CANNOT REFERENCE CONTROLLER REGISTER/
 9381  055622  052040  051505  051524
 9382  055630  027056  041456  047101
 9383  055636  047516  020124  042522
 9384  055644  042506  042522  041516
 9385  055652  020105  047503  052116
 9386  055660  047522  046114  051105
 9387  055666  051040  043505  051511
 9388  055674  042524  000122
 9389  055700  051104  020101  047111  EM11:   .ASCIZ  /DRA IN RKDS & NED IN RKCS2 BOTH SET/
 9390  055706  051040  042113  020123
 9391  055714  020046  042516  020104
 9392  055722  047111  051040  041513
 9393  055730  031123  041040  052117
 9394  055736  020110  042523  000124
 9395  055744  047503  052116  047522  EM12:   .ASCIZ  /CONTROLLER NOT READY IN RKCS1/
 9396  055752  046114  051105  047040
 9397  055760  052117  051040  040505
 9398  055766  054504  044440  020116
 9399  055774  045522  051503  000061
 9400  056002  047516  040440  052124  EM13:   .ASCIZ  /NO ATTN IN RKASOF/
 9401  056010  020116  047111  051040
 9402  056016  040513  047523  000106
 9403  056024  047125  054105  042520  EM14:   .ASCIZ  /UNEXPECTED MEMORY PARITY TRAP/
 9404  056032  052103  042105  046440
 9405  056040  046505  051117  020131
 9406  056046  040520  044522  054524
 9407  056054  052040  040522  000120
 9408  056062  045522  041504  023040  EM15:   .ASCII  /RKDC & RKDA INDICATE THAT WCE OCCURRED AT/
 9409  056070  051040  042113  020101
 9410  056076  047111  044504  040503
 9411  056104  042524  052040  040510
 9412  056112  020124  041527  020105
 9413  056120  041517  052503  051122
 9414  056126  042105  040440     124
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 9415  056133     015  041412  046131          .ASCIZ  <CR><LF>/CYL 411, TRACK 2, SECTOR 21/
 9416  056140  032040  030461  020054
 9417  056146  051124  041501  020113
 9418  056154  026062  051440  041505
 9419  056162  047524  020122  030462
 9420  056170     000
 9421  056171     103  047101  047516  EM16:   .ASCIZ  /CANNOT READ BAD SECTOR INFORMATION/
 9422  056176  020124  042522  042101
 9423  056204  041040  042101  051440
 9424  056212  041505  047524  020122
 9425  056220  047111  047506  046522
 9426  056226  052101  047511  000116
 9427  056234  042515  051523  043501  EM17:   .ASCIZ  /MESSAGE A0 ERROR/
 9428  056242  020105  030101  042440
 9429  056250  051122  051117     000
 9430  056255     115  051505  040523  EM18:   .ASCIZ  /MESSAGE B0 ERROR/
 9431  056262  042507  041040  020060
 9432  056270  051105  047522  000122
 9433  056276  042515  051523  043501  EM19:   .ASCIZ  /MESSAGE A1 ERROR/
 9434  056304  020105  030501  042440
 9435  056312  051122  051117     000
 9436  056317     115  051505  040523  EM20:   .ASCIZ  /MESSAGE B1 ERROR/
 9437  056324  042507  041040  020061
 9438  056332  051105  047522  000122
 9439  056340  042503  051122  051440  EM21:   .ASCIZ  /CERR SET IN RKCS1/
 9440  056346  052105  044440  020116
 9441  056354  045522  051503  000061
 9442  056362  047516  042040  044522  EM22:   .ASCII  /NO DRIVES FOUND IN DEVICE MAP ($DEVM)/<CR><LF>
 9443  056370  042526  020123  047506
 9444  056376  047125  020104  047111
 9445  056404  042040  053105  041511
 9446  056412  020105  040515  020120
 9447  056420  022050  042504  046526
 9448  056426  006451     012
 9449  056431     123  052105  050125          .ASCIZ  /SETUP CORRECTLY AND RESTART/<CR><LF>
 9450  056436  041440  051117  042522
 9451  056444  052103  054514  040440
 9452  056452  042116  051040  051505
 9453  056460  040524  052122  005015
 9454  056466     000
 9455  056467     116  020117  051104  EM23:   .ASCII  /NO DRIVES FOUND ON BUSS/<CR><LF>
 9456  056474  053111  051505  043040
 9457  056502  052517  042116  047440
 9458  056510  020116  052502  051523
 9459  056516  005015
 9460  056520  042523  052524  020120          .ASCIZ  /SETUP CORRECTLY AND PRESS 'CONTINUE'/<CR><LF>
 9461  056526  047503  051122  041505
 9462  056534  046124  020131  047101
 9463  056542  020104  051120  051505
 9464  056550  020123  041447  047117
 9465  056556  044524  052516  023505
 9466  056564  005015     000
 9467  056567     126  046117  053040  EM24:   .ASCIZ  /VOL VALID NOT SET IN RKMR2/
 9468  056574  046101  042111  047040
 9469  056602  052117  051440  052105
 9470  056610  044440  020116  045522
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 9471  056616  051115  000062
 9472  056622  005015  042504  042524  EM25:   .ASCIZ  <CR><LF>/DETECTED 10 BAD SECTORS...ABORTING TEST/
 9473  056630  052103  042105  030440
 9474  056636  020060  040502  020104
 9475  056644  042523  052103  051117
 9476  056652  027123  027056  041101
 9477  056660  051117  044524  043516
 9478  056666  052040  051505  000124
 9479  056674  042504  042524  052103  EM26:   .ASCIZ  /DETECTED BSE BUT NOT LISTED IN BAD SECTOR FILE/
 9480  056702  042105  041040  042523
 9481  056710  041040  052125  047040
 9482  056716  052117  046040  051511
 9483  056724  042524  020104  047111
 9484  056732  041040  042101  051440
 9485  056740  041505  047524  020122
 9486  056746  044506  042514     000
 9487  056753     104  052105  041505  EM27:   .ASCII  /DETECTED BSE IN READ COMMAND/
 9488  056760  042524  020104  051502
 9489  056766  020105  047111  051040
 9490  056774  040505  020104  047503
 9491  057002  046515  047101     104
 9492  057007     015  041012  052125          .ASCIZ  <CR><LF>/BUT NOT IN PREVIOUS WRITE COMMAND TO SAME SECTOR/
 9493  057014  047040  052117  044440
 9494  057022  020116  051120  053105
 9495  057030  047511  051525  053440
 9496  057036  044522  042524  041440
 9497  057044  046517  040515  042116
 9498  057052  052040  020117  040523
 9499  057060  042515  051440  041505
 9500  057066  047524  000122
 9501  057072  054503  020114  042101  EM36:   .ASCIZ  /CYL ADDR IN RKMR3 NOT SAME AS RKDC/
 9502  057100  051104  044440  020116
 9503  057106  045522  051115  020063
 9504  057114  047516  020124  040523
 9505  057122  042515  040440  020123
 9506  057130  045522  041504     000
 9507  057135     103  046131  042040  EM39:   .ASCIZ  /CYL DIFF & OFFSET IN RKMR2 NOT CLEARED/
 9508  057142  043111  020106  020046
 9509  057150  043117  051506  052105
 9510  057156  044440  020116  045522
 9511  057164  051115  020062  047516
 9512  057172  020124  046103  040505
 9513  057200  042522  000104
 9514  057204  054503  020114  042101  EM40:   .ASCIZ  /CYL ADDR IN RKMR3 NOT CLEARED/
 9515  057212  051104  044440  020116
 9516  057220  045522  051115  020063
 9517  057226  047516  020124  046103
 9518  057234  040505  042522  000104
 9519  057242  054503  020114  042101  EM41:   .ASCIZ  /CYL ADDR IN B2 DID NOT REMAIN CLEARED/
 9520  057250  051104  044440  020116
 9521  057256  031102  042040  042111
 9522  057264  047040  052117  051040
 9523  057272  046505  044501  020116
 9524  057300  046103  040505  042522
 9525  057306  000104
 9526  057310  052101  047124  047040  EM55:   .ASCIZ  /ATTN NOT CLEARED IN RKASOF/
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 9527  057316  052117  041440  042514
 9528  057324  051101  042105  044440
 9529  057332  020116  045522  051501
 9530  057340  043117     000
 9531  057343     110  040505  051504  EM60:   .ASCIZ  /HEADS HOME NOT FOUND IN RKMR2/
 9532  057350  044040  046517  020105
 9533  057356  047516  020124  047506
 9534  057364  047125  020104  047111
 9535  057372  051040  046513  031122
 9536  057400     000
 9537  057401     104  042524  051440  EM62:   .ASCIZ  /DTE SET IN RKER/
 9538  057406  052105  044440  020116
 9539  057414  045522  051105     000
 9540  057421     104  052114  051440  EM63:   .ASCIZ  /DLT SET IN RKCS2/
 9541  057426  052105  044440  020116
 9542  057434  045522  051503  000062
 9543  057442  042522  042101  044040  EM65:   .ASCIZ  /READ HEADER ERROR/
 9544  057450  040505  042504  020122
 9545  057456  051105  047522  000122
 9546  057464  054503  020114  042101  EM66:   .ASCIZ  /CYL ADDR IN RKMR3 INCORRECT/
 9547  057472  051104  044440  020116
 9548  057500  045522  051115  020063
 9549  057506  047111  047503  051122
 9550  057514  041505  000124
 9551  057520  046101  043511  046516  EM69:   .ASCIZ  /ALIGNMENT CARTRIDGE USED/
 9552  057526  047105  020124  040503
 9553  057534  052122  044522  043504
 9554  057542  020105  051525  042105
 9555  057550     000
 9556  057551     103  047524  051440  EM73:   .ASCIZ  /CTO SET IN RKCS1/
 9557  057556  052105  044440  020116
 9558  057564  045522  051503  000061
 9559  057572  052122  020132  047516  EM74:   .ASCIZ  /RTZ NOT SET IN RKMR2/
 9560  057600  020124  042523  020124
 9561  057606  047111  051040  046513
 9562  057614  031122     000
 9563  057617     116  042105  051440  EM79:   .ASCIZ  /NED SET IN RKCS2/
 9564  057624  052105  044440  020116
 9565  057632  045522  051503  000062
 9566  057640  051127  052111  020105  EM80:   .ASCIZ  /WRITE CHECK ERROR SET IN RKCS2/
 9567  057646  044103  041505  020113
 9568  057654  051105  047522  020122
 9569  057662  042523  020124  047111
 9570  057670  051040  041513  031123
 9571  057676     000
 9572  057677     127  044522  042524  EM81:   .ASCIZ  /WRITE CHECK COMMAND NOT FUNCTIONING/
 9573  057704  041440  042510  045503
 9574  057712  041440  046517  040515
 9575  057720  042116  047040  052117
 9576  057726  043040  047125  052103
 9577  057734  047511  044516  043516
 9578  057742     000
 9579  057743     122  040505  020104  EM82:   .ASCIZ  /READ DATA DID NOT COMPARE WITH WRITE DATA/
 9580  057750  040504  040524  042040
 9581  057756  042111  047040  052117
 9582  057764  041440  046517  040520
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 9583  057772  042522  053440  052111
 9584  060000  020110  051127  052111
 9585  060006  020105  040504  040524
 9586  060014     000
 9587  060015     104  052101  020101  EM83:   .ASCIZ  /DATA CHECK ERROR SET IN RKER/
 9588  060022  044103  041505  020113
 9589  060030  051105  047522  020122
 9590  060036  042523  020124  047111
 9591  060044  051040  042513  000122
 9592  060052  044127  046111  020105  EM84:   .ASCIZ  /WHILE WAITING FOR CONTR READY OR AFTER CONTR READY REC'D/
 9593  060060  040527  052111  047111
 9594  060066  020107  047506  020122
 9595  060074  047503  052116  020122
 9596  060102  042522  042101  020131
 9597  060110  051117  040440  052106
 9598  060116  051105  041440  047117
 9599  060124  051124  051040  040505
 9600  060132  054504  051040  041505
 9601  060140  042047     000
 9602  060143     117  043106  042523  EM85:   .ASCIZ  /OFFSET STATUS BIT IN RKMR2 CLEARED/
 9603  060150  020124  052123  052101
 9604  060156  051525  041040  052111
 9605  060164  044440  020116  045522
 9606  060172  051115  020062  046103
 9607  060200  040505  042522  000104
 9608  060206  043117  051506  052105  EM86:   .ASCIZ  /OFFSET REG IN A2 NOT = RKASOF/
 9609  060214  051040  043505  044440
 9610  060222  020116  031101  047040
 9611  060230  052117  036440  051040
 9612  060236  040513  047523  000106
 9613  060244  044504  020104  047516  EM88:   .ASCIZ  /DID NOT FIND SECTOR 0 FROM INDEX/
 9614  060252  020124  044506  042116
 9615  060260  051440  041505  047524
 9616  060266  020122  020060  051106
 9617  060274  046517  044440  042116
 9618  060302  054105     000
 9619  060305     110  040505  051504  EM89:   .ASCIZ  /HEADS HOME NOT CLEARED IN RKMR2/
 9620  060312  044040  046517  020105
 9621  060320  047516  020124  046103
 9622  060326  040505  042522  020104
 9623  060334  047111  051040  046513
 9624  060342  031122     000
 9625  060345     123  051105  047526  EM90:   .ASCIZ  /SERVO SIG PRES NOT SET IN RKMR2/
 9626  060352  051440  043511  050040
 9627  060360  042522  020123  047516
 9628  060366  020124  042523  020124
 9629  060374  047111  051040  046513
 9630  060402  031122     000
 9631  060405     122  053105  047040  EM91:   .ASCIZ  /REV NOT SET IN RKMR2/
 9632  060412  052117  051440  052105
 9633  060420  044440  020116  045522
 9634  060426  051115  000062
 9635  060432  042522  020126  047516  EM92:   .ASCIZ  /REV NOT CLEARED IN RKMR2/
 9636  060440  020124  046103  040505
 9637  060446  042522  020104  047111
 9638  060454  051040  046513  031122
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 9639  060462     000
 9640  060463     122  040505  044504  EM93:   .ASCIZ  /READING WRONG CYLINDER # IN HEADER...MISPOSITION/
 9641  060470  043516  053440  047522
 9642  060476  043516  041440  046131
 9643  060504  047111  042504  020122
 9644  060512  020043  047111  044040
 9645  060520  040505  042504  027122
 9646  060526  027056  044515  050123
 9647  060534  051517  052111  047511
 9648  060542  000116
 9649  060544  043117  051506  052105  EM94:   .ASCIZ  /OFFSET IT IN A2 NOT CLEARED/
 9650  060552  044440  020124  047111
 9651  060560  040440  020062  047516
 9652  060566  020124  046103  040505
 9653  060574  042522  000104
 9654  060600  047506  046522  052101  EM95:   .ASCIZ  /FORMAT BIT NOT SET IN RKMR2/
 9655  060606  041040  052111  047040
 9656  060614  052117  051440  052105
 9657  060622  044440  020116  045522
 9658  060630  051115  000062
 9659  060634  040503  047116  052117  EM96:   .ASCIZ  /CANNOT FIND SECTOR 23(8)/
 9660  060642  043040  047111  020104
 9661  060650  042523  052103  051117
 9662  060656  031040  024063  024470
 9663  060664     000
 9664  060665     110  040505  020104  EM97:   .ASCIZ  /HEAD SWITCHING REQ'D ANOTHER FULL REVOLUTION OF DISK/
 9665  060672  053523  052111  044103
 9666  060700  047111  020107  042522
 9667  060706  023521  020104  047101
 9668  060714  052117  042510  020122
 9669  060722  052506  046114  051040
 9670  060730  053105  046117  052125
 9671  060736  047511  020116  043117
 9672  060744  042040  051511  000113
 9673  060752  040503  047116  052117  EM98:   .ASCIZ  /CANNOT FIND CYLINDER 128/
 9674  060760  043040  047111  020104
 9675  060766  054503  044514  042116
 9676  060774  051105  030440  034062
 9677  061002     000
 9678  061003     103  047101  047516  EM99:   .ASCIZ  /CANNOT FIND CYLINDER 256/
 9679  061010  020124  044506  042116
 9680  061016  041440  046131  047111
 9681  061024  042504  020122  032462
 9682  061032  000066
 9683  061034  051104  053111  020105  EM100:  .ASCIZ  /DRIVE OFF TRACK SET IN RKMR3/
 9684  061042  043117  020106  051124
 9685  061050  041501  020113  042523
 9686  061056  020124  047111  051040
 9687  061064  046513  031522     000
 9688  061071     104  042111  047040  EM101:  .ASCIZ  /DID NOT GO TO CYLINDER 10/
 9689  061076  052117  043440  020117
 9690  061104  047524  041440  046131
 9691  061112  047111  042504  020122
 9692  061120  030061     000
 9693
 9694                                  .SBTTL  DATA HEADERS
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9695
9696  061123     124  051505  020124  DH1:   .ASCIZ  /TEST NO.  PC/
9697  061130  047516  020056  050040
9698  061136  000103
9699  061140  045522  051115  004462  DH2:   .ASCIZ  /RKMR2  RKMR3   RKER   RKDS   RKCS1   RKCS2   RKASOF/
9700  061146  045522  051115  004463
9701  061154  045522  051105  051011
9702  061162  042113  004523  045522
9703  061170  051503  004461  045522
9704  061176  051503  004462  045522
9705  061204  051501  043117     000
9706  061211     122  046513  031122  DH5:   .ASCIZ  /RKMR2  RKMR3   RKER   RKDS   RKDC   RKCS1   RKCS2/
9707  061216  051011  046513  031522
9708  061224  051011  042513  004522
9709  061232  045522  051504  051011
9710  061240  042113  004503  045522
9711  061246  051503  004461  045522
9712  061254  051503  000062
9713  061260  045522  051115  020062  DH6:   .ASCIZ  /RKMR2   RKMR3   RKDC   FROM CYL  TO CYL  CYL DIFF/
9714  061266  020040  045522  051115
9715  061274  020063  020040  045522
9716  061302  041504  020040  043040
9717  061310  047522  020115  054503
9718  061316  020114  052040  020117
9719  061324  054503  020114  041440
9720  061332  046131  042040  043111
9721  061340  000106
9722  061342  045522  051115  004462  DH7:   .ASCIZ  /RKMR2  RKMR3   RKER   RKDS   RKDA   RKCS1   RKCS2/
9723  061350  045522  051115  004463
9724  061356  045522  051105  051011
9725  061364  042113  004523  045522
9726  061372  040504  051011  041513
9727  061400  030523  051011  041513
9728  061406  031123     000
9729  061411     124  051505  020124  DH8:   .ASCIZ  /TEST NO.        TRAP PC/
9730  061416  047516  004456  051124
9731  061424  050101  050040  000103
9732  061432  043101  042524  020122  DH9:   .ASCIZ  /AFTER START SPINDLE COMMAND REC'D BY DRIVE/
9733  061440  052123  051101  020124
9734  061446  050123  047111  046104
9735  061454  020105  047503  046515
9736  061462  047101  020104  042522
9737  061470  023503  020104  054502
9738  061476  042040  044522  042526
9739  061504     000
9740  061505     101  020124  047105  DH10:  .ASCIZ  /AT END OF HEAD LOADING/
9741  061512  020104  043117  044040
9742  061520  040505  020104  047514
9743  061526  042101  047111  000107
9744  061534  045522  051115  004462  DH11:  .ASCIZ  /RKMR2  RKMR3   RKCS1   RKCS2   EXPECTED        WAS/
9745  061542  045522  051115  004463
9746  061550  045522  051503  004461
9747  061556  045522  051503  004462
9748  061564  054105  042520  052103
9749  061572  042105  053411  051501
9750  061600     000
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 9751  061601     122  046513  031122  DH12:   .ASCIZ  /RKMR2  RKMR3   RKCS1   RKCS2   RKDC    RKDA/
 9752  061606  051011  046513  031522
 9753  061614  051011  041513  030523
 9754  061622  051011  041513  031123
 9755  061630  051011  042113  004503
 9756  061636  045522  040504     000
 9757  061643     117  020116  042523  DH13:   .ASCIZ  /ON SECTORS 10, 12, 14, 16, 18 OR 20 CYL 410 TRACK 2/
 9758  061650  052103  051117  020123
 9759  061656  030061  020054  031061
 9760  061664  020054  032061  020054
 9761  061672  033061  020054  034061
 9762  061700  047440  020122  030062
 9763  061706  041440  046131  032040
 9764  061714  030061  052040  040522
 9765  061722  045503  031040     000
 9766  061727     117  020116  042523  DH14:   .ASCIZ  /ON SECTORS 11, 13, 15, 17, 19 OR 21 CYL 410 TRACK 2/
 9767  061734  052103  051117  020123
 9768  061742  030461  020054  031461
 9769  061750  020054  032461  020054
 9770  061756  033461  020054  034461
 9771  061764  047440  020122  030462
 9772  061772  041440  046131  032040
 9773  062000  030061  052040  040522
 9774  062006  045503  031040     000
 9775  062013     101  052106  051105  DH17:   .ASCIZ  /AFTER RECAL COMMAND/
 9776  062020  051040  041505  046101
 9777  062026  041440  046517  040515
 9778  062034  042116     000
 9779  062037     101  052106  051105  DH18:   .ASCIZ  /AFTER UNLOAD COMMAND/
 9780  062044  052440  046116  040517
 9781  062052  020104  047503  046515
 9782  062060  047101  000104
 9783  062064  043101  042524  020122  DH19:   .ASCIZ  /AFTER PACK COMMAND/
 9784  062072  040520  045503  041440
 9785  062100  046517  040515  042116
 9786  062106     000
 9787  062107     101  052106  051105  DH20:   .ASCIZ  /AFTER SELECT DRIVE COMMAND/
 9788  062114  051440  046105  041505
 9789  062122  020124  051104  053111
 9790  062130  020105  047503  046515
 9791  062136  047101  000104
 9792  062142  043101  042524  020122  DH21:   .ASCIZ  /AFTER SUBSYSTEM CLEAR/
 9793  062150  052523  051502  051531
 9794  062156  042524  020115  046103
 9795  062164  040505  000122
 9796  062170  043101  042524  020122  DH22:   .ASCIZ  /AFTER DRIVE CLEAR COMMAND/
 9797  062176  051104  053111  020105
 9798  062204  046103  040505  020122
 9799  062212  047503  046515  047101
 9800  062220  000104
 9801  062222  043101  042524  020122  DH24:   .ASCIZ  /AFTER OFFSET COMMAND/
 9802  062230  043117  051506  052105
 9803  062236  041440  046517  040515
 9804  062244  042116     000
 9805  062247     101  052106  051105  DH25:   .ASCIZ  /AFTER SEEK COMMAND/
 9806  062254  051440  042505  020113
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 9807  062262  047503  046515  047101
 9808  062270  000104
 9809  062272  043101  042524  020122  DH26:   .ASCIZ  /AFTER READ DATA COMMAND/
 9810  062300  042522  042101  042040
 9811  062306  052101  020101  047503
 9812  062314  046515  047101  000104
 9813  062322  043101  042524  020122  DH27:   .ASCIZ  /AFTER WRITE DATA COMMAND/
 9814  062330  051127  052111  020105
 9815  062336  040504  040524  041440
 9816  062344  046517  040515  042116
 9817  062352     000
 9818  062353     105  050130  041505  DH28:   .ASCIZ  /EXPECT EXPECT  EXPECT  EXPECT  EXPECT  EXPECT  EXPECT/
 9819  062360  004524  054105  042520
 9820  062366  052103  042411  050130
 9821  062374  041505  004524  054105
 9822  062402  042520  052103  042411
 9823  062410  050130  041505  004524
 9824  062416  054105  042520  052103
 9825  062424  042411  050130  041505
 9826  062432  000124
 9827  062434  041501  052524  046101  DH29:   .ASCIZ  /ACTUAL ACTUAL  ACTUAL  ACTUAL  ACTUAL  ACTUAL  ACTUAL/
 9828  062442  040411  052103  040525
 9829  062450  004514  041501  052524
 9830  062456  046101  040411  052103
 9831  062464  040525  004514  041501
 9832  062472  052524  046101  040411
 9833  062500  052103  040525  004514
 9834  062506  041501  052524  046101
 9835  062514     000
 9836  062515     101  052106  051105  DH30:   .ASCIZ  /AFTER READ HEADER COMMAND/
 9837  062522  051040  040505  020104
 9838  062530  042510  042101  051105
 9839  062536  041440  046517  040515
 9840  062544  042116     000
 9841  062547     101  004460  030102  DH31:   .ASCIZ  /A0     B0      A1      B1      A2      B2      B3/
 9842  062554  040411  004461  030502
 9843  062562  040411  004462  031102
 9844  062570  041011  000063
 9845  062574  043101  042524  020122  DH32:   .ASCIZ  /AFTER WRITE CHECK COMMAND/
 9846  062602  051127  052111  020105
 9847  062610  044103  041505  020113
 9848  062616  047503  046515  047101
 9849  062624  000104
 9850  062626  052504  044522  043516  DH33:   .ASCIZ  /DURING SEEK COMMAND/
 9851  062634  051440  042505  020113
 9852  062642  047503  046515  047101
 9853  062650  000104
 9854  062652  045522  051503  004461  DH34:   .ASCIZ  /RKCS1  RKCS2   RKASOF  RKER    RKDS    RKDC/
 9855  062660  045522  051503  004462
 9856  062666  045522  051501  043117
 9857  062674  051011  042513  004522
 9858  062702  045522  051504  051011
 9859  062710  042113  000103
 9860  062714  045522  051115  020062  DH35:   .ASCIZ  /RKMR2   RKMR3   RKCS1   RKCS2  FROM SECT  TO SECT/
 9861  062722  020040  045522  051115
 9862  062730  020063  020040  045522
```

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 9863  062736  051503  020061  020040
 9864  062744  045522  051503  020062
 9865  062752  043040  047522  020115
 9866  062760  042523  052103  020040
 9867  062766  047524  051440  041505
 9868  062774  000124
 9869  062776  043101  042524  020122  DH39:   .ASCIZ  /AFTER WRITE HEADER COMMAND/
 9870  063004  051127  052111  020105
 9871  063012  042510  042101  051105
 9872  063020  041440  046517  040515
 9873  063026  042116     000
 9874  063031     122  046513  031122  DH40:   .ASCIZ  /RKMR2  RKMR3   RKDA    WORD#   HEADER WAS  SHOULD BE/
 9875  063036  051011  046513  031522
 9876  063044  051011  042113  004501
 9877  063052  047527  042122  004443
 9878  063060  042510  042101  051105
 9879  063066  053440  051501  020040
 9880  063074  044123  052517  042114
 9881  063102  041040  000105
 9882  063106  052504  044522  043516  DH41:   .ASCIZ  /DURING RECAL COMMAND/
 9883  063114  051040  041505  046101
 9884  063122  041440  046517  040515
 9885  063130  042116     000
 9886  063133     117  020116  042523  DH42:   .ASCIZ  /ON SECTORS 0,2,4,6 OR 8  CYL 410 TRACK 2/
 9887  063140  052103  051117  020123
 9888  063146  026060  026062  026064
 9889  063154  020066  051117  034040
 9890  063162  020040  054503  020114
 9891  063170  030464  020060  051124
 9892  063176  041501  020113  000062
 9893  063204  047117  051440  041505  DH43:   .ASCIZ  /ON SECTORS 1,3,5,7 OR 9  CYL 410 TRACK 2/
 9894  063212  047524  051522  030440
 9895  063220  031454  032454  033454
 9896  063226  047440  020122  020071
 9897  063234  041440  046131  032040
 9898  063242  030061  052040  040522
 9899  063250  045503  031040     000
 9900  063255     106  051117  040515  DH44:   .ASCIZ  /FORMAT & ALL READ-WRITE TESTS WILL BE BYPASSED/
 9901  063262  020124  020046  046101
 9902  063270  020114  042522  042101
 9903  063276  053455  044522  042524
 9904  063304  052040  051505  051524
 9905  063312  053440  046111  020114
 9906  063320  042502  041040  050131
 9907  063326  051501  042523  000104
 9908  063334  043101  042524  020122  DH47:   .ASCIZ  /AFTER READ HEADER COMMAND WITH MOVEMENT/
 9909  063342  042522  042101  044040
 9910  063350  040505  042504  020122
 9911  063356  047503  046515  047101
 9912  063364  020104  044527  044124
 9913  063372  046440  053117  046505
 9914  063400  047105  000124
 9915  063404  051515  020107  020101  DH49:   .ASCIZ  /MSG A & B IN RKMR2 & RKMR3 RESP. ARE INVALID/
 9916  063412  020046  020102  047111
 9917  063420  051040  046513  031122
 9918  063426  023040  051040  046513
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 9919  063434  031522  051040  051505
 9920  063442  027120  040440  042522
 9921  063450  044440  053116  046101
 9922  063456  042111     000
 9923  063461     101  052106  051105  DH51:   .ASCIZ  /AFTER SEEK TO SELF COMMAND/
 9924  063466  051440  042505  020113
 9925  063474  047524  051440  046105
 9926  063502  020106  047503  046515
 9927  063510  047101  000104
 9928  063514  044527  044124  044440  DH52:   .ASCIZ  /WITH INTENTIONAL MISCOMPARE/
 9929  063522  052116  047105  044524
 9930  063530  047117  046101  046440
 9931  063536  051511  047503  050115
 9932  063544  051101  000105
 9933  063550  052504  044522  043516  DH53:   .ASCIZ  /DURING OFFSET COMMAND/
 9934  063556  047440  043106  042523
 9935  063564  020124  047503  046515
 9936  063572  047101  000104
 9937  063576  043101  042524  020122  DH54:   .ASCIZ  /AFTER FORMAT CHANGE AND CONTR READY REC'D/
 9938  063604  047506  046522  052101
 9939  063612  041440  040510  043516
 9940  063620  020105  047101  020104
 9941  063626  047503  052116  020122
 9942  063634  042522  042101  020131
 9943  063642  042522  023503  000104
 9944  063650  045522  051115  004462  DH56:   .ASCIZ  /RKMR2  RKMR3   RKDC    CYL #   HEADER WORD 0/
 9945  063656  045522  051115  004463
 9946  063664  045522  041504  041411
 9947  063672  046131  021440  044011
 9948  063700  040505  042504  020122
 9949  063706  047527  042122  030040
 9950  063714     000
 9951  063715     101  052106  051105  DH57:   .ASCIZ  /AFTER WRITE COMMAND WITH OFFSET/
 9952  063722  053440  044522  042524
 9953  063730  041440  046517  040515
 9954  063736  042116  053440  052111
 9955  063744  020110  043117  051506
 9956  063752  052105     000
 9957  063755     104  052101  020101  DH58:   .ASCIZ  /DATA WAS       SHOULD BE/
 9958  063762  040527  020123  051411
 9959  063770  047510  046125  020104
 9960  063776  042502     000
 9961
 9962                                  .SBTTL  ERROR OUTPUT DATA
 9963
 9964          064002                  .EVEN
 9965  064002  001214  001116  007416  DT1:    $TESTN,$ERRPC,HMR2,HMR3,HER,HDS,HCS1,HCS2,HASOF
 9966  064010  007420  007404  007402
 9967  064016  007370  007372  007406
 9968  064024  001214  001334          DT3:    $TESTN,TRAPPC
 9969  064030  001214  001116  007416  DT4:    $TESTN,$ERRPC,HMR2,HMR3,HDC,FRCYL,TOCYL,CALDIF
 9970  064036  007420  007410  001350
 9971  064044  001352  001360
 9972  064050  001214  001116  007416  DT5:    $TESTN,$ERRPC,HMR2,HMR3,HER,HDS,HDA,HCS1,HCS2
 9973  064056  007420  007404  007402
 9974  064064  007400  007370  007372
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 9975  064072  001214  001116  007416  DT6:    $TESTN,$ERRPC,HMR2,HMR3,HCS1,HCS2,WD2,WD1
 9976  064100  007420  007370  007372
 9977  064106  001470  001466
 9978  064112  001214  001116  007416  DT7:    $TESTN,$ERRPC,HMR2,HMR3,HDA,WDCNT,HDWD,TEMP1
 9979  064120  007420  007406  001506
 9980  064126  001524  007426
 9981  064132  001214  001116  007416  DT8:    $TESTN,$ERRPC,HMR2,HMR3,HDC,TOCYL,FRCYL,CALDIF
 9982  064140  007420  007410  001352
 9983  064146  001350  001360
 9984  064152  001214  001116  007416  DT9:    $TESTN,$ERRPC,HMR2,HMR3,HDC,TOCYL,RHTAB
 9985  064160  007420  007410  001352
 9986  064166  001742
 9987  064170  001214  001116  007416  DT10:   $TESTN,$ERRPC,HMR2,HMR3,HCS1,HCS2,HDC,HDA
 9988  064176  007420  007370  007372
 9989  064204  007410  007400
 9990  064210  001214  001116  007460  DT13:   $TESTN,$ERRPC,E.A0,E.B0,E.A1,E.B1,H.A0,H.B0,H.A1,H.B1
 9991  064216  007462  007464  007466
 9992  064224  007440  007442  007444
 9993  064232  007446
 9994  064234  007370  007372  007406          HCS1,HCS2,HASOF,HER,HDS,HDC
 9995  064242  007404  007402  007410
 9996  064250  001214  001116  007460  DT14:   $TESTN,$ERRPC,E.A0,E.B0,E.A1,E.B1,E.A2,E.B2
 9997  064256  007462  007464  007466
 9998  064264  007470  007472
 9999  064270  007440  007442  007444          H.A0,H.B0,H.A1,H.B1,H.A2,H.B2
10000  064276  007446  007450  007452
10001  064304  007370  007372  007406          HCS1,HCS2,HASOF,HER,HDS,HDC
10002  064312  007404  007402  007410
10003  064320  001214  001116  007460  DT15:   $TESTN,$ERRPC,E.A0,E.B0,E.A1,E.B1,E.A2,E.B2,E.B3
10004  064326  007462  007464  007466
10005  064334  007470  007472  007476
10006  064342  007440  007442  007444          H.A0,H.B0,H.A1,H.B1,H.A2,H.B2,H.B3
10007  064350  007446  007450  007452
10008  064356  007456
10009  064360  007370  007372  007406          HCS1,HCS2,HASOF,HER,HDS,HDC
10010  064366  007404  007402  007410
10011
10012                                  .SBTTL  ERROR DATA FORMATS
10013
10014  064374  000002                  DF1:    2
10015  064376     002     000                  .BYTE 2,0
10016  064400  061140                          DH2
10017  064402     007     000                  .BYTE 7,0
10018
10019  064404  000001                  DF2:    1
10020  064406     002     000                  .BYTE   2,0
10021
10022  064410  000003                  DF3:    3
10023  064412     000     000                  .BYTE   0,0
10024  064414  061123                          DH1
10025  064416     002     000                  .BYTE   2,0
10026  064420  061534                          DH11
10027  064422     006     000                  .BYTE   6,0
10028
10029  064424  000002                  DF4:    2
10030  064426     002     000                  .BYTE   2,0
```

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10031  064430  061601                      DH12
10032  064432     006      000             .BYTE   6,0
10033
10034  064434  000004                      DF5:    4
10035  064436     000      000             .BYTE   0,0
10036  064440  063404                      DH49
10037  064442     000      000             .BYTE   0,0
10038  064444  061123                      DH1
10039  064446     002      000             .BYTE   2,0
10040  064450  061140                      DH2
10041  064452     007      000             .BYTE   7,0
10042
10043  064454  000003                      DF6:    3
10044  064456     000      000             .BYTE 0,0
10045  064460  061123                      DH1
10046  064462     002      000             .BYTE 2,0
10047  064464  061260                      DH6
10048  064466     006      000             .BYTE 6,0
10049
10050
10051  064470  000003                      DF10:   3
10052  064472     000      000             .BYTE 0,0
10053  064474  061123                      DH1
10054  064476     002      000             .BYTE 2,0
10055  064500  061140                      DH2
10056  064502     007      000             .BYTE 7,0
10057
10058  064504  000002                      DF14:   2
10059  064506     002      000             .BYTE   2,0
10060  064510  063031                      DH40
10061  064512     006      000             .BYTE   6,0
10062
10063
10064  064514  000003                      DF15:   3
10065  064516     000      000             .BYTE   0,0
10066  064520  061123                      DH1
10067  064522     002      000             .BYTE   2,0
10068  064524  061342                      DH7
10069  064526     007      000             .BYTE   7,0
10070
10071  064530  000004                      DF17:   4
10072  064532     000      000             .BYTE   0,0
10073  064534  063255                      DH44
10074  064536     000      000             .BYTE   0,0
10075  064540  061123                      DH1
10076  064542     002      000             .BYTE   2,0
10077  064544  061140                      DH2
10078  064546     007      000             .BYTE   7,0
10079  064550  000003                      DF20:   3
10080  064552     000      000             .BYTE   0,0
10081  064554  061123                      DH1
10082  064556     002      000             .BYTE   2,0
10083  064560  063650                      DH56
10084  064562     005      000             .BYTE   5,0
10085
10086  064564  000007                      DF21:   7
```

```
10087  064566    000     000                .BYTE   0,0
10088  064570  061123                       DH1
10089  064572    002     000                .BYTE   2,0
10090  064574  062353                       DH28
10091  064576    000     000                .BYTE   0,0
10092  064600  062547                       DH31
10093  064602    004     000                .BYTE   4,0
10094  064604  062434                       DH29
10095  064606    000     000                .BYTE   0,0
10096  064610  062547                       DH31
10097  064612    004     000                .BYTE   4,0
10098  064614  062652                       DH34
10099  064616    006     000                .BYTE   6,0
10100
10101  064620  000007                 DF22:  7
10102  064622    000     000                .BYTE   0,0
10103  064624  061123                       DH1
10104  064626    002     000                .BYTE   2,0
10105  064630  062353                       DH28
10106  064632    000     000                .BYTE   0,0
10107  064634  062547                       DH31
10108  064636    006     000                .BYTE   6,0
10109  064640  062434                       DH29
10110  064642    000     000                .BYTE   0,0
10111  064644  062547                       DH31
10112  064646    006     000                .BYTE   6,0
10113  064650  062652                       DH34
10114  064652    006     000                .BYTE   6,0
10115
10116  064654  000007                 DF23:  7
10117  064656    000     000                .BYTE   0,0
10118  064660  061123                       DH1
10119  064662    002     000                .BYTE   2,0
10120  064664  062353                       DH28
10121  064666    000     000                .BYTE   0,0
10122  064670  062547                       DH31
10123  064672    007     000                .BYTE   7,0
10124  064674  062434                       DH29
10125  064676    000     000                .BYTE   0,0
10126  064700  062547                       DH31
10127  064702    007     000                .BYTE   7,0
10128  064704  062652                       DH34
10129  064706    006     000                .BYTE   6,0
10130                                .EVEN
10131                                ;;*****************************************************************
10132                                .SBTTL  TYPE ERROR ROUTINE
10133                                ;*ENTRY JSR PC,TYP ERR
10134                                ;*RETURN RTS PC
10135                                ;*
10136                                ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
10137                                ;*ERROR IS TO BE REPORTED. IT THEN USES THE "ERROR TABLE" ($ERRTB)
10138                                ;*ENTRY TO DEFINE WHAT INFORMATION IS TO BE REPORTED CONCERNING
10139                                ;*THE ERROR.
10140                                ;;*****************************************************************
10141  064710  104413                TYPERR: SAVREG
10142  064712  113700  001114               MOVB    $ITEMB,R0       ;ENTER ERROR NUMBER
```

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10143  064716  042700  177400          BIC     #177400,R0      ;CLEAR SIGN EXTENSION
10144  064722  005300                  DEC     R0              ;FORM INDEX FOR ERROR TABLE
10145  064724  006300                  ASL     R0
10146  064726  006300                  ASL     R0
10147  064730  006300                  ASL     R0
10148  064732  062700  007542  1$:     ADD     #$ERRTB,R0      ;FORM ADDRESS OF ERROR ENTRY
10149  064736  012037  064752          MOV     (R0)+,2$        ;GET EM POINTER
10150  064742  001404                  BEQ     3$              ;BRANCH IF THERE ISN'T ONE
10151  064744  104401  001205          TYPE    ,$CRLF          ;TYPE CARRIAGE RETURN LINE FEED
10152  064750  104401                  TYPE                    ;TYPE ERROR MESSAGE (EM)
10153  064752  000000  2$:     .WORD   0               ;EM POINTER GOES HERE
10154  064754  012037  064770  3$:     MOV     (R0)+,4$        ;GET DH POINTER
10155  064760  001404                  BEQ     5$              ;BRANCH IF THERE ISN'T ONE
10156  064762  104401  001205          TYPE    ,$CRLF          ;TYPE CR-LF
10157  064766  104401                  TYPE                    ;TYPE DATA HEADER
10158  064770  000000  4$:     .WORD   0               ;DH POINTER GOES HERE
10159  064772  012001  5$:     MOV     (R0)+,R1        ;GET DT POINTER
10160  064774  001455                  BEQ     20$             ;BRANCH IF THERE ARE NONE
10161  064776  005004                  CLR     R4              ;SET INDENT SWITCH
10162  065000  012000                  MOV     (R0)+,R0        ;GET DF POINTER
10163  065002  012002                  MOV     (R0)+,R2        ;STORE NUMBER OF DH'S
10164  065004  001446                  BEQ     17$             ;DH NUM IS 0-BRANCH
10165  065006  005104                  COM     R4              ;NO INDENT
10166  065010  104401  001205          TYPE    ,$CRLF
10167  065014  112003  10$:     MOVB    (R0)+,R3        ;GET & STORE NUMBER OF DATA WORDS
10168  065016  105720                  TSTB    (R0)+           ;BUMP PAST FORMAT WORD
10169  065020  005703                  TST     R3              ;TEST IF ANY DATA FOR THIS HEADER
10170  065022  001407                  BEQ     14$             ;NO - SKIP DATA PRINT
10171  065024  013146  11$:     MOV     @(R1)+,-(SP)    ;PUT FIRST DATA WORD ON STACK
10172  065026  104402                  TYPOC                   ;TYPE IT
10173  065030  005303                  DEC     R3              ;MORE DATA WORDS
10174  065032  001403                  BEQ     14$             ;NO-BRANCH
10175  065034  104401  065164          TYPE    ,SPACE2         ;TYPE SEPARATORS
10176  065040  000771                  BR      11$             ;LOOP
10177  065042  005302  14$:     DEC     R2              ;MORE DH'S?
10178  065044  003431                  BLE     20$             ;NO-BRANCH
10179  065046  104401  001205          TYPE    ,$CRLF
10180  065052  005760  000002          TST     2(R0)           ;ONLY A DH IN THIS REQUEST?
10181  065056  001404                  BEQ     15$             ;YES-BRANCH BYPASS INDENT
10182  065060  005104                  COM     R4              ;INDENT?
10183  065062  001002                  BNE     15$             ;NO-BRANCH
10184  065064  104401  065164          TYPE    ,SPACE2         ;YES-TYPE SPACES
10185  065070  012037  065076  15$:     MOV     (R0)+,16$       ;GET NEXT DH POINTER
10186  065074  104401                  TYPE                    ;TYPE DH
10187  065076  000000  16$:     .WORD   0               ;DH POINTER GOES HERE
10188  065100  105710                  TSTB    (R0)            ;TYPE A DT?
10189  065102  001003                  BNE     21$             ;YES-BRANCH
10190  065104  062700  000002          ADD     #2,R0           ;INCREMENT DF POINTER
10191  065110  000754                  BR      14$             ;SEE IF END OF DF BLOCK
10192  065112  104401  001205  21$:     TYPE    ,$CRLF
10193  065116  005704                  TST     R4              ;INDENT?
10194  065120  001335                  BNE     10$             ;NO-BRANCH
10195  065122  104401  065164  17$:     TYPE    ,SPACE2         ;YES-TYPE SPACES
10196  065126  000732                  BR      10$             ;LOOP
10197  065130  104414  20$:     RESREG
10198
```

```
10199  065132  032777  010000  114000          BIT     #SW12,@SWR      ;SEE IF ABORT DRV AFTER 20 ERRORS
10200  065140  001410                          BEQ     25$             ;BR IF NO
10201  065142  023727  001103  000024          CMP     $ERFLG,#20.     ;ELSE SEE IF HAVE 20 ERRORS
10202  065150  001004                          BNE     25$             ;BR IF NO
10203  065152  012706  001100                  MOV     #STACK,SP       ;ELSE RESTORE STACK PTR
10204  065156  000137  036034                  JMP     $EOP            ;AND GO TO NEXT DRV
10205
10206  065162  000207                  25$:    RTS     PC
10207  065164  020040      000       SPACE2: .ASCIZ/  /              ;2 SPACES
10208                                  ;  ODT-11 -- V005A
10209
10210                                  ; DEC-11-UODPA-A-LA
10211
10212                                  ; COPYRIGHT 1969,1970,1972
10213                                  ; DIGITAL EQUIPMENT CORPORATION
10214                                  ; MAYNARD, MASSACHUSETTS 01754
10215                                          .ENABL  ABS,AMA
10216          065170                          .EVEN
10217          065250                          .=.+60
10218          000000                  R0      =       %0      ; REGISTER
10219          000001                  R1      =       %1      ;  NAMING
10220          000002                  R2      =       %2      ;   CONVENTIONS
10221          000003                  R3      =       %3
10222          000004                  R4      =       %4
10223          000005                  R5      =       %5
10224          000006                  SP      =       %6
10225          000007                  PC      =       %7
10226          177776                  ST      =       177776          ;STATUS REGISTER
10227                                  ;
10228          000014                  Ø.TVEC  =       14              ;TRT VECTOR LOCATION
10229          000340                  Ø.STM   =       340             ;PRIORITY MASK - STATUS REGISTER
10230          000020                  Ø.TBT   =       20              ;T-BIT MASK - STATUS REGISTER
10231          000003                  TRT     =       000003          ;TRT INSTRUCTION
10232          000006                  RTT     =       000006          ;RTT INSTRUCTION
10233                                  ;
10234                                  ; R5 IS USUALLY CONSIDERED SAFE, THE CURRENT ADDRESS WORD
10235                                  ; RESIDES IN IT.  AFTER A BREAKPOINT, IT IS SET TO ZERO, AND SEARCH
10236                                  ; OPERATIONS LEAVE IT RANDOMLY FILLED.  OTHERWISE, IT SHOULD NOT
10237                                  ; BE USED EXCEPT FOR JSR'S AND THE CURRENT ADDRESS POINTER (CAD).
10238                                  ;
```

```
 10239           177562                  O.RDB   =       177562  ;R DATA BUFFER
 10240           177560                  O.RCSR  =       177560  ;R C/SR
 10241           177566                  O.TDB   =       177566  ;T DATA BUFFER
 10242           177564                  O.TCSR  =       177564  ;T C/SR
 10243                                   ;
 10244                                   ;
 10245                                   ; INITIALIZE ODT
 10246                                   ;  USE O.ODT FOR A NORMAL ENTRY
 10247                                   ;  USE O.ODT+2 TO RESTART ODT - WIPING OUT ALL BREAKPOINTS
 10248                                   ;  USE O.ODT+4 TO RE-ENTER (I.E. - FAKE A BREAKPOINT)
 10249                                   ;
 10250  065250  000413                  O.ODT:  BR      O.STRT          ;NORMAL ENTRY
 10251  065252  000417                          BR      O.RST           ;RESTART
 10252  065254  013737  177776  065230  O.ENTR: MOV     ST,O.UST        ;RE-ENTER  --  SAVE STATUS
 10253  065262  013737  000016  177776          MOV     O.TVEC+2,ST     ;SET UP LOCAL STATUS
Z 10254 065270  010737  065226                  MOV     PC,O.UPC        ;FAKE THE PC
 10255  065274  000137  066426                  JMP     O.BK1
 10256                                   ;
 10257  065300  012706  065210          O.STRT: MOV     #O.URO,SP       ;SET UP STACK
 10258  065304  010637  065224                  MOV     SP,O.USP        ;FAKE THE SAVED STACK
 10259  065310  000414                          BR      O.RST1          ;CLEAR BREAKPOINT TABLES
 10260  065312  004037  066634          O.RST:  JSR     0,O.SVR         ;SAVE REGISTERS
 10261  065316  013777  065246  177716          MOV     O.UIN,@O.ADR1   ;REMOVE THE BREAKPOINT
 10262  065324  113704  065232                  MOVB    O.PRI,R4        ;GET ODT PRIORITY
 10263  065330  106004                          RORB    R4              ;SHIFT
 10264  065332  106004                          RORB    R4              ;  INTO
 10265  065334  106004                          RORB    R4              ;    POSITION
 10266  065336  110437  177776                  MOVB    R4,ST           ;STORE IN STATUS
Z 10267 065342  000127                  O.RST1: JMP     (PC)+
 10268  065344  000403                          BR      O.45
 10269  065346  012737  000002  066336          MOV     #RTI,O.RTIT     ;SET TO RTI IF 11/20 OR /05
 10270  065354  105037  067255          O.45:   CLRB    O.P             ;DISALLOW PROCEED
 10271  065360  012737  000340  000016          MOV     #O.STM,O.TVEC+2 ;STATUS WORD TO TRT VECTOR + 2
 10272  065366  012737  066416  000014          MOV     #O.BRK,O.TVEC   ;PC TO TRT VECTOR
 10273  065374  000447                          BR      O.RALL          ;CLEAR BREAKPOINT TABLES
 10274                                   ;
 10275                                   ; SPECIAL NAME HANDLER
 10276                                   ;  DEPENDS UPON THE EXPLICIT ORDER OF THE TWO TABLES O.TL AND O.URO
 10277                                   ;
 10278  065376  004537  067056  O.REGT: JSR     5,O.GET         ;SPECIAL NAME, GET ONE MORE CHARACTER
 10279  065402  012704  067301          MOV     #O.TL,R4        ;TABLE START ADDRESS
 10280  065406  120024          O.RSP:  CMPB    R0,(R4)+        ;IS THIS THE CORRECT CHARACTER?
 10281  065410  001413                  BEQ     O.SP            ;JUMP IF YES
 10282  065412  022704  067307          CMP     #O.TL+O.LG,R4   ;IS THE SEARCH DONE?
 10283  065416  101373                  BHI     O.RSP           ;BRANCH IF NOT
 10284  065420  042700  177770          BIC     #177770,R0      ;MASK OFF OCTAL
 10285  065424  010004                  MOV     R0,R4
 10286  065426  006304          O.SP1:  ASL     R4
 10287  065430  062704  065210          ADD     #O.URO,R4       ;GENERATE ADDRESS
 10288  065434  005202                  INC     R2              ;SET FOUND FLAG
 10289  065436  000444                  BR      O.SCAN          ;GO FIND NEXT CHARACTER
 10290  065440  162704  067272  O.SP:   SUB     #O.TL-7,R4      ;CORRECT CONSTANT
 10291  065444  000770                  BR      O.SP1
 10292                                   ;
 10293                                   ; ← HANDLER - OPEN INDEXED ON THE PC
 10294                                   ;
```

```
10295  065446  004737  067202          0.ORPC: JSR     PC,0.TCLS
10296  065452  010502                          MOV     R5,R2           ;CURRENT ADDRESS IN R2
10297  065454  061202                          ADD     @R2,R2          ;COMPUTE
10298  065456  006202                          ASR     R2              ;MOVE ONE BIT TO CARRY
10299  065460  103421                          BCS     0.ERR           ;ERROR IF ODD NUMBER
10300  065462  006302                          ASL     R2              ;RESTORE WORD
10301  065464  005722                          TST     (R2)+           ; AND INCREMENT BY TWO
10302  065466  010205                          MOV     R2,R5           ;UPDATE CAD
10303  065470  000137  065742                 JMP     0.OP2           ;GO FINISH UP
10304                                  ;
10305                                  ; B HANDLER - SET AND REMOVE BREAKPOINTS
10306                                  ;
10307  065474  005702                  0.BKPT: TST     R2              ;IF NO NUMBER TYPED
10308  065476  001406                          BEQ     0.RALL          ;  REMOVE BREAKPOINT
10309  065500  006204                          ASR     R4              ;CHECK IF ODD
10310  065502  103410                          BCS     0.ERR           ;JUMP IF ODD
10311  065504  006304                          ASL     R4              ;RESTORE ONE BIT
10312  065506  010437  065242                 MOV     R4,0.ADR1       ;SET A BREAKPOINT
10313  065512  000412                          BR      0.DCD
10314  065514  012737  067316  065242  0.RALL: MOV     #0.TRTC,0.ADR1  ;CLEAR BREAKPOINT
10315  065522  000406                          BR      0.DCD
10316
10317                                  ; COMMAND DECODER - ODT11
10318                                  ;
10319                                  ;   REGISTERS R0-R4 MAY BE USED,
10320                                  ;    REGISTER R5 WILL BE CONSIDERED SAFE
10321                                  ;
10322  065524  052705  000001          0.ERR:  BIS     #1,R5           ;CLOSE EVERYTHING
10323  065530  012700  000077                  MOV     #'?,R0          ;  ? TO BE TYPED
10324  065534  004537  067134                  JSR     5,0.FTYP        ; OUTPUT ?
10325  065540  004537  067234          0.DCD:  JSR     5,0.CRLS        ;TYPE  <CR><LF>*
10326  065544  005004          0.DCD1: CLR     R4              ; R4 CONTAINS THE CONVERTED OCTAL
10327  065546  005002                  CLR     R2              ; R2 IS THE NUMBER FOUND FLAG
10328  065550  004537  067056          0.SCAN: JSR     5,0.GET         ;GET A CHAR, RETURN IN R0
10329  065554  022700  000060                  CMP     #'0,R0          ;COMPARE WITH ASCII 0
10330  065560  101013                          BHI     0.CLGL          ;CHECK LEGALITY IF NON-NUMERIC
10331  065562  022700  000067                  CMP     #'7,R0          ;COMPARE WITH ASCII 7
10332  065566  103410                          BLO     0.CLGL          ;CHECK LEGALITY IF NOT OCTAL
10333  065570  042700  177770                  BIC     #177770,R0      ;CONVERT TO BCD
10334  065574  006304                          ASL     R4              ; MAKE ROOM
10335  065576  006304                          ASL     R4              ;  IN
10336  065600  006304                          ASL     R4              ;    R4
10337  065602  060004                          ADD     R0,R4           ;PACK THREE BITS IN R4
10338  065604  005202                          INC     R2              ;R2 HAS NUMERIC FLAG
10339  065606  000760                          BR      0.SCAN          ;   AND TRY AGAIN
10340  065610  005001          0.CLGL: CLR     R1              ;CLEAR INDEX
10341  065612  120061  067265  0.LGL1: CMPB    R0,0.LGCH(R1)   ;DO THE CODES MATCH?
10342  065616  001405                          BEQ     0.LGL2          ;JUMP IF YES
10343  065620  005201                          INC     R1              ; SET INDEX FOR NEXT SEARCH
10344  065622  020127  000014                  CMP     R1,#0.CLGT      ;IS THE SEARCH DONE?
10345  065626  103336                          BHIS    0.ERR           ;    OOPS!
10346  065630  000770                          BR      0.LGL1          ;RE-LOOP
10347  065632  006301          0.LGL2: ASL     R1              ;MULTIPLY BY TWO
10348  065634  000171  065640                 JMP     @0.LGDR(R1)     ;GO TO PROPER ROUTINE
10349
10350  065640  065670          0.LGDR: 0.WRD   ; /    OPEN WORD
```

```
 10351  065642  065722                    0.CRET  ;  CARRIAGE RETURN    CLOSE
 10352  065644  065376                    0.REGT  ;  $  REGISTER OPS
 10353  065646  066232                    0.GO    ;  G  GO TO ADDRESS K
 10354  065650  065734                    0.OP1   ;  <LF>  MODIFY, CLOSE, OPEN NEXT
 10355  065652  065446                    0.ORPC  ;  ←  OPEN RELATED, INDEX - PC
 10356  065654  065766                    0.BACK  ;  ↑  OPEN PREVIOUS
```

```
10357  065656  065776                          0.OFST  ;  O  OFFSET
10358  065660  066054                          0.WSCH  ;  W  SEARCH WORD
10359  065662  066050                          0.EFF   ;  E  SEARCH EFFECTIVE ADDRESS
10360  065664  065474                          0.BKPT  ;  B  BREAKPOINTS
10361  065666  066340                          0.PROC  ;  P  PROCEED
10362          000030                  0.LGL   =       .-0.LGDR        ;LGL MUST EQUAL 2X CHLGT ALWAYS
10363                                          ;
10364                                          ; PROCESS / - OPEN WORD
10365                                          ;
10366  065670  005702                  0.WRD:  TST     R2              ;GET VALUE IF R2 IS NON-ZERO
10367  065672  001410                          BEQ     0.WRDA          ;SKIP OTHERWISE
10368  065674  010405                          MOV     R4,R5           ;   PUT VALUE IN CAD
10369  065676  006205                  0.WRD1: ASR     R5              ;MOVE ONE BIT TO CARRY
10370  065700  103711                  0.ERR2: BCS     0.ERR           ;JUMP IF ODD ADDRESS
10371  065702  006305                          ASL     R5              ;RESTORE THE CARRY BIT
10372  065704  011500                          MOV     @R5,R0          ;GET CONTENTS OF WORD
10373  065706  004537  066772                  JSR     5,0.CADV        ;GO GET AND TYPE OUT @CAD
10374  065712  000714                          BR      0.DCD1          ;GO BACK TO DECODER
10375  065714  042705  000001          0.WRDA: BIC     #1,R5           ;CLEAR CLOSED BIT
10376  065720  000766                          BR      0.WRD1          ;GO BACK TO MAIN-LINE
10377
10378                                          ;
10379                                          ; PROCESS CARRIAGE RETURN
10380  065722  004737  067202                  ;
10381  065726  052705  000001          0.CRET: JSR     PC,0.TCLS       ;CLOSE LOCATION
10382  065732  000702                          BIS     #1,R5           ;CLOSE EVERYTHING
10383                                          BR      0.DCD           ;RETURN TO DECODER
10384                                          ;
10385                                          ; PROCESS <LF>, OPEN NEXT WORD
10386  065734  004737  067202                  ;
10387  065740  005725                  0.OP1:  JSR     PC,0.TCLS       ;CLOSE PRESENT CELL
10388  065742  004537  067226                  TST     (R5)+           ;GENERATE NEW ADDRESS
10389  065746  010500                  0.OP2:  JSR     5,0.CRLF        ;<CR><LF>
10390  065750  004537  066772                  MOV     R5,R0           ;NUMBER TO TYPE
10391  065754  012700  000057                  JSR     5,0.CADV        ;  TYPE OUT ADDRESS
10392  065760  004537  067134                  MOV     #'/,R0          ;TYPE A /
10393  065764  000744                          JSR     5,0.FTYP
10394                                          BR      0.WRD1          ;GO PROCESS IT
10395                                          ;
10396                                          ; PROCESS ↑, OPEN PREVIOUS WORD
10397  065766  004737  067202                  ;
10398  065772  005745                  0.BACK: JSR     PC,0.TCLS
10399  065774  000762                          TST     -(R5)           ;GENERATE NEW ADDRESS
10400                                          BR      0.OP2           ;GO DO THE REST
10401                                          ;
10402                                          ; PROCESS 0, COMPUTE OFFSET
10403  065776  006205                          ;
10404  066000  103737                  0.OFST: ASR     R5              ;GET LOW ORDER BIT
10405  066002  006305                          BCS     0.ERR2          ;ERROR IF CLOSED
10406  066004  012700  000040                  ASL     R5              ;RESTORE WORD
10407  066010  004537  067134                  MOV     #' ,R0          ;TYPE ONE BLANK
10408  066014  160504                          JSR     5,0.FTYP        ;  AS A SEPARATOR
10409  066016  005304                          SUB     R5,R4           ;COMPUTE
10410  066020  005304                          DEC     R4
10411  066022  010400                          DEC     R4              ;     16 BIT OFFSET
10412  066024  010402                          MOV     R4,R0           ;TYPE A
                                                MOV     R4,R2           ;SAVE R4
```

```
10413  066026  004537  066772          JSR     5,0.CADV        ;NUMBER IN R0 - WORD MODE
10414  066032  010200                  MOV     R2,R0
10415  066034  006200                  ASR     R0              ;DIVIDE BY TWO
10416  066036  103402                  BCS     0.OF1           ;BRANCH IF ODD
10417  066040  004537  066772          JSR     5,0.CADV        ;NUMBER IN R0 - BYTE MODE
10418  066044  000137  065544  0.OF1:  JMP     0.DCD1          ;ALL DONE
10419                                  ;
10420                                  ; SEARCHES - $MSK   HAS THE MASK
10421                                  ;            $MSK+2 HAS THE FWA
10422                                  ;            $MSK+4 HAS THE LWA
```

```
10423
10424  066050  005201                  Ò.EFF:  INC     R1              ;SET EFFECTIVE SEARCH
10425  066052  000401                          BR      O.WDS
10426  066054  005001                  O.WSCH: CLR     R1              ;SET WORD SEARCH
10427  066056  005702                  O.WDS:  TST     R2              ;CHECK FOR OBJECT FOUND
10428  066060  001621                  O.ERR1: BEQ     O.ERR           ;ERROR IF NO OBJECT
10429  066062  013702  065236                  MOV     O.MSK+2,R2      ;SET ORIGIN
10430  066066  013705  065234                  MOV     O.MSK,R5        ;SET MASK
10431  066072  005105                          COM     R5              ;AND COMPLEMENT IT
10432  066074  020237  065240          O.WDS2: CMP     R2,O.MSK+4      ; IS THE SEARCH ALL DONE?
10433  066100  101217                          BHI     O.DCD           ;  YES
10434  066102  011200                          MOV     @R2,R0          ; GET OBJECT
10435  066104  005701                          TST     R1              ;NO
10436  066106  001027                          BNE     O.EFF1          ;BRANCH IF EFFECTIVE SEARCH
10437  066110  010046                          MOV     R0,-(SP)
10438  066112  010403                          MOV     R4,R3           ;EXCLUSIVE OR
10439  066114  040400                          BIC     R4,R0           ; IS DONE
10440  066116  042603                          BIC     (SP)+,R3        ;          IN A VERY
10441  066120  050003                          BIS     R0,R3           ;     FANCY MANNER HERE
10442  066122  040503                          BIC     R5,R3           ;AND RESULT WITH MASK
10443  066124  001016                  O.WDS3: BNE     O.WDS4          ;RE-LOOP IF NO MATCH
10444  066126  010446                          MOV     R4,-(SP)        ;REGISTERS R2,R4, AND R5 ARE SAFE
10445  066130  004537  067226                  JSR     5,Ò.CRLF        ;TYPE <CR,LF>
10446  066134  010200                          MOV     R2,R0           ;GET READY TO TYPE
10447  066136  004537  066772                  JSR     5,Ò.CADV        ;  TYPE ADDRESS
10448  066142  012700  000057                  MOV     #'/,R0          ;SLASH TO R0
10449  066146  004537  067134                  JSR     5,O.FTYP        ;TYPE IT
10450  066152  011200                          MOV     @R2,R0          ;GET CONTENTS
10451  066154  004537  066772                  JSR     5,O.CADV        ;TYPE CONTENTS
10452  066160  012604                          MOV     (SP)+,R4        ; RESTORE R4
10453  066162  005722                  O.WDS4: TST     (R2)+           ;INCREMENT TO NEXT CELL AND
10454  066164  000743                          BR      O.WDS2          ;     RETURN
10455  066166  020004                  O.EFF1: CMP     R0,R4           ; IS (X)=K?
10456  066170  001755                          BEQ     O.WDS3          ;TYPE IF EQUAL
10457  066172  010003                          MOV     R0,R3           ;(X) TO R3
10458  066174  060203                          ADD     R2,R3           ;(X)+X
10459  066176  005203                          INC     R3
10460  066200  005203                          INC     R3              ;(X)+X+2
10461  066202  020304                          CMP     R3,R4           ;IS (X)+X+2=K?
10462  066204  001747                          BEQ     O.WDS3          ;BRANCH IF EQUAL
10463  066206  042700  177400                  BIC     #177400,R0      ;WIPE OUT EXTRANEOUS BITS
10464  066212  110000                          MOVB    R0,R0           ;EXTEND SIGN
10465  066214  000257                          CCC
10466  066216  006300                          ASL     R0              ;MULTIPLY BY TWO
10467  066220  005200                          INC     R0              ;ADD TWO
10468  066222  005200                          INC     R0
10469  066224  060200                          ADD     R2,R0           ;ADD PC
10470  066226  020004                          CMP     R0,R4           ;IS THE RESULT A PROPER REL. BRANCH?
10471  066230  000735                          BR      O.WDS3
10472
10473                                  ;
                                       ; PROCESS G - GO
10474                                  ;
10475  066232  105037  067255          Ò.GO:   CLRB    O.P             ;DISALLOW PROCEED
10476  066236  006204                          ASR     R4              ;CHECK LOW ORDER BIT
10477  066240  103617                          BCS     O.ERR2          ;ERROR IF ODD NUMBER
10478  066242  006304                          ASL     R4              ;RESTORE WORD
```

```
10479  066244  010437  065226                  MOV     R4,0.UPC        ;SET UP NEW PC
10480  066250  112737  000340  177776          MOVB    #0.STM,ST       ;SET HIGH PRIORITY
10481  066256  004537  066724                  JSR     5,0.RSTT        ;RESTORE TELETYPE
10482  066262  105037  067254          0.TBIT: CLRB    0.T             ;CLEAR BOTH
10483  066266  042737  000020  065230          BIC     #0.TBT,0.UST    ;  T-BIT FLAGS
10484  066274  017737  176742  065246          MOV     @0.ADR1,0.UIN   ;SAVE INSTRUCTION
10485  066302  013777  067316  176732          MOV     0.TRTC,@0.ADR1  ;REPLACE WITH TRAP
10486  066310  012600                  0.GO2:  MOV     (SP)+,R0        ;RESTORE
10487  066312  012601                          MOV     (SP)+,R1        ;  R0
10488  066314  012602                          MOV     (SP)+,R2        ;    THRU
10489  066316  012603                          MOV     (SP)+,R3
10490  066320  012604                          MOV     (SP)+,R4        ;
10491  066322  012605                          MOV     (SP)+,R5        ;     R5
10492  066324  012606                          MOV     (SP)+,SP        ;  AND SP
10493  066326  013746  065230                  MOV     0.UST,-(SP)     ;     AND STATUS
10494  066332  013746  065226                  MOV     0.UPC,-(SP)     ;     AND PC
10495  066336  000006                  0.RTIT: RTT                     ;CHANGED TO RTI FOR 11/20 AND /05
10496                                  ;
10497                                  ;  PROCESS P - PROCEED
10498                                  ;    ONLY ALLOWED AFTER A BREAKPOINT
10499                                  ;
10500  066340  105737  067255          0.PROC: TSTB    0.P             ;CHECK LEGALITY OF PROCEED
10501  066344  001645                          BEQ     0.ERR1          ;NOT LEGAL
10502  066346  105037  067255                  CLRB    0.P             ;CLEAR PROCEED FLAG
10503  066352  005702                          TST     R2              ;WAS COUNT SPECIFIED?
10504  066354  001402                          BEQ     0.PR1           ;NO
10505  066356  010437  065244                  MOV     R4,0.CT         ;YES, PUT AWAY COUNT
10506  066362  112737  000340  177776  0.PR1:  MOVB    #0.STM,ST       ;FORCE HIGH PRIORITY
10507  066370  004537  066724                  JSR     5,0.RSTT        ;RESTORE TTY
10508  066374  112737  000340  177776  0.C1:   MOVB    #0.STM,ST       ;SET HIGH PRIORITY
10509  066402  105237  067254                  INCB    0.T             ;SET T-BIT FLAG
10510  066406  052737  000020  065230          BIS     #0.TBT,0.UST    ;SET T-BIT
10511  066414  000735                          BR      0.GO2
10512                                  ;
10513                                  ;  BREAKPOINT HANDLER
10514                                  ;   A TRT BREAKPOINT CAUSES 0.BRK TO BE ENTERED, WHICH SAVES
10515                                  ;   VARIOUS ODDS AND ENDS, FINDS OUT IF THE BREAKPOINT WAS LEGAL,
10516                                  ;   AND GIVES CONTROL TO THE COMMAND DECODER
10517                                  ;
10518  066416  012637  065226          0.BRK:  MOV     (SP)+,0.UPC     ;PRIORITY IS 7 UPON ENTRY
10519  066422  012637  065230                  MOV     (SP)+,0.UST     ;SAVE STATUS AND PC
10520  066426  004037  066634          0.BK1:  JSR     0,0.SVR         ;SAVE VARIOUS REGISTERS
10521  066432  105737  067254                  TSTB    0.T             ;CHECK FOR T-BIT SET
10522  066436  001311                          BNE     0.TBIT          ;JUMP IF SET
10523  066440  013777  065246  176574          MOV     0.UIN,@0.ADR1   ;REMOVE BREAKPOINTS
10524  066446  105737  065232                  TSTB    0.PRI           ;CHECK IF PRIORITY
10525  066452  100003                          BPL     0.BK2           ;  IS AS SAME AS USER PGM
10526  066454  113705  065230                  MOVB    0.UST,R5        ;PICK UP USER UST IF SO
10527  066460  000407                          BR      0.BK3           ;AND DON'T COMPUTE THE PRIORITY
10528  066462  113705  065232          0.BK2:  MOVB    0.PRI,R5        ;OTHERWISE PICK UP ACTUAL PRIORITY
10529  066466  000257                          CCC                     ;CLEAR CARRY
10530  066470  106005                          RORB    R5              ;SHIFT LOW ORDER BITS
10531  066472  106005                          RORB    R5              ;  INTO
10532  066474  106005                          RORB    R5              ;    HIGH ORDER
10533  066476  106005                          RORB    R5              ;      POSITION
10534  066500  110537  177776          0.BK3:  MOVB    R5,ST           ;PUT THE STATUS AWAY WHERE IT BELONGS
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10535  066504  013705  065226            MOV     0.UPC,R5        ;GET PC, IT POINTS TO THE TRT
10536  066510  005745                    TST     -(R5)           ;SUBTRACT TWO
10537  066512  010537  065226            MOV     R5,0.UPC        ;FROM THE USER'S PC
10538  066516  020537  065242            CMP     R5,0.ADR1       ;COMPARE WITH LIST
10539  066522  001417                    BEQ     0.B2            ;JUMP IF FOUND
10540  066524  004537  066672            JSR     5,0.SVTT        ;SAVE TELETYPE STATUS
10541  066530  004537  067226            JSR     5,0.CRLF
10542  066534  012704  067260            MOV     #0.BD,R4        ;ERROR, NOTHING FOUND
10543  066540  012703  067261            MOV     #0.BD+1,R3
10544  066544  004537  067120            JSR     5,0.TYPE        ;OUTPUT "BE" FOR BAD ENTRY
10545  066550  010500                    MOV     R5,R0
10546  066552  042737  000020  065230    BIC     #0.TBT,0.UST    ;CLEAR OUT ANY POSSIBLE FAKE T-BIT
10547  066560  000420                    BR      0.B3            ; AND CONTINUE
10548  066562  005337  065244    0.B2:   DEC     0.CT
10549  066566  003302                    BGT     0.C1            ;JUMP IF REPEAT
10550  066570  012737  000001  065244    MOV     #1,0.CT         ;RESET COUNT TO 1
10551  066576  105237  067255            INCB    0.P             ;ALLOW PROCEED
10552  066602  004537  066672            JSR     5,0.SVTT        ;SAVE TELETYPE STATUS, R4 IS SAFE
10553  066606  012700  000102            MOV     #'B,R0
10554  066612  004537  067134            JSR     5,0.FTYP        ;TYPE "B"
10555  066616  013700  065242            MOV     0.ADR1,R0       ;GET ADDRESS OF BREAK
10556  066622  004537  066772    0.B3:   JSR     5,0.CADV        ;TYPE ADDRESS
10557  066626  005005                    CLR     R5              ;CLEAR CAD
10558  066630  000137  065540            JMP     0.DCD           ;GO TO DECODER
10559                                    ;
10560                                    ; SAVE REGISTERS R0-R6 IN INTERNAL STACK
10561                                    ;
10562  066634  012637  067252    0.SVR:  MOV     (SP)+,0.XXX     ;PICK REGISTER FROM STACK AND SAVE
10563  066640  010637  065224            MOV     SP,0.USP        ;SAVE USER STACK ADDRESS
10564  066644  012706  065224            MOV     #0.USP,SP       ;SET TO INTERNAL STACK
10565  066650  010546                    MOV     R5,-(SP)        ;SAVE
10566  066652  010446                    MOV     R4,-(SP)        ; REGISTERS
10567  066654  010346                    MOV     R3,-(SP)        ;1
10568  066656  010246                    MOV     R2,-(SP)        ; THRU
10569  066660  010146                    MOV     R1,-(SP)        ;    5
10570  066662  013746  067252            MOV     0.XXX,-(SP)     ;PUT SAVED REGISTER ON STACK
10571  066666  005746                    TST     -(SP)
10572  066670  000200                    RTS     R0
10573                                    ;
10574                                    ; SAVE TELETYPE STATUS
10575                                    ;
10576  066672  113737  177560  067256    0.SVTT: MOVB    0.RCSR,0.CSR1   ;SAVE R C/SR
10577  066700  113737  177564  067257            MOVB    0.TCSR,0.CSR2   ;SAVE T C/SR
10578  066706  105037  177560                    CLRB    0.RCSR          ;CLEAR ENABLE AND MAINTENANCE
10579  066712  105037  177564                    CLRB    0.TCSR          ;  BITS IN BOTH C/SR
10580  066716  004537  067226                    JSR     5,0.CRLF        ;TYPE <CR,LF>
10581  066722  000205                            RTS     R5
10582                                    ;
10583                                    ; RESTORE TELETYPE STATUS
10584                                    ;
10585  066724  004537  067226    0.RSTT: JSR     5,0.CRLF                ;<CR,LF> BEFORE RESTORING
10586  066730  105737  177564            TSTB    0.TCSR          ;WAIT READY ON PRINTER
10587  066734  100375                    BPL     .-4
10588  066736  032737  004000  177560    BIT     #4000,0.RCSR    ;CHECK BUSY FLAG ON READER
10589  066744  001403                    BEQ     0.RSE1          ;SKIP READY LOOP IF NOT BUSY
10590  066746  105737  177560            TSTB    0.RCSR          ;WAIT READY
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10591  066752  100375                          BPL     .-4             ;    ON READER
10592  066754  113737  067256  177560  O.RSE1: MOVB    O.CSR1,O.RCSR   ;RESTORE
10593  066762  113737  067257  177564          MOVB    O.CSR2,O.TCSR   ;  THE STATUS REGISTERS
10594  066770  000205                          RTS     R5
10595                                  ;
10596                                  ; TYPE OUT CONTENTS OF WORD OR BYTE WITH ONE TRAILING SPACE
10597                                  ; WORD IS IN R0
10598                                  ;
10599  066772  010246                  O.CADV: MOV     R2,-(SP)        ;SAVE R2
10600  066774  012704  067315                  MOV     #O.BUF+6,R4     ;BUFFER START ADDRESS
10601  067000  012746  000060                  MOV     #'0,-(SP)               ;CONSTANT ASCII 0
10602  067004  010002                  O.SPC:  MOV     R0,R2           ; GET
10603  067006  042702  177770                  BIC     #177770,R2      ;    OCTAL CHARACTER
10604  067012  061602                          ADD     @SP,R2          ;CONVERT TO ASCII
10605  067014  110244                          MOVB    R2,-(R4)        ;STORE IN BUFFER
10606  067016  006200                          ASR     R0              ;SHIFT THIS MESS
10607  067020  006200                          ASR     R0              ; RIGHT
10608  067022  006200                          ASR     R0              ;    THREE WHOLE PLACES
10609  067024  020427  067310                  CMP     R4,#O.BUF+1     ;DONE?
10610  067030  101365                          BHI     O.SPC           ;    NO
10611  067032  042700  177776                  BIC     #177776,R0      ;GET LAST BIT
10612  067036  062600                          ADD     (SP)+,R0                ;CONVERT TO ASCII
10613  067040  110044                          MOVB    R0,-(R4)        ;AND PUT IT AWAY
10614  067042  012703  067315                  MOV     #O.BUF+6,R3     ;LWA
10615  067046  004537  067120                  JSR     5,O.TYPE        ;TYPE WHOLE STRING OF CHARACTERS
10616  067052  012602                          MOV     (SP)+,R2        ;RESTORE R2
10617  067054  000205                          RTS     R5
10618                                  ;
10619                                  ; GENERAL CHARACTER INPUT ROUTINE
10620                                  ; CHARACTER INPUT GOES TO R0
10621                                  ;
10622  067056  105737  177560          O.GET:  TSTB    O.RCSR          ;WAIT FOR
10623  067062  100375                          BPL     .-4             ;    INPUT FROM KEYBOARD
10624  067064  113700  177562                  MOVB    O.RDB,R0        ;GET A CHARACTER
10625  067070  004537  067134                  JSR     5,O.FTYP        ;ECHO CHARACTER
10626  067074  042700  177600                  BIC     #177600,R0      ;STRIP OFF PARITY FROM CHARACTER
10627  067100  001766                          BEQ     O.GET           ;IGNORE NULLS
10628  067102  122700  000040                  CMPB    #40,R0          ;CHECK FOR SPACES
10629  067106  001763                          BEQ     O.GET           ;IGNORE NULLS
10630  067110  122700  000073                  CMPB    #';,R0          ;CHECK FOR SEMI-COLON
10631  067114  001760                          BEQ     O.GET           ;IGNORE THEM IF FOUND
10632  067116  000205                          RTS     R5
10633                                  ;
10634                                  ; GENERAL CHARACTER OUTPUT ROUTINE
10635                                  ;  ADDRESS OF FIRST BYTE IN R4,
10636                                  ;  ADDRESS OF LAST BYTE IN R3, (R3)>(R4)
10637                                  ;
10638  067120  020304                  O.TYPE: CMP     R3,R4           ;CHECK FOR COMPLETION
10639  067122  103426                          BLO     O.TYP1          ;  EXIT WHEN DONE
10640  067124  112400                          MOVB    (R4)+,R0        ;GET A CHARACTER
10641  067126  004537  067134                  JSR     5,O.FTYP        ;TYPE ONE CHARACTER
10642  067132  000772                          BR      O.TYPE          ;LOOP UNTIL DONE
10643                                  ;
10644                                  ; TYPE ONLY ONE CHARACTER (CONTAINED IN R0)
10645                                  ;
10646  067134  105737  177564          O.FTYP: TSTB    O.TCSR          ;CHECK STATUS
```

```
10647  067140  100375                  BPL     .-4             ;WAIT UNTIL READY
10648  067142  110037  177566          MOVB    R0,@#TDB        ;TYPE ONE CHARACTER
10649  067146  120037  000045          CMPB    R0,@#45         ;IS CHAR TO BE FILLED?
10650  067152  001012                  BNE     10$             ;NO
10651  067154  113746  000044          MOVB    @#44,-(SP)      ;YES, INIT THE COUNT
10652  067160  105737  177564  20$:    TSTB    @#TCSR
10653  067164  100375                  BPL     20$
10654  067166  105037  177566          CLRB    @#TDB           ;GENERATE NULL FILLER
10655  067172  105316                  DECB    @SP
10656  067174  003371                  BGT     20$
10657  067176  005726                  TST     (SP)+           ;POP STACK
10658  067200  000205          10$:    RTS     R5
10659                                  ;
10660                                  ; CLOSE WORD OR BYTE AND EXIT,
10661                                  ; UPON ENTERING, R2 HAS NUMERIC FLAG, R4 HAS CONTENTS
10662                                  ;
10663  067202  006205          TCLS:   ASR     R5              ;GET LOW ORDER BIT
10664  067204  103405                  BCS     TC              ;JUMP IF ALREADY CLOSED
10665  067206  006305                  ASL     R5
10666  067210  005702                  TST     R2              ;IF NO NUMBER WAS TYPED THERE IS
10667  067212  001401                  BEQ     CLS1            ;NO CHANGE TO THE OPEN CELL
10668  067214  010415                  MOV     R4,@R5          ;STORE WORD
10669  067216  000207          CLS1:   RTS     PC
10670  067220  005746          TC:     TST     -(SP)           ;POP EXTRA CELL FROM STACK
10671  067222  000137  065524          JMP     ERR             ;AND SCREAM BLOODY MURDER
10672                                  ;
10673                                  ; CRLF - TYPE <CR,LF>
10674                                  ; CRLS - TYPE <CR,LF>*
10675                                  ;
10676  067226  012703  067263  CRLF:   MOV     #CR+1,R3        ;LWA <CR,LF>
10677  067232  000402                  BR      CRS
10678  067234  012703  067264  CRLS:   MOV     #CR+2,R3        ;LWA <CR,LF>*
10679  067240  012704  067262  CRS:    MOV     #CR,R4          ;FWA
10680  067244  004537  067120          JSR     5,TYPE          ;TYPE SOMETHING
10681  067250  000205                  RTS     R5
10682                                  ;
10683  067252  000000          XXX:    .WORD   0               ;TEMPORARY STORAGE
10684  067254  000             T:      .BYTE   0               ;  T-BIT FLAG
10685  067255  000             P:      .BYTE   0               ;PROCEED FLAG = 0 IF PROCEED NOT ALLOWED
10686                                                          ;               = 1 IF PROCEED ALLOWED
10687  067256  000             CSR1:   .BYTE   0               ;SAVE CELL - R C/SR
10688  067257  000             CSR2:   .BYTE   0               ;SAVE CELL - T C/SR
10689                                  ;
10690                                  .EVEN
10691  067260  042502          BD:     .WORD   "BE
10692                                  ;
10693  067262  015             CR:     .BYTE   015     ;  <CR>
10694  067263  012                     .BYTE   012     ;  <LF>
10695  067264  052                     .BYTE   '*      ;  *
10696                                  ;
10697  067265  057             LGCH:   .BYTE   '/      ;  /
10698  067266  015                     .BYTE   015     ;  CARRIAGE RETURN
10699  067267  044                     .BYTE   '$      ;  $
10700  067270  107                     .BYTE   'G      ;  G
10701  067271  012                     .BYTE   012     ;  <LF>
10702  067272  137                     .BYTE   '_      ;  _
```

```
10703  067273  136                     .BYTE   'Z      ;  Z
10704  067274  117                     .BYTE   'O      ;  O
10705  067275  127                     .BYTE   'W      ;  W
10706  067276  105                     .BYTE   'E      ;  E
10707  067277  102                     .BYTE   'B      ;  B
10708  067300  120                     .BYTE   'P      ;  P
10709          000014           0.CLGT  =       .-0.LGCH                ;TABLE LENGTH
10710                                  ;
10711  067301  123             0.TL:   .BYTE   'S      ;DO        1
10712  067302  120                     .BYTE   'P      ;NOT       2
10713  067303  115                     .BYTE   'M      ;CHANGE    3
10714  067304  000                     .BYTE   0       ;THE       4
10715  067305  000                     .BYTE   0       ;ORDER     5
10716  067306  102                     .BYTE   'B      ;HERE      6
10717          000006           0.LG    =       .-0.TL
10718                                  ;
10719  067307                  0.BUF:                          ;6 CHAR. BUFFER WITH
10720          067315           .      =       .+6
10721  067315  040                     .BYTE                   ;TRAILING BLANK
10722                                  .EVEN
10723                                  ;
10724  067316  000003          0.TRTC: TRT                     ;TRACE TRAP PROTOTYPE
10725                                  ;
10726                                  ;THE ORDER OF THE FOLLOWING ENTRIES IS CRITICAL
10727                                  ;
10728          065210           .      =       0.ODT-40
10729  065210  000000          0.URO:  0       ;USER R0
10730  065212  000000                  0       ;      R1
10731  065214  000000                  0       ;      R2
10732  065216  000000                  0       ;      R3
10733  065220  000000                  0       ;      R4
10734  065222  000000                  0       ;      R5
10735  065224  000000          0.USP:  0       ;USER SP
10736  065226  000000          0.UPC:  0       ;USER PC
10737  065230  000000          0.UST:  0       ;USER ST
10738  065232  000007          0.PRI:  7       ;ODT PRIORITY
10739  065234  000000          0.MSK:  0       ;MASK
10740  065236  000000                  0       ;LOW LIMIT
10741  065240  000000                  0       ;HIGH LIMIT
10742                                  ;
10743                                  ; BREAK POINT LISTS, ADR1 = ADDRESS OF BREAKPOINT,CT = COUNT,
10744                                  ;   UIN = CONTENTS
10745                                  ;
10746  065242  000000          0.ADR1: 0
10747  065244  000000          0.CT:   0
10748  065246  000000          0.UIN:  0
10749          000001                  .END
```

```
ABASE = 177440          1658    1699    1713#
ACDW1 = 000000          1658    1701
ACDW2 = 000000          1658    1702
ACLO  = 000010          1343#
ACPUOP= 000000          1658    1673
ACT11   007504          1899#   3108*
ADDW0 = 000000          1658    1703
ADDW1 = 000000          1658    1704
ADDW10= 000000          1658
ADDW11= 000000          1658
ADDW12= 000000          1658
ADDW13= 000000          1658
ADDW14= 000000          1658
ADDW15= 000000          1658
ADDW2 = 000000          1658    1705
ADDW3 = 000000          1658    1706
ADDW4 = 000000          1658    1707
ADDW5 = 000000          1658    1708
ADDW6 = 000000          1658    1709
ADDW7 = 000000          1658    1710
ADDW8 = 000000          1658
ADDW9 = 000000          1658
ADEVCT= 000000          1658    1664
ADEVM = 000000          1658    1700
AENV  = 000000          1658    1669
AENVM = 000000          1658    1670
AFATAL= 000000          1658    1661
AMADR1= 000000          1658    1686
AMADR2= 000000          1658    1690
AMADR3= 000000          1658    1693
AMADR4= 000000          1658    1696
AMAMS1= 000000          1658    1680
AMAMS2= 000000          1658    1688
AMAMS3= 000000          1658    1691
AMAMS4= 000000          1658    1694
AMSGAD= 000000          1658    1666
AMSGLG= 000000          1658    1667
AMSGTY= 000000          1658    1660
AMTYP1= 000000          1658    1681
AMTYP2= 000000          1658    1689
AMTYP3= 000000          1658    1692
AMTYP4= 000000          1658    1695
APASS = 000000          1658    1663
APRIOR= 000000          1658
APTCSU= 000040          8071    8243#
APTENV= 000001          8018    8064    8199    8241#
APTSIZ= 000200          3037    8240#
APTSPO= 000100          8066    8201    8242#
ASWREG= 000000          1658    1671
ATESTN= 000000          1658    1662
ATTN    007360          1832#   6755    6774    6800    7540
AUNIT = 000000          1658    1665
AUSWR = 000000          1658    1672
AVECT1= 000000          1658    1697
AVECT2= 000000          1658    1698
AVGSP   043112          6486    6491    7584#
```

```
AVGTIM  043052          6013    6088    6093    6205    6210    6322    6327    7569#
BADHDR  007354          1822#   3116*   3790*   3924*   4194*   4384*   5504*   5724*   5727*   7724
BADTMO  044000          3188    7781#
BAI     = 000020        1306#   3935    4086    4224    4294    4697    4760    4888    5055    5132    5255    5317    5442
                        5574    5620
BA16    = 000400        1292#
BA17    = 001000        1293#
BIT0    = 000001        1235#   1289    1321    1340    1889    3227    7670
BIT00   = 000001        1225#   1235
BIT01   = 000002        1224#   1234
BIT02   = 000004        1223#   1233
BIT03   = 000010        1222#   1232
BIT04   = 000020        1221#   1231
BIT05   = 000040        1220#   1230
BIT06   = 000100        1219#   1229
BIT07   = 000200        1218#   1228
BIT08   = 000400        1217#   1227    7953
BIT09   = 001000        1216#   1226    7961    8029
BIT1    = 000002        1234#   1322    1890
BIT10   = 002000        1215#   1294    1312    1331    1363    1377    1391    1404    1418    8006
BIT11   = 004000        1214#   1295    1313    1332    1349    1364    1378    1392    1405    1419    6402    6410    6446
                        6454    7968
BIT12   = 010000        1213#   1296    1314    1333    1365    1379    1393    1406    1420
BIT13   = 020000        1212#   1297    1315    1334    1350    1366    1380    1394    1407    1421    8013
BIT14   = 040000        1211#   1298    1316    1335    1351    1367    1381    1395    1408    1422    1435    7251    7262
                        7939
BIT15   = 100000        1210#   1299    1300    1317    1336    1352    1368    1438    5506    5669    7247    7258
BIT2    = 000004        1233#   1323    1342    1891
BIT3    = 000010        1232#   1305    1324    1343
BIT4    = 000020        1231#   1306    1325    1344    1357    1385    1412
BIT5    = 000040        1230#   1307    1326    1345    1358    1372    1386    1399    1413
BIT6    = 000100        1229#   1290    1308    1327    1346    1359    1373    1387    1400    1414
BIT7    = 000200        1228#   1291    1309    1328    1347    1360    1374    1388    1401    1415    3217    4456    4500
                        4552    4651    4913
BIT8    = 000400        1227#   1292    1310    1329    1348    1361    1375    1389    1402    1416
BIT9    = 001000        1226#   1293    1311    1330    1362    1376    1390    1403    1417
BPTVEC= 000014          1242#
BSE     = 000200        1328#   3837    3946    4011    4236    4712    5068    5266
BSERR   001526          1805#   3692*   3697*   3781
BSE20H  002352          1814#   3713    7256    7361
BSE20S  004352          1816#   3722    7260    7365
BSE22H  003352          1815#   3632    3694    3731    7245    7350
BSE22S  005352          1817#   3704    7249    7354
BYP     037250          3297    3320    3324    3339    3391    3399    3417    3421    3425    3429    6827#
BYPCER  001532          1807#   3214*   3443*   6941
BYPTIM  001342          1730#   2950*   2955*   2960*   2965*   2970*   2975*   5750
BYPWRT  001340          1729#   2949*   2954*   2959*   2964*   2969*   2974*   3775
BYTIM   012642          1454    2958#
BYTIMA  012704          1460    2968#
BYWRT   012622          1452    2953#
BYWRTA  012662          1458    2963#
CALADD  001366          1742#   3906*   4197*   4366*   5678*   7218    7224    7226    7280
CALCLK  042262          5766    5839    5957    6031    6148    6265    7412#
CALDIF  001360          1739#   5567*   9969    9981
CCLR    = 100000        1300#   3593    3611    3847    3956    4246    4470    4481    4722    4876    4946    4964    5042
                        5078    5193    5211    5276    5375    5393    5776    6102    6120    6219    6237    6336    6354
```

```
                    6500    6518    6982    6992    7002    7012    7728    7746
CCYL    001354      1737#   7382
CDT     = 002000    1294#
CERR    = 100000    1299#   3277    3377    3644    3750    3809    3834    3917    3943    4009    4096    4208    4233
                    4302    4377    4523    4580    4644    4709    4769    5065    5141    5263    5325    5457    5530
                    5553    5587    5633    5689    5714    6056    6173    6290    6422    6466    6943    7038
CFMT    = 010000    1296#   4203    4228    4268    4297    4331    5963    7347
CHKFLG  001534      1808#   6837*   6919    6922    6926
CHKMSG  037264      3656    3859    3878    3968    3987    4035    4052    4115    4134    4169    4258    4286    4321
                    4349    4421    4442    4492    4544    4607    4734    4753    4788    4807    4847    4868    5013
                    5034    5090    5109    5160    5179    5288    5307    5344    5363    5469    5601    5647    6837#
CKCERR  040016      6705    6709    6720    6725    6941#
CKSWR   = 104407    7938    8002    8028    8903#
CLEAR   = 000005    1277#   3613    4472    4878    4966    5044    5213    5395    5778    6122    6239    6356    6520
                    7748
CLKOF   043332      5857    5860    7440    7498    7641#
CLKON   043236      5851    7420    7477    7619#
CLOCK   043276      3137    7630#
CLRFLG  036204      3058    6582#
COE     = 00:000    1330#
COUNT   001372      1746#   5848*   7417*   7430*   7474*   7486*   7631*   7633*
CR      = 000015    1150#   8110    8120    8915    8920    8922    8927    8931    8941    8950    8957    8965    8970
                    8975    8980    8986    8992    8999    9006    9011    9018    9027    9032    9037    9043    9045
                    9049    9055    9060    9065    9069    9071    9075    9080    9090    9095    9105    9115    9125
                    9134    9141    9150    9155    9163    9171    9180    9190    9198    9206    9215    9229    9237
                    9246    9252    9260    9266    9272    9280    9287    9293    9300    9305    9308    9314    9332
                    9340    9415    9442    9449    9455    9460    9472    9492
CRLF    = 000200    1151#   8081    8120
CTO     = 004000    1295#   6947
CYL     001426      1763#   5245
CYLADD  001364      1741#   4449    4624    5119    5607    5653    7094*   7095*   7096*   7097*   7098*   7099*   7117*
                    7118*   7119*   7120*   7121*   7122*
CYLDIF  001362      1740#   4459    4464    4503    4508    4555    4560    4628    5116    6402    6410    6446    6454
                    7061*   7062*   7063*   7064*   7065*   7066*   7067    7069*   7085*   7086*   7104*   7105*   7106*
                    7107*   7108*   7109*   7110    7112*
DATAO   001510      1796#   3933    3934    4070    4147    5054    5131    5146
DATAO1  001512      1797#   5441
DATAI   001514      1798#   3825    4074    4075    4087    4101    4223    4293    4307    4696    4759    4774    4887
                    5573    5619
DCK     = 100000    1336#   4018
DCLO    = 000020    1344#
DCPAR   = 020000    1297#
DDISP   = 177570    1157#   1633    3025
DDPCH   007502      1898#   3104*   3285    3472
DDT     = 000400    1348#
DDUMP   007500      1897#   3071*   6582
DF1     064374      1939    1945    1951    1957    1962    1968    1974    1980    2206    2246    2251    2291    10014#
DF10    064470      1985    1990    1995    2000    2005    2015    2025    2030    2040    2056    2076    2081    2116
                    2126    2131    2166    2196    2201    2211    2216    2221    2226    2231    2236    2241    2271
                    2276    2301    2306    2331    2336    2341    2346    2361    2386    2391    2416    2466    2481
                    2567    2587    2592    2642    2712    2747    2783    10051#
DF14    064504      2612    10058#
DF15    064514      2296    2577    2582    2602    2607    2717    10064#
DF17    064530      2722    2727    2737    2742    10071#
DF2     064404      2106    10019#
DF20    064550      2146    10079#
```

```
DF21    064564          2035    2045    2050    2061    2066    2071    2086    2091    2096    2101    2151    2156    2161
                        2171    2176    2181    2186    2191    2421    2426    2431    2436    2687    2692    2843    2848
                        2868    2873    2878    2883    2888    2893    2898    2903    2908    2913    2918    2923    2928
                        2933   10086#
DF22    064620          2111    2136    2141    2266    2281    2286    2321    2326    2351    2356   10101#
DF23    064654         10116#
DF3     064410          2010    2020   10022#
DF4     064424          2121   10029#
DF5     064434          2366    2376   10034#
DF6     064454          2311    2316    2637    2778   10043#
DH1     061123          1937    1943    1949    1955    1960    1966    1972    1978    2119    2204    2244    2249    2289
                        2610    9696#  10024   10038   10045   10053   10066   10075   10081   10088   10103   10118
DH10    061505          2239    2585    2590    9740#
DH11    061534          9744#  10026
DH12    061601          9751#  10031
DH13    061643          2720    9757#
DH14    061727          2725    9766#
DH17    062013          2134    2139    2164    2359    2685    2690    2906    2911    9775#
DH18    062037          2209    2234    9779#
DH19    062064          2054    2329    9783#
DH2     061140          9699#  10016   10040   10055   10077
DH20    062107          2334    9787#
DH21    062142          2038    2339    9792#
DH22    062170          2114    2324    2464    2479    2866    2871    2896    2901    9796#
DH24    062222          2074    2079    2094    2099    2109    2319    2841    2846    9801#
DH25    062247          2144    2299    2304    2384    2389    2414    2635    2640    2776    9805#
DH26    062272          1993    1998    2018    2023    2048    2059    2159    2169    2710    2715    9809#
DH27    062322          1983    1988    2033    2043    2129    2149    2154    2194    2269    2294    2309    2314    9813#
DH28    062353          9818#  10090   10105   10120
DH29    062434          9827#  10094   10109   10124
DH30    062515          2349    2565    2575    2580    2886    2891    2926    2931    9836#
DH31    062547          9841#  10092   10096   10107   10111   10122   10126
DH32    062574          2003    2008    2028    2064    2069    2174    2179    2274    9845#
DH33    062626          9850#
DH34    062652          9854#  10098   10113   10128
DH36    062714          9860#
DH39    062776          2600    2605    2876    2881    2916    2921    9869#
DH40    063031          9874#  10060
DH41    063106          2781    9882#
DH42    063133          2735    9886#
DH43    063204          2740    9893#
DH44    063255          2745    9900#  10073
DH47    063334          2264    9908#
DH49    063404          9915#  10036
DH5     061211          9706#
DH51    063461          2124    2354    2419    2424    2429    2434    9923#
DH52    063514          2013    9928#
DH53    063550          2084    2089    2184    2189    9933#
DH54    063576          2199    9937#
DH56    063650          9944#  10083
DH57    063715          2279    2284    9951#
DH58    063755          9957#
DH6     061260          9713#  10047
DH7     061342          9722#  10068
DH8     061411          2104    9729#
DH9     061432          2214    2219    2224    2229    2344    9732#
```

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DI     = 040000          1298#
DISPLA  001142          1633#   3025*   3033*   7983*   8005*
DISPRE  000174          1447#   3033
DIVTYP  043204          7576    7602    7609#
DLT    = 100000          1317#   4591
DLY     037232          5448    6818#   6821
DMD    = 000040          1358#
DOTIM   007536          1917#   3136*   3145*   5429    5735
DOWRT   016650          3776    3779#
DPAT1   001516          1799#   5254    5316    5330
DPAT2   001520          1800#
DRA    = 000001          1340#   3314    3407
DRDY   = 000200          1347#
DRIVS   007510          1901#   3222*   3229*   3246    3261*   3287*   3304    3395*   3461    6545    6637*
DRIVO   007512          1906#   3118    3224    3263    3363    6620
DRIV1   007514          1907#
DRIV2   007516          1908#
DRIV3   007520          1909#
DRIV4   007522          1910#
DRIV5   007524          1911#
DRIV6   007526          1912#
DRIV7   007530          1913#
DROT   = 000040          1345#
DRPAR  = 000010          1324#
DRVMSK= 000007          1304#   3280    3380
DRVPTR  001346          1733#   3118*   3466    3476*
DSC    = 040000          1351#
DSWR   = 177570          1156#   1632    3024
DTE    = 010000          1333#
DTYE   = 000040          1326#
DT1     064002          1938    1944    1950    1956    1961    1967    1973    1979    1984    1989    1994    1999    2004
                        2014    2024    2029    2039    2055    2075    2080    2115    2125    2130    2165    2195    2200
                        2205    2210    2215    2220    2225    2230    2235    2240    2245    2250    2270    2275    2290
                        2300    2305    2330    2335    2340    2345    2360    2365    2370    2375    2385    2390    2415
                        2465    2480    2566    2586    2591    2641    2711    2721    2726    2736    2741    2746    2782
                        9965#
DT10    064170          2120    9987#
DT13    064210          2034    2044    2049    2060    2065    2070    2085    2090    2095    2100    2150    2155    2160
                        2170    2175    2180    2185    2190    2420    2425    2430    2435    2686    2691    2842    2847
                        2867    2872    2877    2882    2887    2892    2897    2902    2907    2912    2917    2922    2927
                        2932    9990#
DT14    064250          2110    2135    2140    2265    2280    2285    2320    2325    2350    2355    9996#
DT15    064320         10003#
DT3     064024          2105    9968#
DT4     064030          2310    2315    2636    9969#
DT5     064050          2295    2371    2576    2581    2601    2606    2716    9972#
DT6     064072          2009    2019    9975#
DT7     064112          2611    9978#
DT8     064132          2777    9981#
DT9     064152          2145    9984#
D.ACLO= 000100          1400#
D.BRHM= 000100          1387#   3650    3853    3872    3962    3981    4029    4046    4109    4128    4163    4252    4280
                        4315    4343    4418    4436    4489    4538    4601    4728    4747    4782    4801    4844    4862
                        5010    5028    5084    5103    5154    5173    5282    5301    5338    5357    5463    5595    5641
D.CART= 000400          1389#   3650    3853    3872    3962    3981    4029    4046    4109    4128    4163    4252    4280
                        4315    4343    4418    4436    4489    4538    4601    4728    4747    4782    4801    4844    4862
```

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                    5010    5028    5084    5103    5154    5173    5282    5301    5338    5357    5463    5595    5641
D.DDT = 000400      1375#
D.DOOR= 000200      1388#   3650    3853    3872    3962    3981    4029    4046    4109    4128    4163    4252    4280
                    4315    4343    4418    4436    4489    4538    4601    4728    4747    4782    4801    4844    4862
                    5010    5028    5084    5103    5154    5173    5282    5301    5338    5357    5463    5595    5641
D.DRA = 000040      1372#   3648    3851    3870    3960    3979    4027    4044    4107    4126    4161    4250    4278
                    4313    4341    4416    4434    4487    4536    4599    4726    4745    4780    4799    4842    4860
                    5008    5026    5082    5101    5152    5171    5280    5299    5336    5355    5461    5593    5639
D.DRDY= 000200      1374#   3648    3851    3870    3960    3979    4027    4044    4107    4126    4161    4250    4278
                    4313    4341    4434    4487    4536    4599    4726    4745    4780    4799    4860    5026    5082
                    5101    5152    5171    5280    5299    5336    5355    5461    5593    5639
D.DROT= 020000      1407#   5583    5629
D.DSC = 040000      1381#   4434    4536    4860    5026
D.FLT = 000200      1401#
D.FORM= 001000      1376#   4272    4335
D.FWD = 002000      1391#
D.HDFL= 000200      1415#
D.HDHM= 000040      1386#   5792    5853    7174
D.IDAE= 000040      1399#
D.ILF = 000400      1402#
D.LIMD= 020000      1421#
D.LOAD= 010000      1393#   7191
D.MHD = 000400      1416#
D.NMOV= 010000      1420#
D.OFF = 002000      1377#   4416    4434    4483    4487    4530    4536    4620    4842    4860    5008    5026
D.PAR = 001000      1403#
D.PIP = 020000      1380#   4416    4842    5008
D.PLO = 004000      1419#
D.REV = 004000      1392#   5878    5891
D.RTZ = 020000      1394#   3604    4957    5204    5386    6113    6230    6347    6511    7739
D.SECT= 000020      1412#
D.SKI = 002000      1404#
D.SPIN= 010000      1379#   3648    3851    3870    3960    3979    4027    4044    4107    4126    4161    4250    4278
                    4313    4341    4416    4434    4487    4536    4599    4726    4745    4780    4799    4842    4860
                    5008    5026    5082    5101    5152    5171    5280    5299    5336    5355    5461    5593    5639
D.SPLS= 010000      1406#
D.SPOK= 001000      1390#   3650    3853    3872    3962    3981    4029    4046    4109    4128    4163    4252    4280
                    4315    4343    4418    4436    4489    4538    4601    4728    4747    4782    4801    4844    4862
                    5010    5028    5084    5103    5154    5173    5282    5301    5338    5357    5463    5595    5641
D.SSP = 000020      1385#   3650    3853    3872    3962    3981    4029    4046    4109    4128    4163    4252    4280
                    4315    4343    4418    4436    4489    4538    4601    4728    4747    4782    4801    4844    4862
                    5010    5028    5084    5103    5154    5173    5282    5301    5338    5357    5463    5595    5641
                    5865
D.SUNS= 040000      1422#
D.TIB = 002000      1418#
D.UNLD= 040000      1395#
D.UNS = 040000      1408#
D.VV  = 000100      1373#   3542    3556    3648    3851    3870    3960    3979    4027    4044    4107    4126    4161
                    4250    4278    4313    4341    4416    4434    4487    4536    4599    4726    4745    4780    4799
                    4842    4860    5008    5026    5082    5101    5152    5171    5280    5299    5336    5355    5461
                    5593    5639
D.WCUR= 000040      1413#
D.WGAT= 000100      1414#
D.WLE = 004000      1405#
D.WRL = 004000      1378#
D.XERR= 001000      1417#
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ECCW  = 020000          1366#
ECH   = 000100          1327#
EMTVEC= 000030          1245#   3008*   3009*
EM1     055041          6646    9314#
EM10    055615          1971    9380#
EM100   061034          2308    9683#
EM101   061071          2348    9688#
EM11    055700          1977    9389#
EM12    055744          1982    1992    2002    2073    2328    2333    2338    2343    2358    2383    2463    2564    2599
                        2709    9395#
EM13    056002          2078    2163    2233    2238    2388    9400#
EM14    056024          2103    9403#
EM15    056062          2118    9408#
EM16    056171          2719    2724    2734    2739    9421#
EM17    056234          2083    2148    2158    2173    2418    2684    2840    2895    2915    2925    9427#
EM18    056255          2032    2047    2063    2183    2423    2845    2865    2875    2885    2905    9430#
EM19    056276          2088    2093    2153    2168    2178    2428    2689    2900    2920    2930    9433#
EM2     055115          1936    9322#
EM20    056317          2042    2058    2068    2098    2188    2433    2870    2880    2890    2910    9436#
EM21    056340          1987    1997    2027    2037    2579    2604    2639    2714    9439#
EM22    056362          2243    9442#
EM23    056467          2248    9455#
EM24    056567          2053    9467#
EM25    056622          2128    9472#
EM26    056674          2193    9479#
EM27    056753          2203    9487#
EM3     055205          7785    9332#
EM36    057072          2313    2634    2775    9501#
EM39    057135          2133    2278    2413    2584    9507#
EM4     055260          9340#
EM40    057204          2138    2283    2589    9514#
EM41    057242          2108    9519#
EM5     055334          1942    2373    9348#
EM55    057310          2478    9526#
EM6     055355          1948    9351#
EM60    057343          2208    9531#
EM62    057401          9537#
EM63    057421          2574    9540#
EM65    057442          2609    9543#
EM66    057464          9546#
EM69    057520          2744    9551#
EM7     055376          1954    9354#
EM73    057551          2363    9556#
EM74    057572          2780    9559#
EM79    057617          2368    9563#
EM8     055465          1959    9364#
EM80    057640          2007    9566#
EM81    057677          2012    9572#
EM82    057743          2017    9579#
EM83    060015          2022    9587#
EM84    060052          2364    2369    2374    9592#
EM85    060143          2113    2123    9602#
EM86    060206          2318    2323    2353    9608#
EM88    060244          2198    9613#
EM89    060305          2213    9619#
EM9     055541          1965    9372#
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EM90    060345          2218    9625#
EM91    060405          2223    9631#
EM92    060432          2228    9635#
EM93    060463          2143    9640#
EM94    060544          2263    9649#
EM95    060600          2268    2273    9654#
EM96    060634          2288    9659#
EM97    060665          2293    9664#
EM98    060752          2298    9673#
EM99    061003          2303    9678#
ERRVEC= 000004          1238#   3022    3023*   3034*   3041*   3042*   3055*   3056*   3121*   3125*   3132*   3170*   3188*
                        7944    7945*   7947*   7950*
ESEC    001404          1752#
E.A0    007460          1878#   3648*   3851*   3870*   3960*   3979*   4027*   4044*   4107*   4126*   4161*   4250*   4278*
                        4313*   4341*   4416*   4434*   4487*   4536*   4599*   4726*   4745*   4780*   4799*   4842*   4860*
                        5008*   5026*   5082*   5101*   5152*   5171*   5280*   5299*   5336*   5355*   5461*   5593*   5639*
                        6841*   6848    6850*   6879    9990    9996    10003
E.A1    007464          1880#   3650*   3853*   3872*   3962*   3981*   4029*   4046*   4109*   4128*   4163*   4252*   4280*
                        4315*   4343*   4418*   4436*   4489*   4538*   4601*   4728*   4747*   4782*   4801*   4844*   4862*
                        5010*   5028*   5084*   5103*   5154*   5173*   5282*   5301*   5338*   5357*   5463*   5595*   5641*
                        6842*   6852    6854*   6899    9990    9996    10003
E.A2    007470          1882#   3652*   3855*   3874*   3964*   3983*   4031*   4048*   4111*   4130*   4165*   4254*   4282*
                        4317*   4345*   4438*   4540*   4603*   4730*   4749*   4784*   4803*   4864*   5030*   5086*   5105*
                        5156*   5175*   5284*   5303*   5340*   5359*   5465*   5597*   5643*   6843*   6856    6858*   9996
                        10003
E.A3    007474          1884#   6844*
E.B0    007462          1879#   3649*   3852*   3871*   3961*   3980*   4028*   4045*   4108*   4127*   4162*   4251*   4279*
                        4314*   4342*   4417*   4435*   4488*   4537*   4600*   4727*   4746*   4781*   4800*   4843*   4861*
                        5009*   5027*   5083*   5102*   5153*   5172*   5281*   5300*   5337*   5356*   5462*   5594*   5640*
                        6860    6862*   6889    9990    9996    10003
E.B1    007466          1881#   3651*   3854*   3873*   3963*   3982*   4030*   4047*   4110*   4129*   4164*   4253*   4281*
                        4316*   4344*   4419*   4437*   4490*   4539*   4602*   4729*   4748*   4783*   4802*   4845*   4863*
                        5011*   5029*   5085*   5104*   5155*   5174*   5283*   5302*   5339*   5358*   5464*   5596*   5642*
                        6864    6866*   6909    9990    9996    10003
E.B2    007472          1883#   3653*   3856*   3875*   3965*   3984*   4032*   4049*   4112*   4131*   4166*   4255*   4283*
                        4318*   4346*   4439*   4541*   4604*   4731*   4750*   4785*   4804*   4865*   5031*   5087*   5106*
                        5157*   5176*   5285*   5304*   5341*   5360*   5466*   5598*   5644*   6868    6870*   9996    10003
E.B3    007476          1885#   3654*   3857*   3876*   3966*   3985*   4033*   4050*   4113*   4132*   4167*   4256*   4284*
                        4319*   4347*   4440*   4542*   4605*   4732*   4751*   4786*   4805*   4866*   5032*   5088*   5107*
                        5158*   5177*   5286*   5305*   5342*   5361*   5467*   5599*   5645*   6872    6874*   10003
FATT1   037056          3608    4961    5208    5390    5927    6117    6234    6351    6515    6771#   7720    7743
FATT2   037152          3747    4430    4520    4641    4856    5022    5550    5711    5772    5920    6419    6463    6798#
FATT3   042752          6052    6169    6286    7540#   7544
FHDHM   041312          7171#   7179
FHDTAB  041434          3909    4200    4369    5681    7204#
FLGTST  041714          7246    7250    7257    7261    7273#
FLOAD   041366          7188#
FMTE  = 000020          1325#
FMT1    001504          1793#   7214*   7215*   7216*   7221
FORM    031420          5559    5665    5668#   7758
FORMAT  001502          1792#   3908*   4199*   4368*   5680*   7214    7243
FRCYL   001350          1735#   5562*   9969    9981
FRDY    036542          3256    3270    3275    3370    3375    3553    3599    3615    3641    3743    3806    3831    3914
                        3940    4006    4093    4152    4205    4230    4270    4299    4333    4374    4413    4474    4516
                        4578    4637    4706    4766    4839    4880    4893    4952    4968    5005    5046    5062    5138
                        5199    5215    5260    5322    5381    5397    5452    5527    5546    5579    5625    5686    5707
```

```
                    5780    5843    5965    6047    6108    6124    6164    6225    6241    6281    6342    6358    6397
                    6441    6506    6522    6700#   6703    6972    7033    7716    7734    7750
FRDY1   036610      6714#   6717    6987    6997    7007    7016
FSEC23  041222      5437    7147#
FTITLE  001344      1731#   6593    6595*
GBA     036444      3090    6660#
GDRVS   036304      3088    6615#
GINT    036472      3092    6673#
GNS   = ****** U    1446    8895    8896    8897    8898    8899    8901    8903    8904    8905    8906    8907    8908
                    8909
GO    = 000001      1289#
GSTAT   040100      3506    3603    3643    3808    3833    3916    3942    4008    4095    4154    4207    4232    4301
                    4376    4482    4593    4708    4768    4895    4956    5064    5140    5203    5262    5324    5385
                    5454    5529    5582    5628    5688    5791    5852    5864    5877    5890    6055    6112    6172
                    6229    6289    6346    6510    6781    6785    6805    6809    6968#   7037    7048    7060    7093
                    7173    7190    7738
GSTAT1  040142      6839    6980#
GTSWR = 104406      6604    8901#
HASOF   007406      1849#   6739*   6755    9965    9994    10001   10009
HBA     007376      1845#   6735*
HCS1    007370      1842#   3277    3377    3644    3750    3809    3834    3917    3943    4009    4096    4208    4233
                    4302    4377    4523    4580    4644    4709    4769    5065    5141    5263    5325    5530    5553
                    5587    5633    5689    5714    6056    6173    6290    6422    6466    6732*   6943    6947    7038
                    7347    9965    9972    9975    9987    9994    10001   10009
HCS2    007372      1843#   3310    3312    3316    3328    3403    3405    3409    3412    4098    4155    4304    4771
                    4896    5143    5327    6733*   6952    6956    9965    9972    9975    9987    9994    10001   10009
HDA     007400      1846#   6736*   7390    9972    9978    9987
HDB     007412      1851#
HDC     007410      1850#   6740*   9969    9981    9984    9987    9994    10001   10009
HDS     007402      1847#   3314    3407    6737*   9965    9972    9994    10001   10009
HDTAB   001536      1810#   3792    3798    3801    3902    4191    4361    5511    5518    5521    5674    7206
HDWD    001524      1803#   9978
HD1     001500      1791#   7208*   7209*   7210*   7211*   7212*   7213*   7220
HEAD    001474      1789#   3907*   4198*   4367*   5679*   7208    7285
HEADA   001476      1790#   7137*   7138*   7139*   7140*
HER     007404      1848#   3837    3946    4011    4018    4236    4712    5068    5266    6738*   9965    9972    9994
                    10001   10009
HMR1    007414      1852#   6741*
HMR2    007416      1853#   3279    3379    3507    3542    3556    3604    4272    4335    4483    4530    4620    4957
                    5204    5386    5792    5853    5865    5878    5891    6113    6230    6347    6511    6718*   6723*
                    6742*   6989    6999    7009    7018    7061    7174    7191    7739    9965    9969    9972    9975
                    9978    9981    9984    9987
HMR3    007420      1854#   5583    5629    6719*   6724*   6743*   6990    7000    7010    7019    7049    7094    9965
                    9969    9972    9975    9978    9981    9984    9987
HOLD    036676      6704    6708    6732#   6981
HPAT    007424      1856#   6745*
HPEND   007356      1824#   3117*   5721    5723*   7726*
HPOS    007422      1855#   6744*
HT    = 000011      1148#   8079    8120
HVRC  = 000400      1329#
HWC     007374      1844#   6734*
HZ      001370      1744#   5848    7633
H.A0    007440      1867#   6879    7018*   9990    9999    10006
H.A1    007444      1869#   6899    7009*   9990    9999    10006
H.A2    007450      1871#   6999*   7104    9999    10006
H.A3    007454      1873#   6989*
```

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H.B0    007442          1868#   6889    7019*   9990    9999    10006
H.B1    007446          1870#   6909    7010*   9990    9999    10006
H.B2    007452          1872#   7000*   7117    9999    10006
H.B3    007456          1874#   6990*   7127    7137    10006
IDAE  = 002000          1331#
IE    = 000100          1290#
ILF   = 000001          1321#
INTER   044130          6688    7825#
IOTVEC= 000020          1243#   3006*   3007*
IR    = 000100          1308#
LCLKF   007532          1915#   3123*
LCVEC   001330          1721#   3124
LF    = 000012          1149#   8114    8120    8915    8920    8922    8927    8931    8941    8950    8957    8965    8970
                        8975    8980    8986    8992    8999    9006    9011    9018    9027    9032    9037    9043    9045
                        9049    9055    9060    9065    9069    9071    9075    9080    9090    9095    9105    9115    9125
                        9134    9141    9150    9155    9163    9171    9180    9190    9198    9206    9215    9229    9237
                        9246    9252    9260    9266    9272    9280    9287    9293    9300    9305    9308    9314    9332
                        9340    9415    9442    9449    9455    9460    9472    9492
LIMERR  001530          1806#
LKS     001326          1719#   3122    7622*   7643*
LOOP    042726          5794    5867    5880    5893    5983    6413    6457    7437    7495    7529#   7542
LPCNT   001452          1775#   5788*   5795    5800    5861*   5868    5871    5874*   5881    5884    5887*   5894    5897
                        5978*   5996    6050*   6060    6167*   6177    6284*   6294    6408*   6414    6426    6452*   6458
                        6470    7432*   7441    7488*   7499    7534*   7543
LPTIM   001454          1776#   5997    6061    6178    6295    6427    6471    7458*   7516*   7554
MCLK  = 000400          1361#
MDS   = 001000          1311#   3310    3403    6956
MEMBAS= 172100          1725#   3044    3053
MEMERR  044066          3047    7811#
MEMPAR  013236          3041#
MEMVEC= 000114          1724#   3047*   3048*
MERD  = 001000          1362#
MESMSK= 000017          1356#
MEWD  = 002000          1363#
MIND  = 000200          1360#
MSG1    050630          6596    8915#
MSG10   052125          3221    3260    9045#
MSG11   052152          7858    9049#
MSG13   052212          3146    5757    9055#
MSG14   052300          6827    9065#
MSG15   052323          3330    3477    9069#
MSG16   052335          3504    9071#
MSG17   052361          3730    9075#
MSG18   052411          5799    9080#
MSG19   052504          3777    9090#
MSG2    051531          3072    8999#
MSG20   052542          5900    9095#
MSG21   052636          5905    9105#
MSG22   052730          5910    9115#
MSG23   053022          7427    7483    9125#
MSG24   053107          6011    9134#
MSG25   053151          7563    7577    9140#
MSG26   053155          3784    3812    3865    3920    3974    4015    4121    4211    4264    4327    4380    4583    4595
                        4740    4794    5096    5166    5294    5350    5533    5692    9141#
MSG27   053237          3463    9150#
MSG28   053267          6087    9155#
```

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MSG29   053346          6090    9163#
MSG3    051602          3087    9006#
MSG30   053426          6204    9171#
MSG31   053514          6207    9180#
MSG32   053603          6321    9190#
MSG33   053662          6324    9198#
MSG34   053742          6485    9206#
MSG35   054030          6488    9215#
MSG36   054117          7603    9225#
MSG37   054143          4928    9229#
MSG38   054221          4941    9237#
MSG39   054301          4904    9246#
MSG4    051634          3089    9011#
MSG40   054343          3783    9252#
MSG41   054456          5752    9266#
MSG42   054515          5763    9272#
MSG43   054567          5802    5903    9280#
MSG44   054635          5908    5913    9287#
MSG5    051701          3091    9018#
MSG6    051762          7830    9027#
MSG7    052016          3106    9032#
MSG74   054677          7706    9293#
MSG75   054745          7708    9300#
MSG76   055002          7762    9305#
MSG77   055024          7766    9308#
MSG8    052053          4814    9037#
MSG9    052112          4818    9043#
MSP   = 000100          1359#
MULT6   042100          7305    7331#
M.ALGN= 040000          1435#
M.CADD= 017760          1434#   7095    7118
M.CDIF= 017760          1427#   7062    7086    7105
M.DPID  044252          7457    7515    7593    7609    7873#
M.DP40  044310          7884#   7906
M.DP41  044344          7889    7897#
M.DP42  044354          7895    7901#
M.DP44  044406          7908    7914#
M.DP50  044420          7882    7919#
M.DRV = 000007          1426#
M.HEAD= 007000          1437#   7138
M.ID  = 000003          1433#
M.OFST= 017760          1428#
M.PAR = 100000          1438#   7672
M.SECT= 000760          1436#   7050    7128
M.SER = 077770          1429#
NED   = 010000          1314#   3316    3328    3409    3412    6952
NEM   = 004000          1313#
NUDRV   015154          3248    3342    3443#   6547
NXF   = 000004          1323#
OFFERR  001472          1786#   4826*   4900*   4902    4918    4926    4935    4939
OFFSET= 000015          1281#   4411    4837    5003
OFST  = 000004          1342#
OPI   = 020000          1334#
OR    = 000200          1309#
O.ADR1  065242          10261*  10312*  10314*  10484   10485*  10523*  10538   10555   10746#
O.BACK  065766          10356   10397#
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0.BD    067260          10542   10543   10691#
0.BKPT  065474          10307#  10360
0.BK1   066426          10255   10520#
0.BK2   066462          10525   10528#
0.BK3   066500          10527   10534#
0.BRK   066416          10272   10518#
0.BUF   067307          10600   10609   10614   10719#
0.B2    066562          10539   10548#
0.B3    066622          10547   10556#
0.CADV  066772          10373   10390   10413   10417   10447   10451   10556   10599#
0.CLGL  065610          10330   10332   10340#
0.CLGT= 000014          10344   10709#
0.CLS1  067216          10667   10669#
0.CR    067262          10676   10678   10679   10693#
0.CRET  065722          10351   10380#
0.CRLF  067226          10388   10445   10541   10580   10585   10676#
0.CRLS  067234          10325   10678#
0.CRS   067240          10677   10679#
0.CSR1  067256          10576*  10592   10687#
0.CSR2  067257          10577*  10593   10688#
0.CT    065244          10505*  10548*  10550*  10747#
0.C1    066374          10508#  10549
0.DCD   065540          10313   10315   10325#  10382   10433   10558
0.DCD1  065544          10326#  10374   10418
0.EFF   066050          10359   10424#
0.EFF1  066166          10436   10455#
0.ENTR  065254          10252#
0.ERR   065524          10299   10310   10322#  10345   10370   10428   10671
0.ERR1  066060          10428#  10501
0.ERR2  065700          10370#  10404   10477
0.FTYP  067134          10324   10392   10407   10449   10554   10625   10641   10646#
0.GET   067056          10278   10328   10622#  10627   10629   10631
0.GO    066232          10353   10475#
0.GO2   066310          10486#  10511
0.LG  = 000006          10282   10717#
0.LGCH  067265          10341   10697#  10709
0.LGDR  065640          10348   10350*  10362
0.LGL = 000030          10362#
0.LGL1  065612          10341#  10346
0.LGL2  065632          10342   10347#
0.MSK   065234          10429   10430   10432   10739#
0.ODT   065250           1463   10250#  10728
0.OFST  065776          10357   10403#
0.OF1   066044          10416   10418#
0.OP1   065734          10354   10386#
0.OP2   065742          10303   10388#  10399
0.ORPC  065446          10295#  10355
0.P     067255          10270*  10475*  10500   10502*  10551*  10685#
0.PRI   065232          10262   10524   10528   10738#
0.PROC  066340          10361   10500#
0.PR1   066362          10504   10506#
0.RALL  065514          10273   10308   10314#
0.RCSR= 177560          10240#  10576   10578*  10588   10590   10592*  10622
0.RDB = 177562          10239#  10624
0.REGT  065376          10278#  10352
0.RSE1  066754          10589   10592#
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0.RSP    065406           10280#  10283
0.RST    065312           10251   10260#
0.RSTT   066724           10481   10507   10585#
0.RST1   065342           10259   10267#
0.RTIT   066336           10269*  10495#
0.SCAN   065550           10289   10328#  10339
0.SP     065440           10281   10290#
0.SPC    067004           10602#  10610
0.SP1    065426           10286#  10291
0.STM =  000340           10229#  10271   10480   10506   10508
0.STRT   065300           10250   10257#
0.SVR    066634           10260   10520   10562#
0.SVTT   066672           10540   10552   10576#
0.T      067254           10482*  10509*  10521   10684#
0.TBIT   066262           10482#  10522
0.TBT =  000020           10230#  10483   10510   10546
0.TC     067220           10664   10670#
0.TCLS   067202           10295   10380   10386   10397   10663#
0.TCSR=  177564           10242#  10577   10579*  10586   10593*  10646   10652
0.TDB =  177566           10241#  10648*  10654*
0.TL     067301           10279   10282   10290   10711#  10717
0.TRTC   067316           10314   10485   10724#
0.TVEC=  000014           10228#  10253   10271*  10272*
0.TYPE   067120           10544   10615   10638#  10642   10680
0.TYP1   067200           10639   10650   10658#
0.TYP2   067160           10652#  10653   10656
0.UIN    065246           10261   10484*  10523   10748#
0.UPC    065226           10254*  10479*  10494   10518*  10535   10537*  10736#
0.URD    065210           10257   10287   10729#
0.USP    065224           10258*  10563*  10564   10735#
0.UST    065230           10252*  10483*  10493   10510*  10519*  10526   10546*  10737#
0.WDS    066056           10425   10427#
0.WDS2   066074           10432#  10454
0.WDS3   066124           10443#  10456   10462   10471
0.WDS4   066162           10443   10453#
0.WRD    065670           10350   10366#
0.WRDA   065714           10367   10375#
0.WRD1   065676           10369#  10376   10393
0.WSCH   066054           10358   10426#
0.XXX    067252           10562*  10570   10683#
0.45     065354           10268   10270#
PACK  =  000003            1276#   3551
PARAM    001336            1728#   2948*   2953*   2958*   2963*   2968*   2973*   3084
PARSRT   012602            1456    2948#
PAT   =  000020            1357#
PCA   =  004000            1364#
PCD   =  010000            1365#
PCLKF    007534            1916#   3127*   3134*   7620    7641
PCVEC    001332            1722#   3128    3135
PCYL     001356            1738#
PFSRT    015312            3487#   7860
PGE   =  002000            1312#
PIP   =  020000            1350#
PIRQ  =  177772            1155#
PIRQVE=  000240            1249#
PKRB     001324            1718#
```

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PKS     001320          1716#   3126    3133    7625*   7645*
PKSB    001322          1717#   7624*
PPTP    007506          1900#   3075*
PRGSRT  012742          2951    2956    2961    2966    2971    2976#   6647
PRO   = 000000          1172#   2978    3165
PR1   = 000040          1173#
PR2   = 000100          1174#
PR3   = 000140          1175#
PR4   = 000200          1176#
PR5   = 000240          1177#   1715
PR6   = 000300          1178#   3138
PR7   = 000340          1179#   3042    3048    7855    7856
PS    = 177776          1152#   1153
PSEC    001402          1751#
PSW   = 177776          1153#
PWRVEC= 000024          1244#   3012*   3013*   7845*   7854*   7855*
QKCYLD  040666          6401    6409    6445    6453    7075#   7493
RCYLA   041100          6924    7117#
RCYLD   041026          6921    7104#
RDCHR = 104410          8522    8904#
RDCYLA  040756          7092#
RDCYLD  040602          7059#
RDDATA= 000021          1283#   3639    4004
RDGATE= 100000          1368#
RDHEAD= 000025          1285#   4576    5963    5979
RDLIN = 104411          6615    8596    8905#
RDOCT = 104412          6660    6673    8906#
RDSEC   040532          5971    5989    7047#   7148    7152    7155    7303
RDTAB   006352          1818#   4000    4059    4067
RDY   = 000200          1291#   5450    5981    6700    6714    7079
RECAL = 000013          1280#   3595    4948    5195    5377    6104    6221    6338    6502    7730
RESREG= 104414          7461    7517    7578    7604    8656    8708    8908#   10197
RESVEC= 000010          1239#
RHEAD   041174          6929    7137#
RHTAB   001742          1811#   4575    4614    7310    7312    7316    7319    9984
RKASOF= 000016          1262#   3179    4408*   4454*   4498*   4550*   4831*   5000*   6739    6774    6800    7540
RKBA  = 000004          1257#   3175    3633*   3687*   3705*   3714*   3723*   3801*   3825*   3902*   3933*   4000*   4074*
                        4087*   4147*   4191*   4223*   4293*   4361*   4696*   4759*   4887*   5054*   5131*   5254*   5316*
                        5441*   5521*   5573*   5619*   5674*   6735
RKCS1 = 000000          1255#   3172    3273*   3373*   3551*   3593*   3595*   3611*   3613*   3639*   3741*   3804*   3829*
                        3847*   3912*   3938*   3956*   4004*   4091*   4150*   4203*   4228*   4246*   4268*   4297*   4331*
                        4372*   4411*   4470*   4472*   4481*   4514*   4576*   4635*   4704*   4722*   4764*   4837*   4876*
                        4878*   4891*   4946*   4948*   4964*   4966*   5003*   5042*   5044*   5060*   5078*   5136*   5193*
                        5195*   5211*   5213*   5258*   5276*   5320*   5375*   5377*   5393*   5395*   5445*   5450    5457
                        5525*   5544*   5577*   5623*   5684*   5705*   5770*   5776*   5778*   5841*   5963*   5979*   5981
                        6045*   6102*   6104*   6120*   6122*   6162*   6219*   6221*   6237*   6239*   6279*   6336*   6338*
                        6354*   6356*   6395*   6439*   6500*   6502*   6518*   6520*   6700    6714    6732    6970*   6982*
                        6985*   6992*   6995*   7002*   7005*   7012*   7014*   7077*   7079    7714*   7728*   7730*   7746*
                        7748*
RKCS2 = 000010          1259#   3173    3254*   3268*   3272*   3368*   3372*   3594*   3612*   3935*   4086*   4224*   4294*
                        4471*   4591    4697*   4760*   4877*   4888*   4947*   4965*   5043*   5055*   5132*   5194*   5212*
                        5255*   5317*   5376*   5394*   5442*   5574*   5620*   5777*   6103*   6121*   6220*   6238*   6337*
                        6355*   6501*   6519*   6733    6969*   6983*   6993*   7003*   7013*   7031*   7035*   7729*   7747*
RKDA  = 000006          1258#   3176    3635*   3689*   3707*   3716*   3725*   3824*   3932*   3999*   4076*   4089*   4222*
                        4295*   4702*   4762*   4833*   4890*   5058*   5134*   5251*   5315*   5444*   6736
RKDB  = 000024          1264#   3181    4100    4306    4586    4587    4588    4773    4899    5145    5329
```

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RKDC  = 000020          1263#   3180    3637*   4570*   5253*   5314*   5523*   5542*   5572*   5676*   5702*   6044*   6068
                        6161*   6185    6278*   6302    6394*   6740
RKDS  = 000012          1260#   3177    6737
RKECPS= 000030          1268#   3185    6744
RKECPT= 000032          1269#   3186    6745
RKER  = 000014          1261#   3178    6738
RKMR1 = 000026          1265#   3182    3505*   3602*   4955*   5202*   5384*   5789*   5850*   5862*   5875*   5888*   6111*
                        6228*   6345*   6509*   6741    6780*   6784*   6804*   6808*   6984*   6994*   7004*   7036*   7047*
                        7059*   7076*   7092*   7172*   7189*   7737*
RKMR2 = 000034          1266#   3183    6718    6723    6742    7085
RKMR3 = 000036          1267#   3184    6719    6724    6743
RKPRI   001316          1715#   6689
RKVEC   001314          1714#   3111*   6677*   6680*   6687
RKWC  = 000002          1256#   3174    3638*   3802*   3826*   3903*   3936*   4001*   4088*   4148*   4192*   4225*   4292*
                        4362*   4698*   4761*   4889*   5056*   5133*   5256*   5318*   5443*   5522*   5575*   5621*   5675*
                        6734
RLS   = 000010          1305#
RSEC    041136          6928    7127#
RTT   = 000006         10232#
SAVREG= 104413          7412    7469    7569    7584    8641    8682    8907#  10141
SBPAR   043354          6849    6853    6857    6861    6865    6869    6873    7658#
SCLR  = 000040          1307#   3254    3268    3368    7031
SCOP1 = 104415          3265    3365    3545    3817    3925    3993    4080    4141    4215    4355    5124    5564    5612
                        8909#
SCOP1$  043426          7682#   8909
SDC   = 000000          8914
SEC     001374          1748#   5849*   7418*   7431*   7475*   7487*   7634*
SECFLG  041614          7222    7242#
SECNT   001400          1750#
SECTOR  001406          1753#   3823*   3824    3842*   3843    3931*   3932    3951*   3952    3999    4076    4089    4221*
                        4222    4241*   4242    4295    4701*   4702    4717*   4719    4762    4890    5057*   5058    5073*
                        5074    5134    5250*   5251    5271*   5272    5315    5972    5990    7049*   7050*   7051*   7052*
                        7053*   7054*   7127*   7128*   7129*   7130*   7131*   7132*   7149    7153    7156    7304*   7308
                        7309*   7310*   7321    7331*   7332    7333*   7334*
SEEK  = 000017          1282#   3741    4514    4635    5544    5705    6045    6162    6279    6395    6439
SELDRV= 000001          1275#   3273    3373    4268    4331    6970    6985    6995    7005    7014    7077
SETINT  036524          3112    6678    6687#
SIZFLG  007540          1918#   3113*   3258    6633*   6653*
SKI   = 000002          1322#
SORT    041772          7301#
SPACE2  065164         10175   10184   10195   10207#
SRTSPL= 000011          1279#   5841    7714
SRTTAB  002146          1812#   7313
ST    = 177776         10226#  10252   10253*  10266*  10480*  10506*  10508*  10534*
STACK = 001100          1143#   2977    3004    3163    3212    3266    3361    3366    3457    3497    3537    3546    3587
                        3773    3818    3897    3926    3994    4081    4142    4186    4216    4356    4401    4691    4993
                        5125    5243    5427    5503    5565    5613    5748    5834    5952    6028    6145    6262    6379
                        6543    6934    7819    7857   10203
START   012726          1450    2973#
START1  013344          3066#
STKLMT= 177774          1154#
STOP    043460          5725    7697#   8363    8446
ST2     013412          3073    3084#
ST3     013456          3074    3102#
ST4     013510          3086    3107    3110#
ST5     013534          3093    3115#   3252    3308    6572    7768
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SUBCLR  040452          3501    3539    3548    3589    3624    3663    3737    3787    3820    3899    3928    3936    4083
                        4144    4188    4218    4358    4405    4566    4632    4693    4828    4997    5127    5247    5434
                        5508    5569    5615    5671    5760    5836    5954    6039    6075    6156    6192    6273    6309
                        6389    6436    7031#   7699    7711
SUM     001456          1778#   5960*   5961*   6004*   6005*   6034*   6035*   6071*   6072*   6073*   6091*   6092*   6151*
                        6152*   6188*   6189*   6190*   6208*   6209*   6268*   6269*   6305*   6306*   6307*   6325*   6326*
                        6382*   6383*   6433*   6434*   6489*   6490*   7414*   7415*   7441*   7442*   7448*   7449*   7456
                        7471*   7472*   7499*   7500*   7506*   7507*   7514    7573    7574    7587    7588
SUM1    001462          1780#   6036*   6037*   6079*   6080*   6081*   6091    6092    6153*   6154*   6196*   6197*   6198*
                        6208    6209    6270*   6271*   6313*   6314*   6315*   6325    6326    6384*   6385*   6477*   6478*
                        6489    6490
SVAL  = 100000          1352#
SWR     001140          1632#   3002    3024*   3026    3032*   3039*   6602    6885    6895    6905    6915    7682    7783
                        7791    7796    7815    7939    7953    7955    7961    7968    8006    8013    8025    8029    8366
                        8405    8460*   10199
SWREG   000176          1448#   3032    6602    8366    8405    8428
SW0   = 000001          1207#
SW00  = 000001          1197#   1207
SW01  = 000002          1196#   1206
SW02  = 000004          1195#   1205
SW03  = 000010          1194#   1204
SW04  = 000020          1193#   1203
SW05  = 000040          1192#   1202
SW06  = 000100          1191#   1201
SW07  = 000200          1190#   1200
SW08  = 000400          1189#   1199
SW09  = 001000          1188#   1198
SW1   = 000002          1206#
SW10  = 002000          1187#
SW11  = 004000          1185#
SW12  = 010000          1185#   10199
SW13  = 020000          1184#   7783
SW14  = 040000          1183#   7796
SW15  = 100000          1182#
SW2   = 000004          1205#
SW3   = 000010          1204#
SW4   = 000020          1203#
SW5   = 000040          1202#
SW6   = 000100          1201#
SW7   = 000200          1200#
SW8   = 000400          1199#
SW9   = 001000          1198#   6885    6895    6905    6915    7682    7791    7815
TBITVE= 000014          1240#
TEMP1   007426          1859#   3255*   3269*   3274*   3279*   3280*   3281    3369*   3374*   3379*   3380*   3381    3552*
                        3598*   3614*   3640*   3742*   3746*   3805*   3830*   3913*   3939*   4005*   4092*   4151*   4204*
                        4229*   4269*   4298*   4332*   4373*   4412*   4429*   4473*   4515*   4519*   4577*   4636*   4640*
                        4705*   4765*   4838*   4855*   4879*   4892*   4951*   4967*   5004*   5021*   5045*   5061*   5137*
                        5198*   5214*   5259*   5321*   5380*   5396*   5447*   5526*   5545*   5549*   5578*   5624*   5685*
                        5706*   5710*   5771*   5779*   5842*   5919*   5964*   5980*   5984*   6046*   6107*   6123*   6163*
                        6224*   6240*   6280*   6341*   6357*   6396*   6400*   6404*   6418*   6440*   6444*   6448*   6462*
                        6505*   6521*   6702*   6716*   6772*   6776*   6802*   6818    6820*   6846    6849*   6850    6852*
                        6854    6856*   6858    6860*   6862    6864*   6866    6868*   6870    6872*   6874    6876*   6968
                        6971*   6974*   6980    6986*   6996*   7006*   7015*   7021*   7032*   7075    7078*   7081*   7087*
                        7147*   7159*   7171*   7176*   7188*   7193*   7224*   7227*   7228    7419*   7425*   7476*   7481*
                        7664*   7672*   7715*   7733*   7749*   9978
TEMP2   007430          1860#   3607*   3627*   3666*   3667    3703*   3712*   3721*   4960*   5207*   5389*   5926*   6116*
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                    6233*  6350*  6514*  6778*  7178*  7225*  7226*  7228*  7229   7719*  7742*
TEMP3   007432       1861#  3628*  3669   3674   3679   3700*  3701   3710   3719
TEMP4   007434       1862#  3632*  3633   3687   3704*  3705   3713*  3714   3722*  3723
TEMP5   007436       1863#  3634*  3635   3689*  3689   3706*  3707   3715*  3716   3724*  3725   5433*  5444
                     5476   5478*  5506*  5538*  5669*  5697*
TERR1   042222       7351   7355   7362   7366   7380#  7385   7392
TIME1   031740       5751   5754#
TIMING  031706       3778   3785   3813   3866   3921   3975   4016   4122   4212   4265   4328   4381   4584
                     4596   4741   4795   5097   5167   5295   5351   5534   5693   5731#
TIMUP   001376       1749#  5855   7423   7433*  7435   7479   7489*  7491   7619*  7630*  7636*
TIM1    001442       1770#  5871*  5901
TIM2    001444       1771#  5884*  5906
TIM3    001446       1772#  5897*  5911
TIM4    001450       1773#
TITLE   036224       3068   3105   6593#
TKVEC =  000060       1247#  8343*  8344*
TOCYL   001352       1736#  3904*  3906   4193*  4197   4363*  4366   4569*  4614   5505*  5513   5516   5523
                     5539*  5540   5561*  5567   5572   5607   5663*  5664   5668*  5676   5678   5698*  5699
                     9969   9981   9984
TPVEC =  000064       1248#
TRAPPC  001334       1726#  7812*  9968
TRAPVE=  000034       1246#  3010*  3011*  7856*
TRT    =  000003      10231#  10724
TRTVEC=  000014       1241#
TRUERR  042122       3839   3948   4238   4714   5070   5268   7345#
TSTATN  037024       3617   4476   4882   4970   5048   5217   5399   5782   6126   6243   6360   6524   6753#
                     7752
TST1    013714       3139   3161#
TST10   016616       3693   3729   3771#
TST11   017352       3895#
TST12   021152       4184#
TST13   022410       4399#
TST14   023722       4666   4689#
TST15   025534       4936   4978   4991#
TST16   027102       5241#
TST17   030146       5425#
TST2    014070       3189   3210#
TST20   030432       5431   5439   5477   5501#
TST21   031706       5746#
TST22   032202       5832#
TST23   032706       5923   5950#
TST24   033162       5976   5987   5994   6026#
TST25   033674       6098   6143#
TST26   034406       6215   6260#
TST27   035120       6332   6377#
TST3    014630       3259   3359#
TST4    015160       3389   3455#
TST5    015312       3495#
TST6    015450       3500   3535#
TST7    015552       3543   3557   3585#
TYPDS =  104405       6561   8899#
TYPE   =  104401       3072   3087   3089   3091   3106   3146   3221   3231   3260   3289   3330   3463   3477
                     3485   3504   3526   3527   3730   3734   3735   3777   3783   3784   3812   3865   3920
                     3974   4015   4121   4211   4264   4327   4380   4583   4595   4740   4794   4814   4818
                     4824   4904   4910   4911   4928   4941   5096   5166   5294   5350   5533   5692   5752
                     5757   5763   5799   5802   5803   5804   5900   5903   5905   5908   5910   5913   5915
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                    5916    6011    6014    6015    6087    6090    6095    6096    6204    6207    6212    6213    6321
                    6324    6329    6330    6485    6488    6493    6494    6559    6562    6596    6646    6827    7427
                    7483    7563    7577    7603    7706    7708    7762    7766    7785    7830    7858    8008    8016
                    8084    8178    8304    8360    8372    8426    8427    8430    8441    8451    8462    8481    8529
                    8535    8540    8544    8549    8550    8552    8555    8559    8625    8627    8767    8895#   10151
                   10152   10156   10157   10166   10175   10179   10184   10186   10192   10195
TYPERR  064710      8015   10141#
TYPOC = 104402      8429    8896#   10172
TYPON = 104404      8898#
TYPOS = 104403      3234    3292    3333    3481    4821    4907    6830    7788    7833    8897#
TYPTIM  043004      5801    5902    5907    5912    7553#
T.A2  = 000001      1889#   3860    3879    3969    3988    4036    4053    4116    4135    4259    4322    4443    4493
                    4545    4608    4735    4754    4789    4808    4869    5035    5091    5110    5161    5180    5289
                    5308    5345    5364    5602    5648    6919
T.B2  = 000002      1890#   3860    3879    3969    3988    4036    4053    4116    4135    4259    4322    4443    4493
                    4545    4608    4735    4754    4789    4808    4869    5035    5091    5110    5161    5180    5289
                    5308    5345    5364    5602    5648    6922
T.B3  = 000004      1891#   6926
T1      001410      1755#
T10     001412      1756#   3255    3269    3274    3369    3374    3598    3607    3614    4269    4332    4473    4879
                    4951    4960    4967    5045    5198    5207    5214    5380    5389    5396    5771    5779    5842
                    6107    6116    6123    6224    6233    6240    6341    6350    6357    6505    6514    6521    6971
                    6986    6996    7006    7015    7032    7078    7715    7733    7742    7749
T100    001420      1759#   4412    4838    5004    5926    7719
T50     001414      1757#   3742    4515    4636    5545    5706    6046    6163    6280    6396    6440
T500    001416      1758#   6400    6444
T5000   001422      1760#   4429    4855    5021    5919    7147
T50000  001424      1761#   3640    3746    3805    3830    3913    3939    4005    4092    4204    4229    4298    4373
                    4519    4577    4640    4705    4765    5061    5137    5259    5321    5526    5549    5578    5624
                    5685    5710    5964    5980    6418    6462
UFE   = 000400      1310#   3312    3405
UNLD    007352      1820#   3115*   5767*   5922*   5929*   7702
UNLOAD= 000007      1278#   5770
UNS   = 040000      1335#
UPE   = 020000      1315#
VELCAL  042502      6387    7469#
VV    = 000100      1346#
WCE   = 040000      1316#   4098    4155    4304    4771    4896    5143    5327
WDCNT   001506      1794#   9978
WD1     001466      1783#   4060*   4100*   4306*   4773*   4899*   5145*   5329*   9975
WD2     001470      1784#   4061*   4101*   4307*   4774*   5146*   5330*   9975
WLE   = 004000      1332#
WORD    001522      1802#
WRDATA= 000023      1284#   3829    3938    4228    4704    5060    5258    5445    5577    5623
WRHEAD= 000027      1286#   3804    3912    4203    4372    5525    5684
WRL   = 004000      1349#
WRTCHK= 000031      1287#   4091    4150    4297    4764    4891    5136    5320
WRTGAT= 040000      1367#
$APTHD  001000      1485    1491#
$ASTAT= ****** U    8221    8236
$ATYC   045642      8192    8194#
$ATY1   045616      8190#
$ATY3   045624      8069    8191#
$ATY4   045634      8021    8193#
$AUTOB  001134      1629#   6606*   8419    8576
$BASE   001264      1699#   3110*   3171    6664*   6666*
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$BDDAT  001126          1626#
$BELL   001200          1650#   8008    8041    8372    8569
$CDW1   001270          1701#
$CDW2   001272          1702#
$CHARC  045366          8086*   8096*   8103    8112*   8117#
$CKSWR  046610          8405#   8903
$CMTAG  001100          1612#   2999    3000    3008    3014    3015    3016
$CM3    =  000000       1642#
$CM4    =  000006       1642#   1643#   1644#   1645#   1646#   1647#   1648#
$CNTLC  047520          8360    8441    8569#
$CNTLG  047532          8426    8571#
$CNTLU  047525          8451    8544    8570#
$CPUOP  001236          1673#
$CRLF   001205          1652#   3231    3289    3485    3526    3527    3734    3735    4824    4910    4911    5803    5804
                        5915    5916    6014    6015    6095    6096    6212    6213    6329    6330    6493    6494    8016
                        8041    8085    8120    8462    8549    8569    8630    10151   10156   10166   10179   10192
$DBLK   045606          8144    8178    8186#
$DB2D   050042          7561    7613    8682#   8744
$DB2O   047722          3732    8641#
$DDW0   001274          1703#
$DDW1   001276          1704#
$DDW2   001300          1705#
$DDW3   001302          1706#
$DDW4   001304          1707#
$DDW5   001306          1708#
$DDW6   001310          1709#
$DDW7   001312          1710#
$DECVL  050222          8684    8730#
$DEVCT  001220          1664#   3059*   3119*   3467    6544*   6545
$DEVM   001266          1700#   3225
$DOAGN  036160          6555    6564    6570#
$DTBL   045576          8147    8182#
$ENDAD  036150          1471    6566#   8036
$ENDCT  036116          3014    6557#
$ENDMG  036167          6559    6574#
$ENULL  036164          6562    6573#
$ENV    001230          1669#   6600    8018    8064    8199    8223
$ENVM   001231          1670#   3037    3217    8066    8071    8201
$EOP    036034          5753    5758    5764    5930    6496    6540#   7428    7484    7764    10204
$EOPCT  036110          3014*   6554#   6558    7763*
$EOP1   036062          3193    3464    6546    6548#   7807
$ERFLG  001103          1615#   7684    7928    7957    7959    7965*   7987    8003*   8041    10201
$ERMAX  001115          1621#   3017*   7959    7982*   7987
$ERROR  044710          3008    8001#
$ERRPC  001116          1622#   6010*   8011*   8012    8041    9965    9969    9972    9975    9978    9981    9984    9987
                        9990    9996    10003
$ERRTB  007542          1933#   10148
$ERTTL  001112          1619#   8009*   8041
$ESCAP  001176          1649#   3016*   4410*   4428*   4836*   4854*   5002*   5020*   5559*   5703*   5769*   5806*   5846*
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                        6498*   6877    6881*   6891*   6901*   6911*   6931*   6935*   7811*   7814*   7981*   8032    8034
                        8041
$ETABL  001230          1668#
$ETEND  001314          1497    1711#
$FATAL  001212          1661#   8227*
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$FILLS  001155          1639#   8120
$GDADR  001120          1623#
$GDDAT  001124          1625#
$GET42  036140          6563#
$GTSWR  046700          8427#   8901
$HD   = 000000          1114
$HIBTS  001000          1492#
$HIOCT  047720          8618*   8629#
$ICNT   001104          1616#   7972*   7973    7975*   7986
$INTAG  001135          1630#   8424*   8443    8463    8576
$ITEMB  001114          1620#   8012*   8020    8041   10142
$LF     001206          1653#   8041    8120    8559    8569    8630
$LFLG   046061          8231*   8237#
$LPADR  001106          1617#   3018*   7794    7963*   7979*   7984    7986
$LPERR  001110          1618#   3019*   6936    7686    7689*   7820    7963    7980*   7986    8031
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$MADR2  001246          1690#
$MADR3  001252          1693#
$MADR4  001256          1696#
$MAIL   001210          1493    1497    1659#   3036    6600    7978    8018    8064
$MAMS1  001240          1680#
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$MAMS3  001250          1691#
$MAMS4  001254          1694#
$MBADR  001002          1493#
$MFLG   046060          8191*   8197    8232*   8236#
$MNEW   047550          8430    8574#
$MSGAD  001224          1666#   8207*   8210
$MSGLG  001226          1667#   8212*
$MSGTY  001210          1660#   8205    8213*   8225    8229*
$MSWR   047537          8427    8572#
$MTYP1  001241          1681#
$MTYP2  001245          1689#
$MTYP3  001251          1692#
$MTYP4  001255          1695#
$MUL  = 000037          6001#   6003    6065#   6182#   6299#   6431#   6433    6475#   6477    7557#
$MULT   050332          6000    6064    6181    6298    6430    6474    7556    8786#
$MXCNT  044706          7976    7986#
$NULL   001154          1638#   8091    8120
$NWTST= 000001          3151#   3153    3196#   3198    3344#   3346    3446#   3448    3488#   3490    3529#   3531    3562#
                        3564    3761#   3763    3885#   3887    4177#   4179    4386#   4388    4669#   4671    4981#   4983
                        5225#   5227    5407#   5409    5482#   5484    5736#   5738    5808#   5810    5932#   5934    6017#
                        6019    6134#   6136    6251#   6253    6367#   6369

$OCNT   046306          8276*   8305*   8318#
$OCTVL  050024          3508    8643    8668#
$OMODE  046310          8271*   8275*   8280    8283*   8294*   8320#
$OVER   044672          7940    7956    7964    7974    7983#
$PASS   001216          1663#   3036*   3499    3728    6551*   6552*   6560    6573    7970    7987
$PASTM  001006          1495#
$PWRCT  044250          7851*   7852*   7862#
$PWRDN  044164          3012    7845#   7854
$PWRUP  044176          7845    7851#
$QUES   001204          1651#   8041    8120    8481    8552    8569    8627    8630
$RDCHR  047152          8494#   8904
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$RDLIN  047242          8517#   8905
$RDOCT  047562          8591#   8906
$RDSZ = 000022          8510#
$RESRE  050502          8852#   8908
$RTNAD  036162          6572#
$R2A  = ****** U        8909
$SAVRE  050444          8836#   8907
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$SCOPE  044430          3006    7937#
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                        8002    8028    8036    8364    8369    8370    8400    8576
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                        4185    4400    4690    4992    5242    5426    5502    5747    5833    5951    6027    6144    6261
                        6378    6537    6550    6565    6571    6573    7929    7930    7931    7932    7933    7939    7951
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$SWREG  001232          1671#   3039
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$TKB    001146          1635#   8324    3345    8356    8381    8409    8436
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$TKQEN= 046321          8329#   8395    8506
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$TYPEC  045322          8088    8095    8102    8107#   8108    8467
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$VECT2  001262          1698#
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$$GET4= 000000          6565#
$OFILL  046307          8270*   8274*   8284    8319#
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        4260   4261  4262  4263  4266  4271  4274  4288  4289  4290  4291  4300  4308  4311  4323
        4324   4325  4326  4334  4337  4351  4352  4353  4354  4359  4375  4379  4406  4414  4423
        4424   4425  4426  4431  4444  4445  4446  4447  4451  4461  4466  4475  4478  4485  4494
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GETPRI  1250#
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MULT    1250#  5998  6062  6179  6296  6428  6472  7553
NEWTST  1250#  3151  3196  3344  3446  3488  3529  3562  3761  3885  4177  4386  4669  4981  5225
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PUSH      1250#  8132   8194   8196   8217   8593   8786   8837
QKSEEK    1558#  3740   4513   4634   5543   5704
QKSRT     1538#  7709
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RDHDR     1548#  4574
REPORT    1250#
SCOPE     1145#  3161   3210   3359   3455   3495   3535   3585   3771   3895   4184   4399   4689   4991   5241
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SETTRA    8887#  8896   8897   8898   8899   8901   8903   8904   8905   8906   8907   8908   8909
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SKTIM     1592#  6030   6147   6264
SLASH     1250#
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          5949   6017   6025   6134   6142   6251   6259   6367   6376   6534   7925   7989   8043   8122   8189
          8246   8323   8400   8415   8486   8510   8579   8632   8671   8733   8751   8774   8821   8866  10131
         10140
SWRSU     1250#  3020#
TRMTRP    8887#
TYPBIN    1250#
TYPDEC    1250#  6560
TYPNAM    1250#
TYPNUM    1250#
TYPOCS    1250#  3232   3290   3331   3479   4819   4905   6828   7786   7831
TYPOCT    1250#  8428
TYPTXT    1250#
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WRCHK     1583#  4090   4296   4763   5135   5319
WRHDR     1543#  3803   3911   4202   4371   5524   5683
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$$CMTM    1605#  1642   1643   1644   1645   1646   1647
$$ESCA    1250#
$$NEWT    1250#  3151   3196   3344   3446   3488   3529   3562   3761   3885   4177   4386   4669   4981   5225
          5407   5482   5736   5808   5932   6017   6134   6251   6367
$$SET     8887#  8896   8897   8898   8899   8901   8903   8904   8905   8906   8907   8908   8909
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.HEADE    1099#  1104
.SETUP    1099#  2945
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.$ACT1    1099#  1465
.$APTB    1655#
.$APTH    1099#  1476
.$APTY    1099#  8187
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.$CMTA   1099#   1605
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.$ERRO   1099#   7987
.$MULT   1099#   8772
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.$READ   1099#   8321
.$SAVE   1099#   8819
.$SB2D   1099#   8731
.$SCOP   1099#   7923
.$SUPR   1099#   8749
.$TRAP   1099#   8864
.$TYPD   1099#   8120
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. ABS.  067320     000

% ERRORS DETECTED:  0 HARD     2 SOFT
 DEFAULT GLOBALS GENERATED:  0

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 RUN-TIME: 80 80 9 SECONDS
 RUN-TIME RATIO: 248/172=1.4
 CORE USED:  32K  (63 PAGES)

 DOCUMENT PAGES:  233
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Spooler runtime 35 Seconds, 147 KCS, 925 disk reads, 0 disk writes, 233 pages

[redacted] Date 01-Dec-76 17:50:09 Monitor IPC-0 602 [680] %%END%%